POULTRY FARMING

SKILL DEVELOPMENT COURSE

STUDY MATERIAL

POULRY FARMING SKILL DEVELOPMENT COURSE

SYLLABUS:

Section I (Introduction to Poultry Farming): 10Hrs
1.1 General introduction to poultry farming -Definition of Poultry; Past and present scenario of poultry industry in India.
1.2 Principles of poultry housing. Poultry houses. Systems of poultry farming.
1.3 Management of chicks, growers and layers. Management of Broilers.
1.4 Preparation of project report for banking and insurance

Section II (Feed & Livestock Health Management): 10 Hrs
2.1 Poultry feed management – Principles of feeding, Nutrient requirements for different stages of layers and broilers. Feed formulation and Methods of feeding.
2.2 Poultry diseases – viral, bacterial, fungal and parasitic(two each); symptoms, control and management; Vaccination programme.

Section III (Harvesting of Eggs and Sanitation): 10 Hrs
3.1 Selection, care and handling of hatching eggs. Egg testing.Methods of hatching.
3.2 Brooding and rearing. Sexing of chicks.
3.3 Farm and Water Hygiene, Recycling of poultry waste.

STUDY MATERIAL

MODULE I

Que. 1. General introduction to poultry farming - Definition of Poultry; Past and present scenario of poultry industry in India.

Poultry farming is a farming method where domestic fowls are raised. In poultry farming, rearing, and management of fowls are done for two purposes- one for egg production and another for meat/flesh.

History

Today Poultry industry is the fastest growing sector of India's agriculture. India is considered as the home for Jungle fowl from which many domesticated birds have discended.

Christian missionaries were the first to start a scientific poultry farming in India. First missionary poultry farm was established in Uttarpradesh in 1912.

Government of India established **Poultry Development Project** in 1957 to promote poultry farming extensively. It was started with 269 poultry development centres each with a unit of 100 layers of improved breeds in different parts of the country. Mostly Leghorn and Rhode Island breeds which were imported from U.S.A. This has brought a tremendous change and has become a turning point in the history of poultry industry in India.

Central Avian Research Institute: In the year 1979 to provide a strong research support for the poultry industry an institute called Central Avian Research Institute (CARI) was setup in (Uttar Pradesh) Izatnagar, for both public and private sector poultry farming.

2.2 Top 5 States in terms of poultry population:

S.No.	State	Poultry Population (in million)
1.	Andhra Pradesh	161.33
2.	Tamil Nadu	117.35
3.	Maharashtra	77.79
4.	Karnataka	53.44
5.	West Bengal	52.84
6.	All others	266.45
	Total	**729.21**

Current Scenario

Poultry has become one of the fastest growing segments of agricultural sector in India today. The production of agricultural crops have been raising by 2% per annum, where as that of eggs and broilers are rising at a rate of 8-10% per annum

India is the third largest egg producer after china and USA and the fourth largest chicken producer after China, Brazil and USA.

The Percapita consumption of eggs is 68 eggs per year and meat is 2.5 kg. We still lag behing other countries where the percapita egg consumption is 240 eggs and meat is 20 kgs.

In the calendar year from 2019-20 India's broiler production has been projected to an increase of app 4.5-5 million tons and consumption of meat rises by 20% every year.

According to 2017 censes, India produces 84 billion eggs per year. Andhra Pradesh ranks top in poultry industry followed by tamil nadu, Maharashtra and Karnataka. Broiler production reached 3.8 million tonnes per year in 2017. Andhra Pradesh ranks top in the number of poultry population also.

Poultry sector in India is valued at about Rs. 80,000 crore (2015-16) broadly divided into two sub-sectors – one with a highly organized commercial sector with about 80% of the total market share (say, Rs. 64,000 crore) and the other being unorganized with about 20% of the total market share of Rs. 16,000 Crore.

There are around 30 million farmers engaged in poultry as per19th Livestock Census.

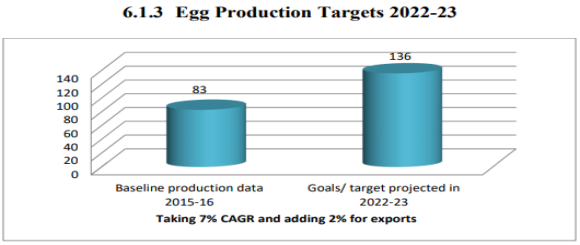
In 2012 the population of poultry is 729 millions. In 2019 it increased by 17% and is at 851. 81 millions.

SWOT Analysis Poultry Sector

STRENGTHS
i. Low cost Protein in the country
ii. Good growth rate- Average grow th rate is around 5% for egg production and 7% for meat production
iii. Poultry contributes nearly 12% to rural household monthly Income;
WEAKNESSES
i. Lack of infrastructure facilities for processing, Cold storage, refrigerated vehicles etc.
ii. High Maize & Soya prices for poultry feed production
OPPORTUNITIES
i. Very big market for poultry products.
iii. Large potential for the export
THREATS
i. Diseases. Lack of vaccines. ii. Natural calamitie

Future of Poultry industry in india

In coming years, poultry production and consumption in India is predicted to grow due to various factors such as a shift in food habits, urbanization, increasing awareness of balanced nutrition etc.



The Egg production targets for 2022-23 was fixed at 136 billion eggs as compared to 83 billion egg production in 2015-2016. And similarly the meat production was also aimed at 6.2 million tonnes for 2022-23 by the government of India.

The Indian poultry market, consisting of broilers and eggs was worth INR 1,750 Billion in 2018. The market is further projected to reach INR 4,340 Billion by 2024.

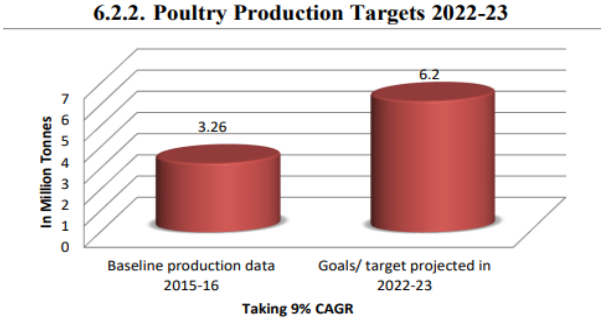
Que. 2. Principles of poultry housing. Poultry houses. Systems of poultry farming.

Introduction

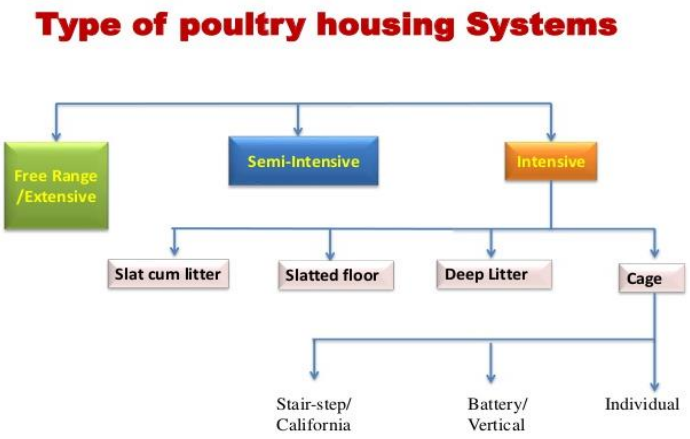
Housing in modern poultry is an important aspect since it accounts for a major component of the initial capital investment. The structures are constructed and designed keeping in mind about the welfare of the bird and efficiency of production.

Principles of Poultry housing

1. Poultry house should be located away from residential and industrial area
2. It should have proper road facilities.



3. It should have the basic amenities like water and electricity.
4. Availability of farm laborers at relatively cheaper wages.
5. Poultry house should be located in an elevated area and there should not be any water-logging.
6. It should have proper ventilation
7. Egg store room, office room and the feed store rom should be located near entrance to minimize the



government of people among the sheds
8. Disposal pit and sick room should te constructed only at the extreme end of the site

Types of Poultry Housing systems

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

1. Availability of land
2. Cost of land
3. Type of farming activity
4. Climatic condition
5. Labour availability

Broadly, poultry housing systems are classified into three systems:

1. Free range or extensive system
2. Semi-intensive system
3. Intensive system
   a. Deep-litter system
   b. Slatted floor system
   c. Slat cum litter system
   d. Cage system

1) Free range system or Extensive system

In this system poultry are reared in an open unrestricted area with out having an artificial shelter. It is the oldest system in use since centuaries by poultry owners. It requires more land.

We can rear about 250 adult birds per hectare. Foraging is the major source of feeding for birds. Shelter is usually provided by temporary roofing supported by ordinary poles. All categories of birds can be reared in this system. This system is most preferred for organic egg production. The birds must be protected from predatory animals, infectious diseases.

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.
- It eliminates cannibalism among the birds.
- Birds possess better leg and muscles

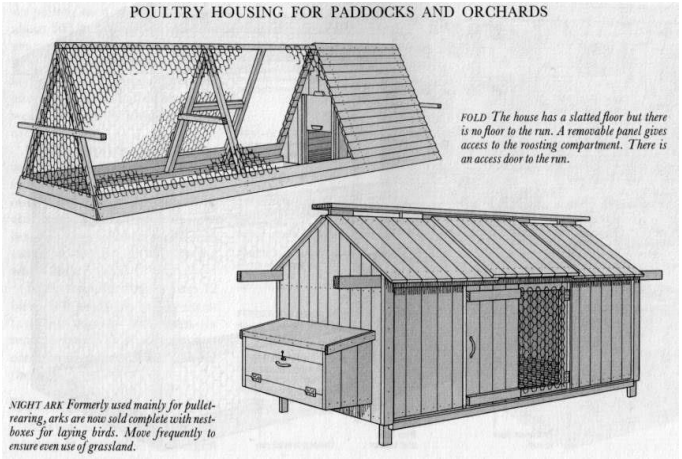
Disadvantages

- 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.
- Difficulty in controlling the birds.

2) Semi-intensive system/ Folding unit 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 and they are also given access to open fields during day time for foraging.



The success of rearing depends on maintenance of condition of runs to reduce the contamination. The stocking density rate on an average for adult birds is 750 per hectare. This system is usually adopted for duck rearing.

Sometimes the fowls are kept in foldable cabins which is called folding unit system. Each folding unit is made to accommodate 25 hens. A floor space of 1 square foot is allowed for each bird.

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

3. 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.
-

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 natural food, all the nutrients should be provided artificially.
- Chances for spreading of diseases are more.

Intensive system is further devided into *a. Deep-litter system b. Slatted floor system c. Slat cum litter system d. Cage system*

a. 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.

Litter is usually renewed once every year. One square foot space is required for each fowl.

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 extend

- The deep litter manure is a useful fertilizer.
- Lesser nuisance from flies when compared to cage system.
- Birds are protected from predators.

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

b. 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. Wooden reapers or iron rods of 2" diameter can be used on lengthwise of the house with interspaces of 1" between rods.

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

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.

c. Slat (Slot) Cum Litter System

This system is commonly practiced for rearing birds for eggs production, 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.

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.

d. 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 except nipple waterers, for which pipeline is installed through or above cages. 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.

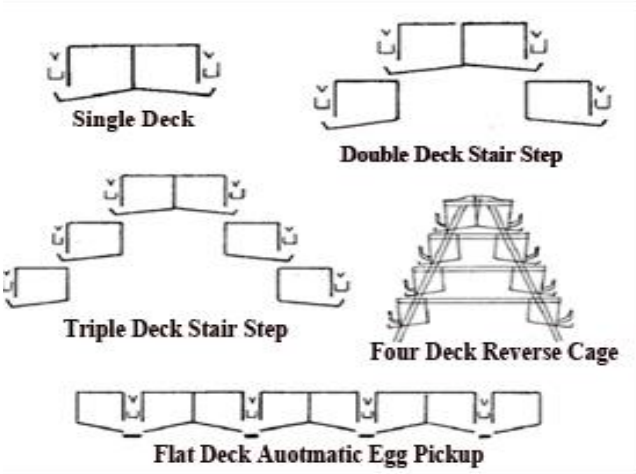
Advantages

- 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, cannibalism is minimal
- No need of litter material
- Artificial Insemination (AI) can be adopted.

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)



Types of cages

1. **Based on the number of birds** in a cage, it is classified as

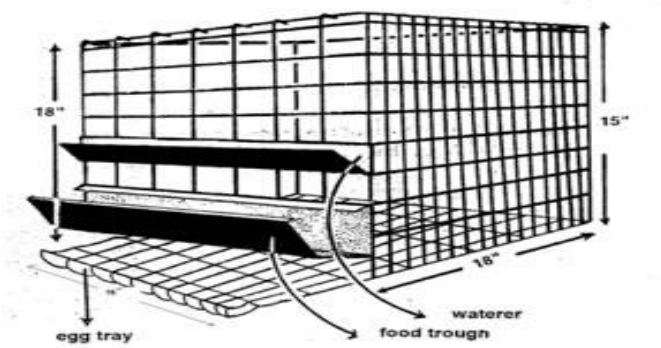
- Single or individual bird cage (Only one bird in a cage)
- Multiple bird cage (From 2 to 10 birds, usually 3 or 4 birds per cage)
- Colony cages (Holding birds more than 11 per cage)

2. Based on the number of rows

- Single-deck: Birds are kept in Single row of cages
- Double-deck: Birds are kept in Double Rows of cages
- Triple-deck: Birds are kept in triple rows of cages
- Four-deck: Birds are kept in Four rows of cages
- Flat-deck: Birds are kept in single row but spread throughout the floor.

a).Conventional cage dimensions

Specifications for each box:



Front feeding length	15inch
Front height	18inch
Back height	15inch
Depth	18inch

These cages can hold 3 to 4 birds. They are arranged either in 2-tier or 3-tier.

Qu. Write an essay on Management of chicks, layers and Broilers.

Ans. **Introduction:**

In poultry farming the birds that are grown for meat are called broilers and those that are grown for egg production are called layers. Principles of management change slightly basing upon the nature of the birds like chicks, broilers or layers grown in the farm.

I. Management of Chicks

Chicks of either broilers or Layers are purchased from Hatcheries and kept in houses and grown

1. Before Arrival of Chicks:-

The following preparations should be completed well in advance before arrival of chicks in the farm.

1. Sheds should be kept vacant for at least three weeks before arrival of chicks. The walls, celings, floors and are to be washed thoroughly for disinfection.
2. Equipments should be washed with Phenyl, rinsed in Potassium Permanganate solution and expose to such light at least for 5 days earlier.
3. Flush out and clean all water lines / channels before and after disinfection.
4. Spray roof and floor with 10% Formalin and close the sheds for at least 24 hours.

5. White wash the walls with Malathion powder at the rate of 1 kg: 50 kg of lime.
6. Provide clean litter material (paddy husk / saw dust) inside the brooder guard and spread old news paper on litter so that chicks do not eat litter.
7. Spread broken rice / grinded maize on the paper few hours before arrival of day old chicks.
8. Bring temperature to brooding level (95F) 24 hours before arrival of chicks.

2. After Arrival of Chicks:-

1. Release the chicks gently into the brooder guard close to drinking water and grinded maize / broken rice.
2. Provide 6 sq. inches space per chick in the brooder.
3. Brooding should be started at 95 F temperature
4. Debeaking may be done at 3rd or 4th week of age.
5. Provide chick feeders within 5 – 7 days.
6. Replace new papers every day till the chick guards are removed.
7. Remove the chick guard after 7 – 10 days and spread out the chicks into the entire brooding pens.
8. Add some more litter material

II. Layer/Grower management and egg production

Layers are grown for egg production. Consistent supplies of high quality eggs are produced when hens are well housed, fed and watered, and suffer as little stress as possible

Welfare starts from day one when newly-hatched chicks are bought in and taken through the growing phase into laying hens over the next 18 weeks.

Successful management of laying flocks hinges on the following factors:

- Housing and light management
- Feed and water management
- Heat stress management

1. Housing and light management

Choice of housing is wide and includes intensive and semi-intensive. Artificial light is provided to increase the day length upto 16-18 hrs, at which stage maximum number of eggs laid
General guidelines for total of natural and artificial light could be as follows:

First week after chicks are housed - 24 hours of light.
2 to 6 weeks - 16 hours of light.
6 to 12 weeks - 13 hours of light.
12 to 18 weeks - 10 hours of light.

At 18 weeks, increase day length one half hour per week until 15 hours of day length is reached. Laying hens must have a minimum of 8 continuous hours of rest (black-out) per 24-hour period.

Use one 60-watt bulb for laying hens or very young birds per 200 square feet of floor space.

2. Feed and Water Management

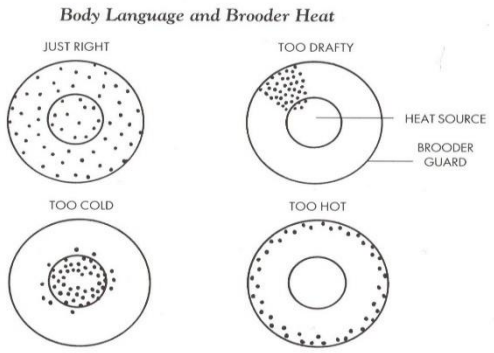
Birds are to be fed @ 50 gms of balanced layer ration / bird / day.

The feed given to the birds should be minimal at the same time nutritive. Feed restriction is essential, at the same time, birds should never be deprived of feed, and feeders should never be empty

Layers' rations must contain 3-4 % calcium, needed for extra strong bones and for egg production
Poultry require the full range of vitamins, nutrients and amino acids, but Vitamin D in particular has a crucial role in the metabolism of laying hens. Hens lacking in Vitamin D are unable to utilise calcium and phosphorous with serious consequences for bone tissue and egg shells.

3. Heat stress management

The optimum temperature range for birds over 4 weeks of age is 65°-75° F. As temperature gets above or below this range, the production, growth rate or efficiency can suffer.



The following tips are recommended to keep the birds comfortable and to curtail deaths during summer months.

1. Provide plenty of clean, cool drinking water at all times. Crushed ice may be provided in waters during hightemperature days.
2. Plant shade trees around the poultry house.
3. Use a hosepipe sprinkler on the roof. Sprinkling can reduce temperature inside the house.
4. Reduce the thickness of old built-up litter. Two inches of fresh litter may be provided in the place of old litter.

5. Addition of electrolytes, Vitamin C, and probiotic in drinking water helps to alleviate heat stress.
6. Provide fan/Air Cooler ventilation during summer.
7. Feed during cool hours of the day.
8. Hang wet gunny bags on the sides.

III. Broiler Management

Chick Quality

1) Chicks are to be from healthy parents
2) Average weight of 100 chicks should be between 3.8 to 4.0 kg.
3) Uniform size and colour.
4) Well dry, fluffed and cleanly hatched.
5) Should be alert, active and free from deformities.
6) Vaccinated at hatchery for Marek's disease and tested negative to gumboro (IBD)

Housing

1) Space per each chick in brooder should be 32 cm2
2) Space per each broiler should be 1 sq. ft.
3) Adequate ventilation & proper temperature must be maintained.
4) Temperature : Chickens prefer a laying house temperature of about 23.8^{o}C and are comfortable up to 29.4^{o}C. When the laying house temperature is above 32.3^{o}C, birds are uncomfortable and the feed consumption is greatly reduced with low egg production. Over 37.8oC, the mortality rate is rather high.

Litter Arrangement

1) Kind of litter :- Rice husk, saw dust, wood shavings etc.
2) Type of litter : Clean, dry, new, free from dust & Aflatoxins.
3) Depth of litter : 5 to 7 cm. Care : i) Keep free from dust & moisture (between 20%).
4) Free from injurious material like fungus.

Lighting

Put on dim light all the night for three weeks during brooding

Watering

1) Requirement of Drinking water per 100 chicks: 0 to 2 weeks age 2 litres capacity waterers. 3 to 8 weeks age 3 waterers of 1 gallon capacity.
2) Birds for water should not go beyond 3 m. distance.
3) Keep water fresh, clean and cool.

Feeders

1) Type – Linear feeder is used. The chicks line up and eat the food.
2) Space per chick is 5 cm
3. Method : (i) Group feeding, (ii) chick may be fed with mash up to 4 weeks (iii) from 5th week onwards chicks can be fed with Feed pelleted or crumbled form.
Feed conversion ratio 2 kg. feed for 1 kg. gain in weight.

Broiler House Management

The following management methods can be adopted

1) Check electrical equipment & thermometer regularly to monitor temperature and lighting.
2) Switch on white light or 40 watt bulbs. First Two Weeks (Most critical period)
3. if the chicks huddle together in the brooder pan, increase the temperature and if the chick separate and disperse degrease the temperature.

4) Feeding movement should be observed whether all the chicks are eating or not.
5). After One week old: a) Reduce brooder temperature by 5 degrees F. b) Reduce light intensity if vice are noted.
6). After Two weeks:
a) If necessary debeak the birds to control cannibalism.
b) Keep litter dry to prevent coccidiosis as its organisms thrive on wet litter.
c) Follow the Suggested Vaccination Programme for Broilers:

OTHER MANAGEMENT PRACTICES

Cannibalism : Eating of its own species is called cannibalism. In poultry farms, pecking is the commonly observed problem. An accidentally injured bird with blood on it will be pecked, sometimes to death, by other birds.
Some reasons for pecking or cannibalism are:
1. overcrowding
2. inadequate diet (especially a salt and/or protein deficient diet);
3.infestation with lice or mites.
Preventive measures:
Once a pecking problem occurs, the best action is de beaking the chicken should be done.
To prevent cannibalism, good management is of practices include
1. Reducing the density of flock by expanding the space or removing some birds
2. Placing evergreen boughs (such as pine) with needles, leaves, freshly cut green grass, torn up newspapers, etc., in the pen to divert the birds to pecking at these materials.
3. Improving the diet.
4. Treating the birds from lice or mites.

5 Spreading pine tar or other non- toxic, bad tasting substances or commercial preparations over the wounds of pecked birds.
6. Removing pecked birds and aggressive birds from the flock.

De-beaking: This concept deals with the cutting of the tips of the beak by the farmers to prevent chickens from pecking each other. This act also reduces feed wastage. Here, the farmers cut a portion of the upper beak and the tip of the lower beak off.

Layer type chickens should be debeaked before they start producing eggs. 1/3 of the top beak should be cut so that they can scoop up the feed and eat more easily.

Equipment specifically designed for de-beaking is now available. These electrical devices are designed to cut and shape the beak with a hot blade. To debeak baby chicks, just burn back the top beak quickly. For older birds, hold the tongue back with the tip of your index finger, cut and reshape the beak. Chicks also can be debeaked with nail clippers

Culling: Removal of the sick or poorly producing chicken from a flock is called culling. This practice lessen the chance of spreading disease, and thus reduce the waste of feeding non - layers.

During a flock's first five months, watch for sick birds. The sick birds can be placed in a special pen. If they recover totally, they can rejoin the flock. In larger flocks, it is better to destroy obviously sick chickens.

Culling may increase the profits from a laying flock by up to ten percent. This takes experience, for some layers go through pauses in production

Non laying hens can be removed based on the following physical appearance.

1. Dry, hard shrunken comb or wattle
2. Long thin pointed beak
3. Dull sleepy eyes
4. Adomen is hard and small
5. Vent is dry and puckered

Care of eggs: Eggs produced under clean conditions are most profitable. To produce table eggs keep males out of flock. Fertile eggs deteriorate more quickly than infertile eggs. Provide clean good litter material in the nest boxes. Collect eggs as frequently as possible at least 3 times a day and keep them cool until they are disposed off. In warm weather increase collection to four or five times a day. Handle eggs carefully.

Qn. Prepare a Project report for a Broiler Farm for Banking and Insurance

The broiler is the fastest growing industry in the world among the other poultry.

Technical details and assumptions
1. House: Open sided, tile roofed, deep litter house.
2. Floor space: Half square feet per bird up to 25 days of age and one square feet per bird there after.
3. Cost of poultry house: Rs. 50/- sq. ft.
4. Other building cost: Rs. lOO/-sq. ft.
5. Equipment cost: Rs. 10/- bird.
6. Cost of Medicine, Vaccine, Insurance
Labour, Electricity, Fuel, etc.: Rs. 4/ – bird.
7. Total number of birds in the farm: 7000
8. Total number of birds per batch (including extra 5%) : 1050
9. Batch interval: 1 week
10. Saleable broilers per batch per week: 980
11. Growing period: 45 to 50 days

Total capital investment, the share of the promoter (margin money), bank finance needed (amount in lakhs of Rs.)

Certificate

Certified that this project is prepared by me taking into account the prevailing prices of various farm inputs and outputs and the latest technical and production standards. It appears that this project will be technically feasible and financially viable.

Signature

Enclosures:
1. Land ownership document.
2. Farm site map.
3. Blue print and estimates of farm buildings.

(SEE THE PICTURE IN THE NEXT PAGE. WRITE THAT AS ANSWER)

POULRY FARMING SKILL DEVELOPMENT COURSE

Project report for
poultry farm establishment

STATEMENT – 1	
Non-recurring Expenditure	**Amount (Rs. in lakhs)**
Cost of 6000 square feet broiler housing @Rs. 50/- sq. ft.	3.00
Cost of 1600 sq. ft. feed store, supervisor, workers quarters	1.60
Land development charges like fencing, provision of the gate, farm roads, etc.	0.3
Cost of deep tube well, water pump, overhead tank and pipeline to all shed	0.7
Cost of feeders, waterers, platform weighing scales, wheelbarrow, brooders, etc. @ Rs. 10/- per bird for 7000 birds	0.7
Total	6.3

STATEMENT – 3			
Description	**Total capital**	**Promotor/farmer share**	**Bank Finance Required**
Land cost (1 acre Own land)	1.00	1.00 (100%)	–
Non-recurring expenditure (vide Statement I)	6.30	1.57 (25%)	4.73
Working capital (vide Statement 11)	3.22	0.80 (25%)	2.42
Total	**10.52**	**3.37**	**7.15**

STATEMENT-2	
Working Capital	Amount (Rs. in lakhs)
Cost of 1000×7 batches of day-old chick @ Rs 10/	0.70
Feed cost for 7 batches at an average of 4 kg/bird x Rs. 8000/ tonne	2.24
Medicine, Vaccine, Insurance, Labour, Electricity, Health coverage, etc. @ Rs. 4/bird	.28
Total	3.22

STATEMENT – 4	
Annual Recurring Expenditure	**Amount (Rs. in lakhs)**
Cost of 1000 day-old chicks x 52 batches/year @ Rs. 10/- each	5.20
Feed cost for 52,000 broilers x 4 kg/bird @ Rs. 8/kg	16.64
Other miscellaneous cost@Rs. 4/bird	2.08
Total	·23.92

STATEMENT – 5	
Annual Gross and Net Returns	**Amount (Rs. in lakhs)**
By sale of 980 live broilers per batch x 52 batches x Rs. 35/kg live weight (1.8 kg)	32.10
By sale of about 3500 empty gunny bags @ Rs 5/ each	0.18
By sale of about 200 tonnes of manure @ Rs. lOO/tonne	0.20
Total	**32.48**
LESS: Annual expenditure (statement IV)	23.92
Gross Profits 32.48 - 23.92	**8.56**
Loan Repayment	**2.0**
NET Profits after paying bank Loan	**6.56**

Prepared by
B. A. Ali Baba, M.Sc. M.Phil. B.Ed. NET

Module II

Qn. Write an essay on the Principles of feeding, and the Nutrient requirements for different stages of layers and broilers.

POULTRY FEED MANAGEMENT

India ranks 3rd In egg and 4th in broiler production. Balanced diet involves 70% of of total production cost. Carbohydrates, Proteins, Fats, Vitamins, Minerals and water are the six major components of feed.

The primary objective of feeding poultry birds is to convert low quality feeds like cereal grains, oil cakes and other by products of agriculture and industry into high quality food like egg and meat.

I. Principles of feeding in poultry:

1. Chickens have neither lips nor teeth. They cannot chew the feed. Hence, their ration must be soft concentrates
2. Birds have simple stomach; hence requirements are more precise and specific.
3. Because of higher rate of metabolism, different feed is to be given for different Class of birds.
4. They are to be fed in groups.

5. Nutritional adjustments are to be done as per the requirements.
6. Feed must be free from aflatoxins
7. Clean, fresh and cool water must be made available at all time.
8. Birds feed must contain a maximum or 6 to 10% of crude fibre.
9. Feed requirements must be determined based on type of birds grown (chick/young/adult) and purpose for which it is grown (Meat or egg production)
10. Feed must be of balanced type having all essential nutrients
11. Records are to be maintained relating to the daily average feed
12. Water is most important suppliment to the birds. If inadequate water is available birds cease eating
13. Quality of feed affects the consumption. Stale, rancid, moldy feeds are not eaten by birds. Some times such feeds cause diseases.
14. Poultry feeds may be in the form of Mash, Pellet or Crumble.
15. Type of Feed: Broilers are fed with Broiler starter (0-3 weeks), Broiler Finisher (4-8 weeks) till it is sent to market
16. Layer feed was traditionally devided as Chick feed (0-8 weeks), Grower Feed (9-20 weeks), Layer Feed (20-72 weeks). The feed given to Layers during Egg Laying Period is being devided now a days as –

Phase I (20-35 wk) is characterized by an increase in bodyweight to achieve mature body weight.

Phase II (35wk – 50wk) is characterized by an increase in egg size and maintaining peak egg production.

Phase III (50wk and above) egg size is increased but egg production and body weight are decreased.

II. Nutrient requirements for different stages of layers and broilers/ or Write an essay on Feed formulation

Poultry feeding is one of the important aspect of poultry science. Poultry feeds Chicken feeds shall be of Five types

1. **Broiler Starter Feed** (BSF):- It is Chick mash to be fed to chicks, intended for meat production, up to the age of 4 weeks.
2. **Broiler Finisher Feed** (BFF):- It is feed to be fed to chicks, intended for meat production, from the age of 6 weeks onwards till it is sent to market.
3. **Chick Feed** (CF):- it is feed to be fed to chicks, not intended for meat production, up to the age of 8 weeks.
4. **Growing Chicken Feed** (GCF) :- A ration to be fed to growing chickens from 8-20 weeks or until laying commences.
5. **Laying Chicken Feed** (LCF) :- A ration to be fed to laying birds from 20 weeks onwards or after laying commences. It is further devided into Phase I, Phase II and Phase III types of feed.
6. **Brooder Chicken Fee**d (BCF) :- A ration to be

Requirements for Chicken feeds

S.No	Characteristic	Requirement for					
		BSF	BFF	CF	GCF	LCF	BCF
1	Moisture, percent by mass (max)	10	10	10	10	10	10
2	Crude Protein, percent by mass (max)	22	19	22	16	18	18
3	Crude fiber, percent by mass (max)	6	6	7	8	8	8
4	Acid Insoluble Ash, percent by mass (max)	3	3	4	4	4	4
5	Salt (as Nacl) , percent by mass (max)	0.6	0.6	0.6	0.6	0.6	0.6
6	Calcium, percent by mass (min)	1.0	1.0	1.0	1.0	2.75	2.75
7	Available phosphorus, percent by mass (min)	0.5	0.5	0.5	0.5	0.5	0.5
8	Lysine, percent by mass (min)	0.9	0.9	1.0	0.7	0.5	0.5
9	Methionine, percent by mass (min)	0.35	0.35	0.35	0.25	0.25	0.25
10	ME kcal/kg (min)	2900	3000	2700	2700	2700	2800

fed to breeding chicken. (it is given in hatcheries, not at farm level usually)

Following are the nutrient constituents/ Ingredients of poultry feeds/Feed formulation

Proteins

In poultry, the products produced consists mainly of protein. On a dry weight basis the carcass of an 8 weeks old broiler is more than 65% protein and the egg contents are about 50% protein. Typical broiler rations will contain from **22 to 24% protein** and in layers ration the amount varies between **16-17%.**

Source of Proteins: Meat scraps (lysine), fish meal (lysine, methionine), poultry by-product meal (tryptophan, lysine), cottonseed meal, peanut meal, soybean meal, sesame meal, sunflower seed meal etc.

Carbohydrates

The main function of carbohydrates in the diet is to provide energy to the animal. Chicks can digest only starch. Cellulose is completely indigestible. Cereal grains and their by-products are excellent source of starch and thus constitutes a bulk of poultry ration.

Source of Carbohydrates: Corn, sorghum grains (milo) barley, rye, oats, wheat, wheat middlings, various grain by-products.

Fats

Fats make up over 40% of the dry egg and about 17% of the dry weight of a broiler. Although fats supply concentrated form of energy (2.25 times more energy than carbohydrate and protein)

Most feed ingredients (maize, barley, safflower, milo, wheat, rice, bran, etc.) contain 2-5% fat and that is enough for the inclusion of one essential fatty acid (Linoleic acid),

Sources of fats: Animal tallow (beef), lard, corn-oil, other vegetable oils.

Minerals

The body of the chicken and the egg excluding shell contain nearly 4 and 1% mineral matter respectively.

The minerals required for normal growth are calcium, phosphorus, sodium, potassium, magnesium, chlorine, iodine, iron, manganese, copper, molybdenum, zinc and selenium.

Source of minerals: Meat scraps, fish meal, milk products, ground limestone (calcium), ground oyster shells (calcium), rock phosphate (phosphorus, calcium), steamed bone meal (phosphorus, calcium), salt (sodium, chlorine, iodine), manganese oxide (manganese), zinc carbonate (zinc), zinc oxide (zinc).

Vitamins

Vitamins most commonly function as coenzymes and regulators of metabolism. The 13 vitamins required by poultry.

Apart from natural sources, commercial vitamin mixture suitable for poultry are also available.

Source of vitamins: Yeasts, fish solubles, distillers' solubles, liver meal, alfalfa meal, milk by-products.

Chick ration	
Ingredient	**% composition**
Maize	30
Wheat	20
Wheat bran	10
Rice bran	10
Sunflower cake	10
Cotton seed cake	5
Fish meal	2
Beans	10
Bone meal	1
Limestone	0.5
Salt	0.5
Mineral premix	1
	100

Grower rations	
Ingredient	**% composition**
Maize	25
Wheat	25
Wheat bran	15
Rice bran	10
Sunflower cake	5
Cotton seed cake	11
Fish meal	2
Beans	5
Bone meal	1
Limestone	0.5
Salt	0.5
Mineral premix	1

Layer ration	
Ingredient	**% composition**
Maize	35
Rice bran	35
Soya cake	10
Fish meal	15
Limestone	2
Ground dried Legume leaves	3.5
Salt	0.5
Mineral premix	1
	100

Feed additives

Additives are never nutrients. They either singly or in combinations are added to a basic feed, usually in small qualities for the purpose as stimulants or medicines. Often they are called "non-nutrient" feed additives.

Following are some modern feed additives used for poultry

A. Additives that promote feed intake or selection like Butylated Hydroxytoleune BHT, Poultry nector etc.

B. Additives that Enhance the colour or quality of the marketed product like Xanthophylls, synthetic carotenoids etc

C. Additives that facilitate digestion and absorption like Agrozyme, Prozyme enzymes, Probiotics etc.

D. Additives that alter metabolism like Hormone Progesterone, Dienestrol diacetate etc for enhancing growth and egg laying capacity.

E. Additives that affects health status like
1. Antifungal additives: sodium propionate, sodium benzoate etc. 2. Anticoccidial: Bifuran supplement, Amprol 25%, Embazin, Zonamix, Nitrofurazone, Furazolidone. 3. Antihelmintic drugs: Mebendazole etc.

Que. Write a short notes on Methods of feeding

METHODS OF FEEDING

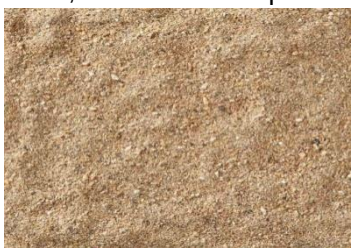
A well balanced give the most satisfactory result unless a satisfactory method is followed.

I. Types of Feeds

Whole grain feeding system: by this method birds are given whole grains as feed. This old and abandoned system offers no particular advantage.

Grain and mash method: this method is slightly better than the previous one. it involves feeding of grain mixture along with balanced mash. By this, one can increase or decrease the protein level as desired.

All mash method: In this method of feeding, all the feed ingredients are ground, mixed in required proportion and feed as a single balanced mixture. This method is desirable for all types of poultry grown under litter and cage system



a. Crumble: It is a coarse variety of mash with a texture of oat meal. Crumble is a semi loose food. It fills the gap between mash and pellets

b. Shell Grit: This is the mixture of shells given to supplement calcium needs of birds. Chicks store the shell grit in their gizzard which helps in pulverizing the food for easy digestion

c. Chicken Scratch: It is akind of treat for the flock. It consists mostly corn and other grains. It is given occasionally to change the regular diet. It is eaten happily by birds.

d. Fermented feed: To improve vitamin and enzyme content of the food fermented food is given occasionally

e. Medicated feed: Sometimes medicines are mixed to prevent diseases along with food.

f. Pellet method of feeding : Pellet are made of dry mash under high pressure. These are quite hard and cylindrical shape and are being extensively used in western countries. The greatest advantage in using pellets is that there is little waste in feeding. The disadvantage is that pellet are expensive

II. Restricted and controlled feeding:

This is further categorized as

A. Quantitative restriction feeding method: Here the quantity of feed is reduced below the normal requirements of birds. This is done by various methods like

(1) Skip a-day programme: Feed is not provided for a day in a planned way. This controls obesity and fatty liver syndrome in broiler farming.

(2) Alternate day feeding: In this feed is provided on alternate days

(3) Restriction of feeding time: Feed available time is reduced. In this the continuous availability of the feed is reduced to 1 to 2 hours per day twice or thrice a day.

B. Qualitative Restriction Feeding Method: This method is practiced by reducing the quality of the feed below the standard requirement of the bird. This can be done by including feeds that are lesser in nuttient value. This will prevent obesity in birds.

Advantages of Restricted feeding

1. A Considerable saving on feed cost.
2. Only 80% of the calculated feed requirement will be offered.
3. The pullets accumulate less fat and therefore produce more eggs.
4. It is easier to identify weaker birds at an early age during feed restriction.
5. Layers feed, restricted during growing period has been found to produce heavier eggs than those fed at freely

Que.Wrie an essay on Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management; Vaccination programme.

POULTRY DISEASES

Most complicated aspect of poultry farming is the problem of diseases and their control. Various diseases that affect poultry industry are classified as follows

1. Diseases caused by Pathogens

Viral Diseases: New Castle Disease, Gumbora, Avian Influenza, Fowl pox, Infectuous bronchites etc.

Bacteria Diseases: Fowl Cholera, Salmonella, Mycoplasma, Rimerella etc.
Fungal Diseases: Asperjilosis, Mould, Mycotoxins
The Protozoan and other kinds of parasites: Coccidiosis, Intestinal worms, Lice and Mites

VIRAL DISEASES

1. Ranikhet Newcastle Disease ND

Cause: Newcastle disease is caused by a Paramyxovirus (APMV-1).

Transmission: Newcastle disease virus is highly contagious through infected droppings and respiratory discharge between birds. Spread between farms is by infected equipment, trucks, personnel, wild birds or air. The incubation period is variable but usually about 3 to 6 days.

Species affected: Chickens and turkeys.

Clinical signs

- Highly pathogenic strains of ND cause high mortality with death within 3 to 5 days. Affected chickens usually exhibit respiratory or nervous signs.
- Labored breathing with wheezing and gurgling, accompanied bynervous signs, such as paralysis or twisted necks are the main signs.
- Drop in egg production 30 to 50 % or more, In well-vaccinated chicken flocks clinical signs may be difficult to find.
- Intestinal lesions Inflamed tracheas, pneumonia, and/or froth in the airsacs are the main lesions. Haemorrhagic lesions are observed in the proventriculus andthe intestines.

Diagnosis

- Clinical signs followed by laboratory confirmation. Because other respiratory infections like Infectuous Bronchitis, and Avian Influenza can give similar signs.
- Confirmation can be obtained with virus isolation and identification through PCR test

Treatment

There is no specific treatment for ND; antibiotic treatment of secondary bacterial infections (eg E.coli) will reduce the losses.

2. Merek's Disease MD or Neuro Lymphomatosis

Cause: Marek's disease is caused by a alpha herpesvirus.

Transmission: The disease is highly contagious. Main transmission is by infectedpremises, where day-old chicks will become infected by the oral and respiratory routes. Young chicks are particularly susceptible to infection.

Species affected: Especially chickens, also quail, turkeys and pheasants are susceptible.

Clinical signs

- Infected birds show weight loss, or may exhibit some form of paralysis.
- The classical form: neurolymphomatosis (paralysis) with leg nerveinvolvement causes a bird to lie on its side with one leg stretched forward and the other backward.
- Acute Marek's disease is an epidemic causing paralysis, mortality and tumours in multiple organs.
- Mortality usually occurs between 10 and 20 weeks of age and can reachup to 50% in unvaccinated flocks.

Diagnosis: The presence of tumours in liver, spleen, kidneys, lungs, ovary, muscles, or other tissues is indicative of MD, However, nerve involvement (swelling of nerves) is typical of MD.

A proper diagnosis requires histological examination or PCR test

Treatment

There is no effective treatment for affected flocks.

Control

Vaccination is an effective means of control.
It has been demonstrated that MD vaccine only prevents the appearance of Marek's disease tumours and paralysis. It does not prevent the birds from becoming infected with MD-virus.
.

3. Fowl Pox or Avian Pox, Avian Diphtheria)

Cause

Fowl pox is caused by a Poxvirus.

Transmission

Transmission occurs by direct contact and water or feed.
Mosquitoes and other flying insects can also transmit the virus frombird to bird and also transmit the disease to near-by flocks.
The incubation period varies from 4 to 20 days.

Species affected
Chickens, turkeys, pheasants and pigeons can be affected

Clinical signs

- The lesions of fowl pox can be external (mainly on the head) or internal ("wet pox") in the oral cavity, oesophagus and/or trachea; The lesions on the head, combs, and wattles are usually wart-like in appearance, yellow to dark brown in color.

- The internal lesions (diptherie) in the mouth, oesophagus and/or trachea are yellow-white and cheesy in appearance.
  Affected birds will lack appetite and breathe laboriously.
- Mortality is variable, from 2%, to over 40% Reduced egg production can be observed in laying birds, this will return to normal in a few weeks.

Diagnosis
Wart-like lesions of the head particularly of the comb and around theeyes or yellow cheesy lesions of the mucous membranes of the nasaland oral cavities are suggestive of fowl pox.
A definitive diagnosis can be made in a laboratory by histological examination or virus identification through PCR

Treatment
There is no effective treatment.
Control
Preventive vaccination using a live vaccine is by far the most successful control method. Even when an outbreak of Fowl Pox has been diagnosed, it is advisable to vaccinate the flock immediately (emergency vaccination) to stop further spreading of the infection.

4. Infectious Bursal Disease (Gumboro disease, IBD)

Cause: The disease is caused by a Birnavirus

Transmission: IBD virus is very infectious and spreads easily from bird to bird by way of droppings. Infected clothing and equipment are means of transmission between farms.

Species affected: Chickens and turkeys appear to be natural hosts.

Clinical signs

- Affected birds become pale and produce watery white diarrhea. Mortality variesfrom 5 to 60%

Diagnosis
Typical clinical signs and post mortem lesions are found after IBDinfection.

The bursa destruction is apparent on histologic examination.

Treatment
No treatment is available for IBD.

Control
Vaccination of breeders and young chicks is the best means of control.
A variety of live and inactivated vaccines have been developed to enhance the control IBD challenges.

BACTERIAL DISEASES

1. Infectious Coryza

Cause: This is a bacterial disease caused by Avibacterium paragallinarum,(in the past known as Haemophilus paragallinarum).

Transmission:
The disease spreads from bird to bird and flock to flock by contact and airborne infected dust particles and via the drinking water.

Species affected: The chicken is the natural host for Avibacterium paragallinarum. All ages are susceptible

Clinical signs

- The main clinical signs are due to an acute inflammation around the eyes and upper respiratory tract.
- Signs include a serous to mucoid discharge in the nasal passage and sinuses, facial edema and conjunctivitis. Loss of weight to broilers and loss of egg production in layers occurs.

Diagnosis
The symptoms of Coryza disease are common to many diseases. Hence thorough inspection of the clinical signs by isolating the bird is to be done. Air Sac Exudate is to be obtained and tested in laboratory.
Treatment
Treatment with various antibiotics (erythromycin and tetracycline arecommonly used) will alleviate the severity and course of the disease.

Prevention
Vaccination is the preferred control method and is standard in most Coryza endemic areas.

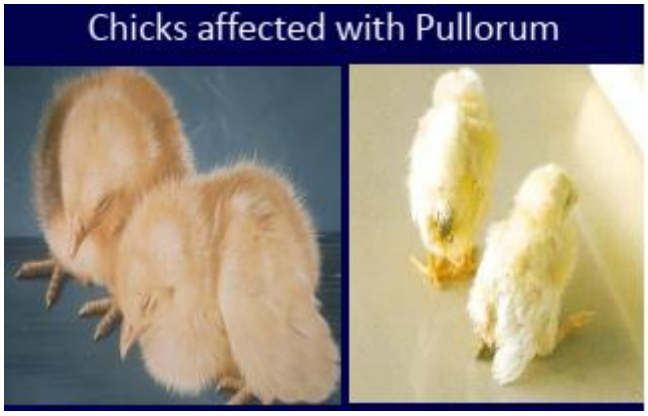
2.Pullorum disease (Bacillary White Diarrhoes)

Cause: Pullorum disease is caused by a bacterium, Salmonella pullorum.

Transmission: Pullorum can be transmitted horizontally and vertically by infected (carrier) breeder hens through their eggs. Horizontal transmission is through infected droppings, dead bird carcasses, and infected clothing, shoes, utensils and other fomites.

Species affected: Chickens and turkeys. Other birds such as quails, pheasants, ducks, peacocks and guinea fowl are susceptible.

Clinical signs and lesions:



- Birds hatched from S.pullorum or S. gallinarum infected eggs appear lazy or dead in the hatching trays
- young birds will show weakness, depressed appetite, poor growth and increased mortality.
- In older birds depression. diarrhea, ruffled feathers, pale shrunkencombs and mortality. Mortality can reach 25-60%
- Lesions; acute septicaemia-enlarged and congested liver, spleenand kidneys, Heart is seen

Treatment
Treatment with antibiotics of pullorum disease will not cure but reduce clinical signs.

For layers vaccines against fowl typhoid are available.

3. Fowl Cholera (Avian Cholera, Pasteurellosis, Avain hemorrhagic septicaemia)

Cause: Fowl cholera is caused by a bacterium: Pasteurella multocida

Transmission: Transmission of fowl cholera is mainly from bird to bird by wateror feed contamination. There is no evidence for egg transmission.

Species affected
Turkeys, chickens, ducks and geese, game birds and other bird speciesare susceptible.

Clinical signs and lesions
Affected birds have decreased appetite. Egg production will drop 5-15 % and mortality will be high in acute fowl cholera. combs and wattles. Swollen wattles is a feature of chronic fowl cholera.

Lesions; acute phase septicaemia in viscera, hemorrhages, swelling in liver and ovaries.

Diagnosis
Clinical signs in combination with isolation and identification fromsamples from birds that died of acute Fowl cholera. (Fresh death birds)

Treatment
Antibiotics based on antibiotic sensitivity test, the earlier the diagnosis the better change of a positive effect of an antibiotic treatment.

Control
Hygiene management and rodent control to be undertaken. Vaccination can be considered in areas where Pasteurella multocida isprevalent.

FUNGAL DISEASES.

1. Brooder Pneumonia / Aspergillosis
It is caused by a fungus Aspergillus fumigatus
It is Spread through litter and feed to the young ones of brooding stage.

Symtoms:
Loss of appetite, encephalitis, waterly diarrhoea, gasping
Yellowish green lesions are formed in eyes, liver, lungs and brain. High mortality rate

Prevention
Regular cleaning of sheds.
Well house keeping
Fumigation , hygienic conditions. Antifungal spraying like fibrotan

Treatment: No specific treatment
• Copper sulphate at 1:2000 conc.Hamycin and 30% Potassium chloride solution is used.

2. Aflotoxicosis
It is Caused by Asperigillus flavus
It is Spread through Contaminated litter and feed

Symptoms: Loss of immunity
Retarded growth, Liver necrosis, Inflammation of pancreas & kidneys

Prevention: By maintaining dry conditions. Prevented by avoiding moisture, contaminated feed and litter.

OTHER PARASITIC DISEASES

1. Coccidiasis

It is caused by a Protozoan parasite Eimeria
Litter and water are the source of infection
It causes High mortality

Symptoms:
• Depression, ruffled feathers, Birds congregate in flocks, blood diarrhoea
Treatment:
• Nitrofurazone should be administered

2. Ticks and mites, Lice and fleas Nematodes & Trematodes also cause various diseases.

Anthelminthic drugs like mebex, albandazole should be administered for deworming.
Mites, lice fleas are treated by giving dip in Carbon tetra chloride & turpentine
Spraying DDT is the preventive measure

PREVENTION OF POULTRY DISEASES

• Right feed
• Clean water
• Shelter against rain and wind
• Changing the litter / Providing dry litter
• Avoiding flocking of birds
• Culling
• Separation of chicks from adult birds
• Killing & burning of diseased and infected birds

VACCINATION SCHEDULE OF POULTRY BIRDS

Animal	Diseases	Age and Booster dose	Route
Broilers	Ranikhet disease (Newcastle disease)	1-7 days	nasal drops
	Infectious bronchitis	3-4 weeks	Spray / drinking water.
	Infectious bursal disease	18-21 days	Spray / drinking water
	Marek's disease	5-10 days or 18-21 days	Drinking water.
Broiler and layer breeders	Fowl pox	6 – 8 weeks 18-20 weeks	Intra muscular
	Fowl cholera	6 weeks Adult repeat annually	0.5 ml sub cutaneous 1 ml sub cutaneous
	Infectious bronchitis	3 weeks 8 weeks 14-16 weeks	Drinking water/spray i/m
	Infectious bursal disease	3 weeks 16 weeks	Drinking water i/m
Commercial layers	Marek's disease	Day 1	Intra muscular
	Ranikhet disease	1-7 days 3-4 weeks 8 weeks 16-18 weeks	spray/drinking water intra muscular or Subcutaneous
	Infectious bursal disease	40th week	Drinking water
	Infectious bronchitis	3 weeks	Drinking water
	Infectious coryza	3 weeks	Drinking water

The above is the vaccination schedule for both broilers and layers which is to be followed for commercial success of poultry farm.

MODULE III

Qn. Write an essay on Selection, care and handling of eggs for hatching purpose and make a note on Egg Testing

Poultry has become one of the fastest growing segments of agricultural sector in India today. Now adays poultry products are in high demand. Hatching Technology deals with various aspects of Incubation of fertilized eggs to the arrival of baby chicken

SELECTION OF EGGS FOR HATCHINGS

Most producers set as many better eggs as possible for incubation.

A. Characters of the layers chosen for egg selection should be

1. Well developed, mature and healthy
2. Compatible with their mates and produce a high percentage of fertile eggs
3. Undisturbed during the mating season
4. Fed with complete breeder diet
5. Not related.

6. Good layer and a cockerel are needed Tor getting tertilized eggs of high quality.

B. Eggs selection

1.Avoid excessively large eggs as they hatcn poorly and small eggs as they produce small chicks.
2. Avoid eggs with cracked or thin shelis as there is difficulty in retaining moisture needed for proper development. Cracked eggs give scope for the penetration of disease causing organisms.
3. Select the eggs from hens aged between eight and eighteen months as they lay eggs with uniform size with superior shell quality.

Keep 20 or 25 eggs on a table and eliminate the eggs which are
(a) Are round and ball like
(b) Have nearly the same size at both ends.
(c) Have uneven shell structure
4. Pick up and select the moderately elongated eggs with broader a side and pointed end on the other.

C. Sanitization:

Bacteria on eggs will penetrate the egg shell within 2 to 5 hours after laying the eggs. Eggs can be sanitized by dipping then in a container having chlorine solution. 500ppm ammonia solution can also be used as disinfectant for dipping. The dipped eggs are removed and dried.

D. Egg Care and Storage:

If eggs need to be stored before they go into the incubator, they must be kept below or near to room temperature with careful handling.

1. Collect eggs at least three times daily. If the daily high temperatures exceed 85°F increase egg collection to five times daily.
2. Collect two or three times in the morning and one or two times in the afternoon.
3. Slightly soiled eggs can be used for hatching purposes without causing hatching problems, but dirty eggs should not be used even after washing them.
4. Store eggs in a cool-humid storage area. Ideal storage conditions include 55° F. temperature and 75% relative humidity.
5. Always store the eggs with the small end pointed downward.
6. Alter the egg position periodically if it is not incubating within 4 to 6 days
7. Turn the eggs to a new position daily once until they are placed in incubator.
8. Hatchability is well up to seven days, but declines rapiaiy. Hence not to store eggs beyond 7 days.
9. Any eggs stored at 10 - 16°C should be kept at 21- 25°C before placing them into incubator
10. placethe egg carton at an angle of 45° to increase the chance of hatching
11. Only clean eggs are to be selected Donot wash or wipe dirty eggs with a damp cloth as it removes the egg Potective coating tnus facilitating the entry of pathogens.
12. Check the eggs for cracks, inner bacterial rings and inner developing

EGG TESTING

There is a need to test the eggs for hatchability, Spoiled, broken, cracked. Unclean eggs are not suiitable and hence are to be properly identified and disposed.

To identify the fertile and viable eggs, egg testing is necessary before the eggs are kept for incubation. Egg testing can be done in the following ways.

Float Test: It is the simple and effective method of testing the eggs for Viability as it is easy to perform.

- Take sufficient water in to a deep bowl and allow the water to settle.
- Drop the egg into the water gently and allow it leave for 10 to 15 mins.
- Totally sunken eggs are probably dead eggs or unfertilizzed and are unfit for hatching. Discard them.
- If 45-50% of the egg floats out side the water it is also not good for hatching. discard them
- The eggs that floats with 90-95% submerged in water are good for hatching. Such egg floats at more of an angle, almost horizontally in the water. use them

Candling Test: Candling is the process of holding a strong light above or below the egg to observe the embryo.The egg is placed against the light. Torch can also be used.

Under the candling lamp, the embryo appears as a dark shadow with the head as a dark spot. Healthy embryos will respond to the light by moving.

Clear eggs with no embryo are to be discarded.

Qn. What are different Methods of Hatching

Ans. There are two methods of Hatching namely

A. *Natural hatching B. Artificial Hatching.*

A. Natural hatching:

Natural incubation by the female bird is the simplest way of hatching eggs. Brahma variety of fowls are brilliant mothers and they can hatch up to 20 eggs

A broody hen can be identified with the following features

a. ruffles her feathers
b. makes noises that remind of water in a bottle –
c. gets angry when you come near her (she picks)

A nest is to be prepared for proper hatching of eggs. The requirements for this nest are:

a. comfortable, fill it with straw
b. separate from all other chickens, to avoid disturbing and distraction
c. dark, shady and silent
d. safe from predators

Place the viable eggs in the nest and allow the brooder to brood on the eggs. It takes 21 days until the chicks will hatch!!!

B. Artificial Hatching/Incubator method

In this method hatching of eggs is done artificially by keeping them in Incubators under controlled conditions.

Principles Of Incubation

Five major functions are involved in the incubation and hatching of poultry eggs. They are: Temperature, Humidity, Ventilation (Oxygen and Carbon dioxide level and air velocity), Position of eggs, Turning of eggs.

1. Temperature

Temperature is the most critical environmental concern during incubation because the developing embryo can only withstand small fluctuations during the period.

The optimum temperature for chicken egg in the setter (for first 18 days) ranges from 99.5^0 to 99.7 ^oF For the las three days it should be 98.50 F.

2. Humidity

Incubation humidity determines the rate of moisture loss from eggs during incubation. Recommended incubation relative humidity for the first 18 days ranging between 55 and 60% (in setter) and for the last 3 days ranging between 65 and 75%.

Higher humidity rates dehydrate the eggs.

3. Ventilation

Ventilation is important in incubators and hatchers because fresh oxygenated air is needed for the respiration of developing embryos.

Generally the oxygen content of the air in the incubator should be at about 21%. For every 1% drop in oxygen there is 5% reduction in hatchability.

Carbon dioxide is a natural by-product of metabolic processes during embryonic development and is released through the shell. CO2 levels above 0.5% in the setter reduce hatchability and completely lethal at 5.0%.

4. Position of eggs

Artificially incubating eggs should be held with their large ends up. When the eggs are incubated with the small end up, it will be difficult for the chick to break the shell after fully developing.

Under normal circumstances eggs are set with large end up for the first 18 days (in setter) and in horizontal position for the last 3 days.

5. Turning of eggs

Birds, including chickens and quail, turn their eggs during nest incubation. Nature provides nesting birds with the instinct of turning eggs during incubation. Similarly eggs to be turned at least 8 times a day.

Turning of eggs during incubation prevents embryo mortality. In large commercial incubators the eggs are turned automatically each hour i.e. 24 times a day.

6. Arrival of the baby chicks

Around 18th day spray a little quantity of warm water over the eggs to facilitate easy breakage of egg shell by the baby chick. on 21st day the eggs hatch and the newly hatched chick will be wet and will quickly dry.

It runs and looks for food and water immediately.

7. Hardening the chicks: The Hatched chicks are to be pulled out from the incubater and are left for 4-5 hours so that they will acclamatize to the environmental conditions. This is called hardening the chicks.

8 Grading the chicks: No chick below the minimum standard must be allowed to go to a customer. Some standards for quality are,

1) No deformities
2) No unhealed navels
3) Above a minimum weight
4) Not dehydrated and
5) Stand up well.

9. Sexing the chicks: Layer type day-old chicks are need to be sex separated either by vent sexing or autosexing (feather sexing). In case of meat-type day-old chicks sexing is not practiced.

Que. Write an Essay on the Brooding and Rearing of the healthy chicks.

Once the chicks have hatched, the needs of the baby chicken are the same as naturally hatched chicks. Generally the brooding hen will look after the needs of the baby chicks. In incubator method brooding and rearing is to be provided as follows.

1. Housing

- The brooding room should be heated prior to arrival of the chicks. It should be disinfected properly.
- A newly hatched chick requires supplemental heat to maintain its body temperature; therefore, an external heat source must be provided to chicks in the first few weeks.
- Heat lamps with infra-red bulbs are usually positioned in the centre of a brooder ring.
- Heat lamps are used to confine chicks in a small area close to feed and water

2. Brooder Rings

- Brooder rings are made from corrugated cardboard which has been cut to an appropriate length in order to form a ring 2.4 to 3.6 m in diameter.
- The brooder ring is set up in the pen where the chicks are placed, and is removed once they are five to 10 days old.

- These brooding temperature should be adjusted according to observations of the chicks. The behaviour and sounds of the chicks will indicate their comfort level.
- Comfortable birds will be evenly spaced around the pen and will make soft "cheeping" noises.
- Cold chicks will huddle in the warmest part of the pen and cheep loudly.
- Source of heating: Incandecent light 100w. 1 for 100 chicks, Infrared lamps (250 watts) 1 for 250 chicks Pancake heater 1 for 1000 chicks

3. Space requirements

Baby chicks are small when they hatch but grow quite rapidly. Minimum space requirements are as follows:

Age	0-3 weeks	3-8 weeks	More than 8 weeks
Space required in Feet square per bird	0.5	0.75 - 1.0	1.5 - 2.0

4. Lighting

- Light is a powerful stimulus for most production birds.
- Broiler chicks should be raised in 24-hour light for maximum growth rate. Constant bright light of 20 to 50 lux
- The constant lighting allows chicks to adjust to their new environment and find their feed and water sources. After seven days, the light intensity may be lowered to five lux.

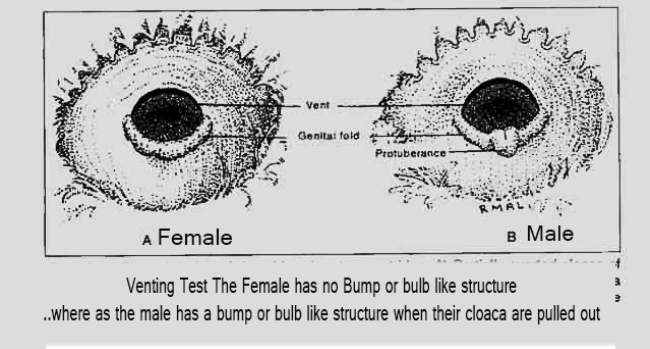
5. Water

During the first week of brooding, deaths due to dehydration can be reduced by providing additional water sources in the brooder ring.

Fresh water should be available at all times, and the water containers should be cleaned routinely. As with the feeders, the height of the water source should be regularly adjusted to be even with the back of the chicks.

6. Feed

During the first week of brooding, in addition to the feeding troughs, small amounts of feed should be provided in shallow trays (such as box lids) which the chicks can easily access. It is also beneficial to place the feed and water close together during this



Venting Test The Female has no Bump or bulb like structure
..where as the male has a bump or bulb like structure when their cloaca are pulled out

time to ensure the chicks eat and drink. Proper feeder space should be provided.

7. Sanitation and disease

For maximum survival rate chicks must be pre vaccinated.

Sanitation is the best way to prevent diseases. Keep the facility clean, Feed only non moldy feed. Cleaning of waterers. Reduce the movement of people.

8. Precautions to be taken

1. After arrival of chicks, moist the beak and leave the chicks under heating source.

2. Maintain a brooder temperature of 90 to 95^{0}F for

the first week and then reduce 5^0F every week until it reaches the room temperature.

3. First and second day provide electrolytes and vitamins in drinking water to overcome stress.

4. Watch the behaviour of chicks in order to find out whether temperature provided is correct or less or more.

5. 24 hours lighting programme may be adopted during 0-8 days of age.

6. One hour darkness may be provided to train the chicks in case of any power failure.

7. Remove the old newspaper after 3 days and destroy it by burning. If necessary, spread another set of newspaper.

8. Remove brooder guard after 7 to 10 days depending upon the season.

SEXING OF CHICKS

Chicken sexing is practiced mostly by large commercial hatcheries to separate female chicks or "pullets" (destined to lay eggs for commercial sale) from the males or "cockerels" (These are usually killed at the hatchery)

Methods of Sexing

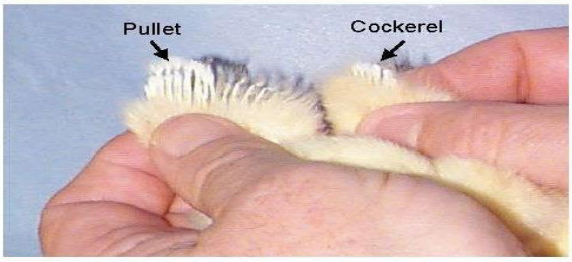
Venting:

Vent sexing, also known simply as venting, involves squeezing the faeces out of the chick, which opens up the chick's cloaca slightly. If a small bulb like structure is seen inside the cloaca the chick is a male and it is discarded.

This kind of sexing is very difficult, only an experienced sexer can do it perfectly.

Feather Sexing Feather sexing is another easy way to determine the gender of chicks. Surprisingly,

Comparison of Pullet and Cockerel One Day Old Chicks



female chicks typically have wing feathers before they hatch.

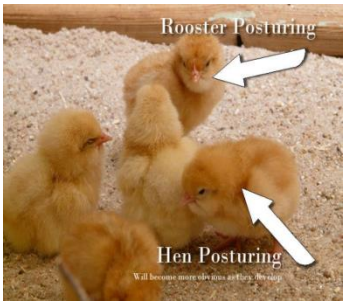
Young roosters do not begin to develop their wing feathers until a few days after they hatch.

Chick's tiny wings are streached to look for signs of wing feather development. Female wing feathers are longer and male baby chick feathers are shorter.

Comb Colours and Sizes

In certain breeds of chicken like Barred rocks the comb size will be more larger in male baby chicks than female chicks. The colour of the combs will be brighter in males than female chicks.

Behaviour

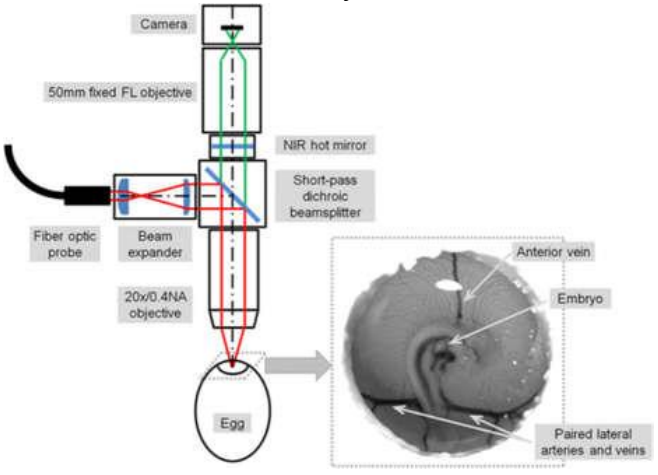


Young male baby chicks act dominant. It tends to be nearer the by female chicks to protect them. The female chick posture usually be submissive.

In Ovo Sexing based on feather colour

Automatic sexing machines are developed in 2016. In this system, 14 days old hatching eggs are put under bright light. The feather colour of the developing embryo are observed using spectroscopy. Embryos sex is determined by the machine based on the colour of the feather.

It is found to be 97% accurate and is very fast method. This method saves time and money because the eggs with male embryos can be discorded on the 14th day itself.



In Ovo sexing based on automated allantoic fluid testing.

The day 15 hatching eggs are punctured by a needle and little quantity of allantoic fluied is collected. This flued contains the genetic information of the baby chick. The sex chromosome pattern tells whether that embryo is male or female. This entire process is automated on a conveyer belt.

This gives 99% accurate results. Once the sex of the embryo is found the male embryos are discarded immediately.

Qn. Write an Essay on Water Hygiene, and Recycling of poultry waste.

Ans: The poultry industry uses various water sources such as the municipal water, underground water, and to some extent, surface water and rainwater etc. Regardless of the source, it is highly important that water provided should be free of germs to ensure flock health.

Water Hygiene in poultry farm

Good quality water is very important for good digestion and to create a healthy gut flora, which will help the bird to absorb all the essential nutrients.

Acidifiers

Acidifiers like citric acid or acetic acid are used to keep water pH to less than 7.0 and this helps to reduce bacteria proliferation.

Chlorination

Chlorination is the method of adding chlorine to water to kill the microorganisms in the water. The commonly used chlorine source for poultry drinking water sanitation is sodium hypochlorite. This is the cheap and best disinfectant.

Hydrogen Peroxide

Hydrogen peroxide is an alternative disinfectant to chlorine. Cleaning of poultry waterlines/pipes with hydrogen peroxide causes little damage.

Other Water Sanitizers in Poultry farm.

Other disinfectants like quaternary ammonium compounds and Iodine are also used in poultry operation for disinfecting water and water system.

Copper sulfate which is an antimicrobial & antifungal agent is used some times.

Ozone and UV rays can also be used for water sanitation but not common in poultry practices.

Water is also the medium of choice for administering live vaccines to chickens.

Recycling of poultry waste

Two main types of waste are produced by poultry depending on the rearing system adopted on the farm

• Poultry litter – Waste from deep litter systems
• Cage layer waste – Excreta collected under the cages, spilled feed and feathers.

This waste is recycled into various useful products as follows.

Nutrient Source

Poultry litter is often used as an organic nutrient source in in forage, cereal crop production. The addition of poultry litter to tall, orchard grass, bermuda grass has been shown to increase the production. Poultry waste has high concentration of available Nitrogen which is calculated to be around 80%.

Soil Amendment

Continuous cultivation of arable soils results in the deterioration of soil structure leading to reduced crop yield. For example, A soil that has undergone continuous cultivation of maize for 34 years was given 300 kg poultry manure per hectare. This poultry manure increased the yield of the maize crop

As Animal Feed

Poultry manure, either on its own or when mixed with feed grains, has been found to be a valuable feed for cattle and fish. Ruminants are able to utilize the urea nitrogen (uric acid) in poultry manure. However, From a hygiene perspective, unprocessed poultry waste contains potential pathogenic microorganisms such as Clostridium, Salmonella and Enterobacter spp. Hence proper processing to make the waste free of pathogens is required.

Dried Poultry Waste: a processed animal waste product contains 18.0% crude protein, and 15% crude fiber, 30% ash.

As Fuel Source

Poultry litter can be burnt directly as a fuel source to produce heat energy. The moisture content should be less than 15% in order to achieve maximum heat energy during burning. Poultry waste yields biogas. It is combustible gas composed of approximately 60% methane. Biogas (also known as 'producer' gas) may be used as an energy source for burning as heat or as fuel for internal combustion engines to generate electricity.

Composting

Poultry waste can be mixed with straw, peat, woodchip, paper waste and composted to produce good quality manure. This ecofriendly nutrient rich compost can be used as fertilizer in house hold gardens, lawsns etc.

Future Litter Re-use

Litter acts both as a fertiliser and soil conditioner. Currently, most Indian growers receive small profits from the sale of litter.

Litter has significant energy value, which is comparable with wood and half that of coal.

MODEL QUESTION PAPER & PATTERN

Max. Marks: 50 Time: 1 1/2 hrs (90 Minutes)

SECTION A (Total: 4x5=20 Marks)

(Answer any four questions. Each answer carries 5 marks)
(At least 1 question should be given from each Unit)

1. Poultry house
2. Broilers
3. Any two viral diseases of poultry
4. Any two bacterial diseases of poultry
5. Any two fungal diseases of poultry
6. Egg testing
7. Brooding
8. Sexing chicks

SECTION B (Total: 3x10 = 30 Marks)

(Answer any three questions. Each answer carries 10 marks
(At least 1 question should be given from each Unit)

1. Discuss briefly the past, present and future scenario of poultry farming industry in India.
2. Explain principles of poultry housing in detail, with examples.
3. Write an essay on viral diseases of poultry.
4. Give an account of fungal and bacterial diseases (any two each) of poultry
5. Write an essay on selection, handling and hatching of eggs.

QUESTION BANK

Module I
Short answer questions
1. SWOT analysis of Poultry industry
2. Current Scenario of poultry industry
3. Principles of poultry Poultry housing
4. Free range system
5. Deep litter system
6. Conventional Cage
7. Heat Stree management of Chicken
8. Cannibalism
9. De beaking
10.Culling

Essay Questions
1. Discuss briefly the past, present and future scenario of poultry farming industry in India.
2. Explain principles of poultry housing and Types of Poultry housing system.
3. Write an essay on Management of Chicks, Layers and Broilers
4. Prepare a Project report for starting a poultry farm for banking and insurance

Module II
Short Answer Questions
1. Principles of feeding in poultry
2. Feed Formulation
3. Types of Feeds
4. Any two viral diseases of poultry
5. Any two bacterial diseases of poultry
6. Any two fungal diseases of poultry
7. Vaccination Schedule of poultry birds
8. Prevention of poultry diseases

Essay Questions

1. Write an essay on Viral and Bacterial diseases of Poultry
2. Write an essay on fungal and otherparasitic diseases of poultry
3. Write an essay on nutrient requirement for different stages of Layers and broilers
4. What are various methods of feeding

Module III
Short answer questions
1. Egg Testing
2. Natural hatching
3. Sexing of chicks
4. Recycling of poultry waste
5. Principles of incubation
6. Egg care and storage

Essay Questions
1. Write an essay on selection, handling and hatching of eggs.
2. Explain what is Artificial hatching
3. Write an Essay on the Brooding and Rearing of the healthy chicks.

Prepared by
B. A. Ali Baba, M.Sc. M.Phil. B.Ed. NET