PRACTICAL MANUAL FOR EXPERIENTIAL LEARNING PROGRAM

ON

POULTRY PRODUCTION TECHNOLOGY

(EL AGP 806)

B.Sc. (Hons.) Agriculture, 4th Year, 8th Semester

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Business idea: Commercial Broiler Production-I (Light weight)

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Business idea: Commercial Broiler Production-II (Heavy weight)

PRACTICAL No: 1 Date:_____

Topic: Brooding of poultry

Brooding is a critical period for poultry. New chicks can't maintain their own temperatures, therefore, they are usually brooded until they are fully feathered. In natural brooding, the mother hen provides heat. In artificial brooding, heat is provided by an external heater.

The pre-brooding management play a very important role to avoid different diseases, which cause great economical losses due to poor managemental practices. Prevention is most and best economical method of disease control. Prevention is best achieved by the use of sanitation and biosecurity programmes.

Preparation of shed for brooding:

There is no hope of overall hygiene process being fully effective if cleaning is not proper. The cleaning process must involve following.

Removal of litters: Old litter should be removed from the poultry house. If it is piled near the house, rats and vermin may carry the residual disease back into the house.

Cleaning of equipment: All equipments must be washed with potassium permanganate ($KMNO_4$) and disinfected. The equipment should be moved outside the house in sun inside the fenced enclosure to complete the cleaning process. The equipment should be moved back into the house.

***Cleaning of house ceiling and walls*:** Remove dustiness in walls and ceiling with moderate volume of water. Using boiling water is most effective and economical method for disinfection purpose.

***Dusting/Web removal*:** Once litter has been removed the next priority should be removal of numerous spider web that bloom here and there on walls. Flying birds often enter in the sheds and build nests in ceiling, these should be removed.

***Washing of house*:** Wash ceiling, walls, floor with generous amounts of water. Preferably add some detergent to wash house. Next all cracks/ crevices in the wall, floor or ceiling should be filled up. All leakage in the gas pipes or water pipes should be sealed, electric short circuit should be corrected and fuse etc. should be replaced.

***Disinfection*:** A basic essential is that disinfection programme must be most carefully planned. The disinfection of a building implies the elimination from the house all microorganism that are capable of causing disease. Follow the manufacture's instruction carefully and make sure that the disinfection has proven active against the pathogens.

***Fumigation*:** This is the very important procedure to give a final boost to the disinfection programme. For this purpose formaldehyde gas is most suitable. The shed should be properly sealed before fumigation. 20 gm $KMNO_4$ and 40 ml formalin can be used for fumigation.

Purchase of chicks:

Hatcheries can have a tremendous impact on the success of poultry rearing. The transition from egg to farm can be a stressful event; therefore, efforts made to minimize stress are fundamental to maintaining good chick quality. Always purchase chicks from a reputed hatchery which follow all measures to achieve quality chicks.

Characteristics of a good quality chick:

1. Well dried, long fluffed down.
2. Bright round active eyes.
3. Look active and alert.
4. Have completely healed navels.
5. Legs should be bright and waxy to touch.
6. Free of red hocks.
7. Chicks should be free from deformities (i.e. crooked legs, twisted necks and cross beaks).

Arrival of chicks

Following precautionary measures may be undertaken at the arrival of chicks.

1. The chicks should arrive early in the morning so that full day is left to observe them and take care of them.
2. Whenever possible, chicks from similar age flock sources should be placed in a house.
3. There should not be any unexpected delays in placing chicks. Delays in placement can contribute to the dehydration of chicks, resulting in higher chick mortality and reduced growth rate.
4. Ensure that proper numbers of chicks are placed in each house.
5. A dim house light during chick placement helps to calm the chicks and reduce stress.
8. Chicks must be carefully placed and water trough evenly distributed throughout the breeding area.

9. Don’t provide feed for at least 2-3 hrs after arrival of chicks. Make sure that, during this period, every chick drink some medicated water (glucose + electrolyte + Vit A, D, E, C).
10. Chick boxes should be removed immediately following chick placement.
11. Lights should be brought to full intensity within the brooding area once all chicks have been placed.
12. Monitor the distribution of the chicks closely during the first few days. This can be used as an indicator for any problems in feeder, drinker, ventilation or heating systems.

EXERCISE:

1. Why brooding is important? Write the procedure in detail about the preparation of room for brooding.
2. Name the different works to be performed during brooding of chicks?

PRACTICAL No : 2 **Date:_____**

Topic: Study of poultry farm equipment.

1. Feeding system

There are different types of feeder to provide feed to poultry. Generally there are two types of feeders. One traditional system of feeder and one automatic feeding system. In traditional system, tube feeder and long feeding troughs are generally common. Three tube feeders per 100 and 4 inches per bird in case of long feed trough is recommended. But in this system, wastage of feed as well as contamination are more common and also labour intensive. In automatic system, wastage of feed as well as contamination are less common. Generally, two types of automatic feeding system are available: chain feeding system and the pan feeding system. The pan-type feeding system is more suitable for floor operation and chain feeding system is more suitable for cage system. Feeding space requirement are given in the table1.

Fig. Poultry feeding with circular feeder

Watering system: It is essential that water is available at all time (i.e. 24 hours/day). Inadequate water supply results in reduced growth and performance rate. It is important that that all birds should be in easy reach of water wherever they are in the house. A pullet should not have to walk more than 10 feet for water and water troughs should be sited fairly close together. To achieve this, a number of small water troughs are better than a few large ones. Generally, 4 waterers per 100 birds is recommended. Birds will drink more water at high ambient temperature.

Types of drinkers: There are two drinking systems most commonly used.

Bell drinkers: At day old, a minimum of 8 "bell" drinkers (40cm/16" diameter) should be provided per 1000 chicks, additional sources of water in the form of 6 mini drinkers or plastic trays per 1000 chicks should be available.

As the broiler become older and the area of the house in use are expanded, minimum of "10" bell drinker must be provided per 1000 chicks. Drinkers should be checked for height on a daily basis, and adjusted so that the base of each drinker is in level with the broilers back from 18 days onwards. This minimizes faecal contamination of water.

Fig. Automatic and manual drinker of poultry.

Nipple drinker: Nipple drinkers be installed at 12 birds per nipple (9-10 for heavy broilers). Nipple system offer drinking water with lower levels of bacterial contamination than conventional open systems. The height adjustment of nipple must be monitored very closely and on a daily basis. Water pressure should be adjusted so that there is a flow rate of at least 60ml/min. from each nipple.

Adequate water storage must be provided on the farm. Sufficient storage to provide 24 hours water at maximum consumption is required.

Table.1: Space requirement for feeder and drinkers

Age in week	*Feeder space*		*Water space*	
	Long	***Circular***	***Long***	***Circular***
0-3	1 inch/chick	0.5 inch/chick	0.25 inch/chick	0.125 inch/chick
3-6	2 inch/chick	1 inch/chick	0.5 inch/chick	0.25 inch/chick
After 6 wks	3 inch/bird	2 inch/ bird	0.75 inch/ bird	0.5 inch/bird

Exercise:

i) Draw the different appliances and equipments seen in the farm.

ii) Measure the length/ circumference of different sized waterer and feeder.

PRACTICAL No: 3 **Date:_____**

Topic: Housing of Poultry

***Systems of housing poultry*:**

Poultry housing systems are broadly classified into 3 types:

1. Free range/ Extensive
2. Semi-intensive system
3. Intensive or confinement system

1. Free range

In this system birds are let loose on fields to harvest their feed on their own. The system is adopted when the land is adequate. For backyard farming in rural areas range system may hold good. The range should provide shelter, greens, water, feed and safety. Shelter is provided by temporary roofing supported by poles. In Assam almost 99% of the desi chicken and ducks are reared in this system in rural areas.

Advantages: 1. Birds get benefit of enough sunlight.
2. Bone development of birds is relatively better.
3. Birds remain stronger and hardier.
4. Less labour is required.
5. Good for meat purpose.
6. Investment is less.

Disadvantages: 1. Need more land.
2. Dirty eggs are found in bad weather.
3. Less production of eggs.
4. Risk of theft of eggs.
5. More loss of energy in movement of birds.

2. Semi-intensive system

This system is adopted where the available amount of free space is limited, but it is necessary to allow 20-30 square yards per bird of outside run. For keeping ducks or turkeys in large scale semi-intensive system may be adopted.

Advantages: 1. Less space is needed than free range system.
2. It is useful for both egg and meat production.
3. Family people can look after, so less labour is needed.
4. Less investment.
5. There is more safety of eggs.

Disadvantages: 1. Compared to free range less expenses are incurred.
2. In case of disease affected areas the egg production rate is reduced.
3. Place of birds in rainy season remain dirty and hence bad smell.

3. Intensive system

In this system the birds are confined to the house entirely, with no access to outside and it is usually adopted where land is limited and expensive. It is divided into two sub-systems-

1. Deep litter system.
2. Cage system
   (a) Battery cages.
   (b) Californian cages.

Deep litter system: In this system the birds are kept confined in large pens up to 250 birds each, on floor covered with litters like paddy husk, saw dust, wood savings, chopped straw etc. Up to depth of 5-6 inches. It is mostly adopted to rear broilers, layers and breeders. Built up litter supplies animal protein factor (APF) and Vit B_2 and also fulfils natural thrust of birds to have litter bath. It avoids cage fatigue problem.

Management of litter:

i) Keep the litter dry and clean.
ii) Remove wet and caked litter by replacing with fresh litter to avoid disease occurrence.
iii) Always stir the litter to avoid cake formation.
iv) Check the leakage and spillage of water from waterers and roof.
v) To avoid damp litter hydrated lime powder (but never quicklime) or 0.5 g of super phosphate may be thoroughly mixed up with litters spreading in 15 sq. ft. of floor area.
vi) Provide sufficient ventilation to enable the litter to keep in correct condition.
vii) During summer reduce the depth of litter and increase the depth during winter.

Advantages: 1. There is synthesis of vitamins like Vit. B_{12} and Vit B_2 by bacterial action.
3. There is safety of birds from dogs, cats, rodents etc.
4. It provides warmth in cold weather.
5. There is evaporation of moisture in hot season.
6. Parasites are killed by heat produced by bacterial action.
7. Germs like *Salmonella* are killed by heat produced by fermentative action.
8. Labour is saved because droppings are not removed from house.
9. Birds are protected from inclement weather.
10. The built up litter is an excellent fertilizer containing 3% N, 2% P_2O_5, and 2% K_2O.
11. Fowls remain more clean and healthy.
12. More number of clean eggs.
13. Less space required.
14. Control of vices of birds.

Disadvantages: 1. Succulent green leaves need to be supplied.
2. Requirement of balanced feed at all times.
3. If not cared properly litter remains moist and foul smell.

Cage system: Rearing of birds on wire floor in wire netting compartments is called as cage system of rearing. It is mainly used for commercial egg production. In cage system initial capital investment is high. But the day-to-day managemental operations like feeding, watering, egg collection etc. are easy. Feed wastage is less and production is better. The important advantage is the saving of floor space per bird. The floor space required per bird is about half in Californian and 1/3rd in Battery cages when compared with deep litter.

Battery cages: The compartments of cages are arranged one above the other in 3 or 4 tiers on stands and dropping tray is kept underneath of each tier for collection of faeces. Dropping trays are to be cleaned daily or on alternate day. Feeders and waterers are attached to cages from outside.

Californian cages: The compartments of cages are arranged stepwise on both sides of cage row in two or three tiers on stands in platform house. Because of this special design, the droppings from all compartments fall on ground in pit under cages. The manure can be removed once in 6 months or 12 months along with disposal of birds. This is the most popular system of housing for commercial egg production adopted all over the world.

Advantages of cage system: 1. Less space required.
2. Better disease prevention and control of infection.
3. Less mortality rate.
4. Less expenses on medication.
5. Feed is saved.
6. Increased laying efficiency.
7. Labour is saved.
8. Better flock supervision and maintenance.

Standards for housing of poultry in Tropical climates:

Density in birds per m^2

	BROILERS	LAYERS	BROILER BREEDERS
Full slats or wire floor	15	7	.
2/3 slats 1/3 litter	.	6	4
1/2slats 1/2 litter	.	5	3.5
Full litter	10	4	3

Eating space in cm per bird

	BROILERS	LAYERS	BROILER BREEDERS
Long feeder	5	12	18
Round feeder	2	5	7

Drinking space in cm per bird

	BROILERS	LAYERS	BROILER BREEDERS
Long drinker	2	2	4
Round drinker	1	1	2

Laying nests

	LAYERS	BROILER BREEDERS
Individual (Hens per nest)	7	5

Layout plans for poultry farms of different sizes:

Depending upon the activity on poultry farms the following buildings may be needed-

1. Hatchery
2. Brooder house
3. Broiler house
4. Layer house
5. Poultry processing unit
6. Feed mill

If more than one type of houses are to be constructed on one farm, these buildings should be located in such a way that it cuts down the chances of cross contamination to minimum, affords maximum labour efficiency and better supervision of farm with least effort.

Brooder House:

Most of the layer or broiler houses can be used efficiently as brooder house. However, there are some advantages and disadvantages of having a permanent brooder house.

***Advantages*:**

1.The house can be used throughout the year for brooding since it is designed to aid temperature control both in cold and hot weathers.
2.Less labour is required for the care of young flock.
3.Less problem of disease contamination from old to young stock.

***Disadvantages*:**

The investment on permanent brooder house is relatively high and often a separate brooder house is not fully utilized throughout the year.

The design of brooder house depends upon the system of brooding practiced. There are two systems of brooding (i) Floor brooding and (ii) Battery brooding. Floor brooding is further divided into two types, namely, hotroom and cold room brooding. The later one is more commonly used in tropical countries.

Processing Plant:

There are several considerations that needs to be given in designing a processing plant like construction, cost, size of the business, facilities for personnel, equipment, layout and ease of maintenance etc.

Most of the plants have eight general work areas. These are receiving, hanging and slaughtering area, defeathering, eviscerating, packaging, refrigeration room and shipping or disposal area. In addition, storage areas, offices, toilets, lockers for workers, machinery rooms and refuse rooms are considered as auxiliary areas.

The building of a processing plant should be constructed so as to prevent the entrance of flies and rodents by providing properly fitted screens or other suitable devices. The floors, walls, ceilings, partitions, posts, doors, etc, should be constructed of materials with a hard and smooth finish which can be readily and thoroughly cleaned. Slope and construction of floor in the areas where water spills like scalding, defeathering, evisceration and chilling should be such that water drains off without making slippery floor. The pitch should be one cm per meter to the drains. Water supply should be pure and ample. Building should be well ventilated and lighted. There should be provision for washing equipment, hands and utensils.

Laying House: In layers two methods of rearing can be adopted for poultry farming

1. Buying ready to lay pullets and rearing layers.
2. Rearing of own pullets and layers

1. Buying ready to lay pullets and rearing layers: Grown-up ready to lay pullets of 14 to 16 weeks are purchased from outside. The direction of shed should be East-West.

2. Rearing own pullets and layers: In this pattern there is need for brooder, grower and layer house in the farm. In small size farm brooder cum grower cum layer house may be constructed.

In cage system, adopt 1 + 3 housing system i.e. one brooder cum grower house and three layer houses for medium sized farm. Some farms adopt 1 + 1 + 4/5 housing system i.e. one brooder, one grower and 4 or 5 layer houses of large size farm.

In layout plan important point is that brooder and grower houses should be situated at far end of farm on western side, away from entrance.

The distance between brooder/grower houses and layer houses preferably be around 50- 60 m. In between brooder and grower house the distance should be 30-35 m. Similarly the parallel distance in between two layer houses must be 10-15 m.

The following points should be considered while deciding for a plan of laying house:

i)Size of house: It depends upon the size of flock to be maintained and the area needed can be calculated at the rate of 2300 sq cm to 2800 sq cm per bird but it is suggested that the unit should not be bigger than to accommodate 500 birds.

ii)Width of house: Under tropical conditions a poultry shed should not be wider than 9 meter. It is more desirable to limit the width to 7.5 m. In case of wider house, birds tend to remain towards the periphery of the house and the central part of the shed is less efficiently utilized unless forced- draft ventilator is installed.

iii)Partition: Partitioning of large house should be done to accommodate 500 to 1000 birds. In a bigger flock culling of poor and sick birds and overall control is difficult whereas labour cost decreases per bird. In a smaller flock culling and supervision are easier but the attendant has to enter in more number of pens to take care of the birds. A thumb rule which usually works well is to keep the length of pen 1.5 times more than the width. A 6 m wide house should have the pens of 6x9 m.

iv)Height of ceiling: During summer, much of radiated heat can be reduced by keeping the ceiling at higher level, but in no case it should be less than 3 m. A ceiling at 3.5 m is more desirable where summer is severe.

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Exercise:

i) Calculate the floor space required for a broiler farm of 500 capacity in deep litter system.
ii) Which system is best for layer and broiler management and why?
iii) Name the other buildings needed in a poultry farm.

PRACTICAL No: 5 **Date:_____**

Topic: Vaccination, Medication and Bio-security measures in broiler farm

Design of a vaccination programme for poultry is interdependent on the parent stock vaccination programme. Vaccination in the hatching, at day old, for Infectious Bronchitis (IB) and Ranikhet Disease is more effective than vaccination on the farm after delivery of chicks. A vaccination schedule for broiler and layer are given in Table no 12&13 respectively.

Vaccination guidelines: The following guidelines are appropriate for successful vaccination:

- Follow the recommendations of the vaccine manufacturer in terms of transport, storage of vaccine and dose per bird, route and method of administration.
- Record vaccine details and check expiry date. Do not use vaccine, which is beyond expiry date.
- Ensure that all birds get equal dose of vaccine.
- When administered live vaccine in water, it is essential to neutralize chlorine in water. A method to neutralize chlorine is the addition of skimmed milk powder in water.
- Do not use UV chlorination treated water during vaccination.
- Do not vaccinate sick birds.

Important considerations

- Combine vaccination with good bio-security.
- Design vaccination programme in consultation with local veterinarians.

Table No. Vaccination Schedule for Broilers

Days	Vaccine	Route of Inoculation
1	Marek's Disease vaccine	Subcutaneously or intraperitoneally (Hatcheries release chicks only after Marek's vaccination)
5	Ranikhet disease vaccine (Lasota or 'F' strain)	Intranasal or Intraocular
15	Gumboro disease vaccine	Intraocular or drinking water
26	Ranikhet disease vaccine (Lasota or 'F' strain) Booster dose	Intranasal or Intraocular

Note: those area are prone to Gumboro disease, vaccine should be given on 14th day and 20th day. Vaccination schedules may vary depending on the disease condition in the area.

Medication of Poultry: Medication in poultry is absolutely depends upon prevalence of

different diseases in a particular locality. Still, following medication guide including following of vaccination schedule may be helpful to reduce diseases incidence in poultry farm.

Table No. Medication Schedule in poultry farms

Age	Name of Drugs	Route
0-3days	i) Doxycycline@1gm/lit of water for 24 hrs for three days.	Orally
	ii)Vit. A,D,E,C(Stressvelt or Stressrock) @ 5ml/100 chicks	
	iii) Electrolyte @ 1gm/lit of water	
	iv) Glucose@ 1gm/lit of water	
5 days	F_1/Lasota strain@1drop/chick	Intraoccular/Intranasal
6-12 days	Vit. B Complex (Ambiplex,Ventriplex etc) @5ml/100chicks	Orally
14 days	IBD vaccine	Intraoccular/Intranasal
15-20 days	Calcium supplement(Ostocalcium,Vetcal etc)@10/100 birds	Orally
21 days	IBD vaccine booster dose	Orally
22-24 days	Liver Tonic(Liv 52,Livol etc)@10ml/100birds	Orally
28 days	Booster dose F_1/Lasota strain	Orally
35-40days	Calcium supplement (Ostocalcium,Vetcal etc) @10/100 birds	Orally
42 days	Deworming(Levamisol)@1gm/lit of water	Orally
46-48days	R_2B vaccine	Subcutaneous
8 weeks	Liver Tonic(Liv 52,Livol etc)@10ml/100birds	

Note: At the time of R_2B vaccination the weight of layer should be 600gm. After 8 weeks of age, vaccination should be followed as per the schedule and time to time calcium supplement should be given.

Biosecurity

Diseases challenged by viruses, bacteria, fungi and coccidian presents a major threat to profitable poultry production. Optimum and profitable poultry production can only be achieved by minimizing diseases risk to a minimum possible extent. Bio-security is of immense help to reduce diseases hazard and thereby improves health status and productivity of the birds. Bio-security is a term that embodies all of the measures that can or should be taken to prevent viruses, bacteria, fungi, protozoa, parasites, insects, rodents and wild birds from entering or surviving and infecting or endangering the well being of the poultry flock. Bio-security procedures, particularly disinfection and sanitation, should be combined with

vaccination and strategic treatments to either eradicate or reduce these pathogens to non-infectious levels.

Bio-security involves two approaches

- Prevent entry of microbes.
- Destroying the microbes that are already present.

Steps to prevent entry of microbes

- People are the most important animate factors. Staff movements should be as limited as possible, particularly where the diseases situation on a particular site has deteriorated
- Control the site traffics to a minimum extend as possible and exclude all un authorized persons.
- All visitors should enter on foot. Use regularly refilled foot dips charged with a suitable disinfectant. All site visitors should be provided with adequate protective clothing, and should wash their hands prior to visiting birds.
- All possible vehicles should be excluded from the site. Vehicles which must enter should be subjected at the site entrance to spray for disinfection of wheels and wheel arches.
- The birds themselves can also be causes of diseases spread. Incoming poultry should therefore be from high health status sources, and there should be well defined health monitoring and audit procedure for breeder supply flocks.
- Fencing the farm to prevent trespass.
- Entry of sparrow should be stopped.
- Use potable drinking water. Clean and disinfect the water system with a non-tainting product to remove the greasy bio-film that will harbour and protect pathogens.
- Strict control for prevention of contact with exotic avian species and backyard poultry.

Steps to destroy organisms already present on the farm

- Remove all equipment from the shed and soak in disinfectant solution for 24 hours and sun dry before re-use.
- Spray the litter with disinfectant and then collect it in bags, sealed them and carry to a distant place for its disposal.
- Scrub the floor and wash the shed including walls, roof and wire mesh and floor with water under pressure and allow to drain.
- Soak the floor with sodium hydroxide solution in water for 24 hours (1Kg of NaOH/100 sq. ft. area)
- Drain the alkaline solution and wash with clean water.
- Flame the floor, walls and wire mesh.
- Apply lime to the floor and walls containing 5% formalin, 1% kerosene oil and 2% copper sulphate.
- Wash the curtains, sundry and fix up to the shed.
- Spread clean litter on the floor, fix up chick guards, waterers, feeders, brooders

and spread the papers.

- Close the curtains and enclose the shed air-tight (as much as possible) and fumigate with 20 gm of $KMnO_4$ and 40 ml of formalin (40%) per 100 cu. Ft. area, keeping this at different places and leave it for 48 hours.
- Open the shed and spray with disinfectant solution before the chicks arrive.
- Clean and disinfect the surroundings of the farm.

By strict execution of above discussed measures, microbial load in a poultry farm can be reduce to a great level, which enable the poultry farmers to adopt cost effective measures in terms of antibiotics and coccidiostats feeding, water treatment, litter treatment etc. The recent trend of production of healthy food for human can only be possible adopting proper bio-security measures.

Exercise:

1. Practice vaccination in the poultry farm.
2. Write about the precautions to be taken during vaccinations (Intraperitonial as well as in drinking water)..

PRACTICAL No: 5 **Date:_____**

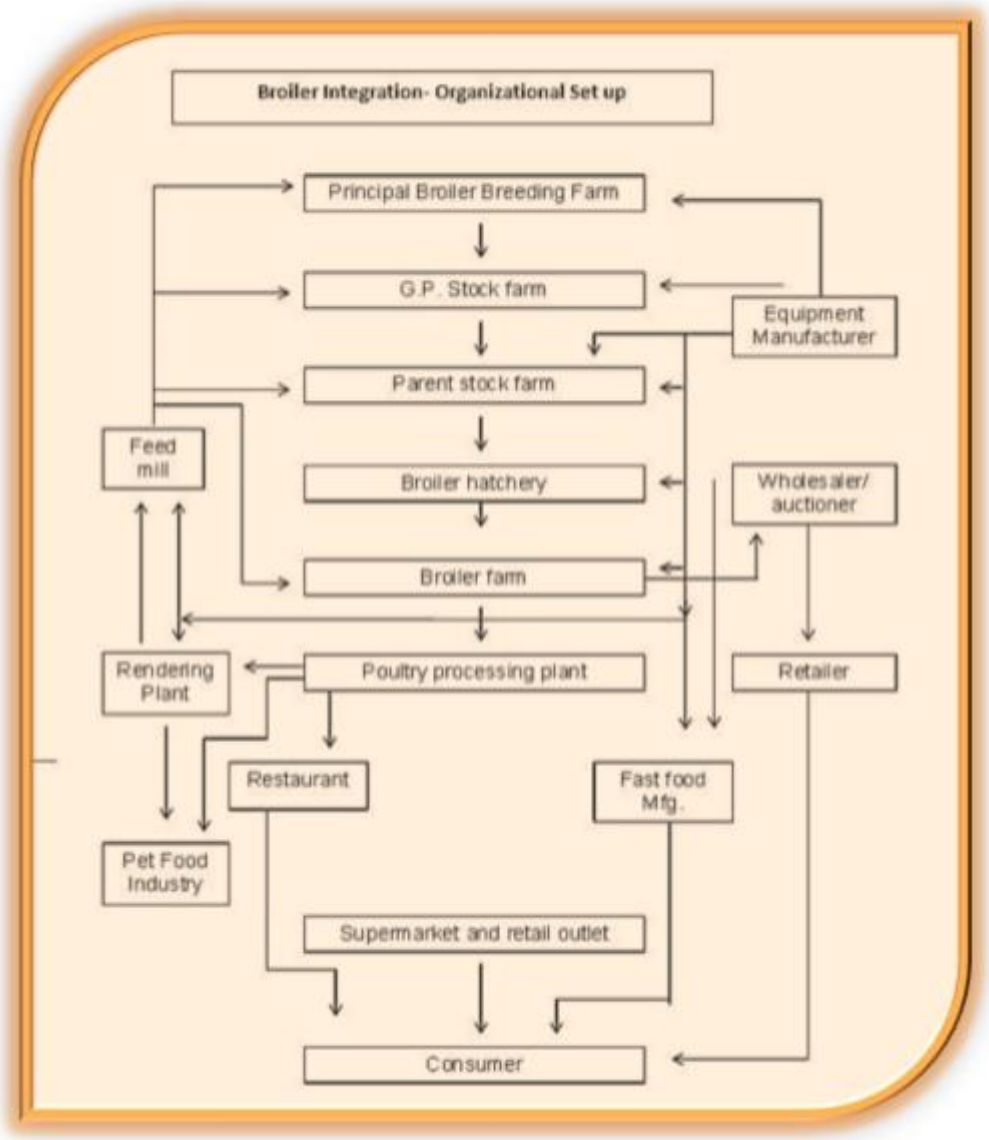
Topic: Marketing of broilers

Marketing Channels :

- Producer – consumer
- Producer – Retailer – Consumer
- Producer – Wholesaler – Retailer – Consumer
- Producer – Co-operative society – Wholesaler – Retailer - Consumer

Broiler Making Integration :

- Integration is the association, coordination, amalgamation of companies engaged in various stages of production of particular product, or related products, so that, there will be a smooth flow of inputs and outputs from one unit to other, leading to overall reduction in the cost of production of the final product
- In all developed countries, the poultry production at present is an integrated operation from the primary breeder to the consumer. Each stage or unit is associated with the other stages
- An integrator will coordinate all these activities. Usually, an integrator is the owner of the processing plant, hatchery and the feed mill and pay commission to others for the services rendered by them
- There are only few integrators in each developed country, who will control the entire poultry production in these countries
- The poultry farmers are acting only as *contract growers* receiving commission for the eggs, broilers and turkeys produced by them. The farmers are not the owners of the birds, but the integrators are the real owners



Government Authorities:

Govt.Agencies involved in poultry marketing (Export)

1. **Agricultural and Processed Food Products Export Development Authority (APEDA) –** http://www.apeda.gov.in

2. **Export Inspection Council (EIC) and Export Inspection Agency (EIA) –** http://www.eicindia.gov.in

Vision

To facilitate worldwide access for Indian exports through a credible and efficient inspection and certification system and earn global recognition as India's premier organization for certifying quality

Mission

1. To create an export inspection & certification infrastructure within the country based on International Standards for Certification Authorities in consonance with WTO requirements.
2. To instill confidence in importers about quality and safety of Indian exports.
3. To provide accredited state-of-art testing facilities in chosen frontier areas.
4. To enhance capability of manpower through trainings to meet International requirements.
5. To obtain recognition for India's export certification system from our major trading partners.
6. To participate in international fora and project Indian interest.
7. To be in sync with the latest technological advancements for capacity building.
8. (EIC) stands out as the forerunner.

3. **Director General of Foreign Trade –** http://dgft.gov.in/

Director General of Foreign Trade
Department of commerce
Government of india
Room 008, H-Wing, Udyog Bhawan
New Delhi – 110 011

Non-Government Authorities :

1. National Egg Coordination Committee (NECC)

- World's largest association of poultry farmers – 25,000 layer farmers
- Price declaration – Monday, Thursday and Saturday
- Monitor egg stock levels
- Market intervention through Agrocorpex India Limited
- Promote export
- Promote egg consumption

2. Broiler Coordination Committee (BCC)

- Daily price fixation
- Mainly for Kerala market from Tamil Nadu
- For TN, Major producers fix their price based on supply and demand
- 90% domestic market as live birds
- 2-5% export
- 2-5% meat products in local

3. BROMARK (Broiler marketing Cooperative Society)
All India Broiler Farmers' Marketing Co - Op. Ltd.,
16/ A, M V L House,
Near Nisarg Mangal Karyalay Market Yard ,
Gultekdi
Pune, Maharashtra - 411037, India.
Phone: 020 - 4269414 / 4269623

PRACTICAL No: 6 **Date:_____**

Topic: DPR on broiler farming-Light weight (500 nos. capacity, marketed at live weight of 2 kg live weight at 42 days of age)

PRACTICAL No: 7 **Date:_____**

Topic: DPR on broiler farming-Heavy weight (500 nos. capacity, marketed at live weight of 3 kg live weight at 56 days of age)

Business idea 3: Commercial Layer Production

PRACTICAL No: 8 **Date:_____**

Topic: Care and management of laying birds

Suitable stock for commercial egg production •
For commercial production of eggs local native birds as well as pure breeds of exotic origin such as White Leg Horn, Rhode Island Red etc are not suitable. • Egg production of commercial hybrid layers are significantly higher than the pure breeds and hence are used for commercial egg production. • Some of such hybrid layers named below are recommended: (a) Babcock (b) B V 300 (c) B V 380 (d) H & N (e) Keystone golden etc.

Qualities of day old chicks:
Chicks should be cleanly hatched.
• Chicks should have well dried fluff.
• Chicks should not have pasted up vent.
• They should have round bright eyes and should be alert and active.
• Chicks should be free from unhealed navels.
• They should not have any kind of deformities such as crooked leg, defective head or eyes or cross beaks.

Debeaking:
The trimming of the upper beak of a chicken is known as debeaking which is done to contain cannibalism in a flock. • It is done by cutting and cauterizing the upper beak of the bird at the point half way between the tip of the beak and the nasal opening. • To debeak a bird electrically operated equipment named debeaker is used. • First debeaking is done at 7 to 10 days of age. • This is to be repeated at the age between 12 to 14 weeks of age again.

MANAGEMENT OF LAYERS (21 -72 weeks) • Chickens at the point of laying is known as pullet. • Present day hybrid chicks starts laying from 19-20 weeks of age and continue laying for a period of one year or more. • For each bird 2.5 sq ft of floor space is required. Preparation of the house: • The house should be cleaned and disinfected before and should be made ready well ahead of pullets arrival. • The feeders and waterers should be placed well before the arrival of pullets. In case of laying flock hanging feeders are used. • For every 25 birds there should be one large size hanging feeder. • The laying nest should be placed 7-10 days before the onset of egg production. • For every 4-5 birds there should be one laying nest. The nests should be placed by the side of the walls at about 30cm (1ft) above the floor level. • Litter material or paddy husks should be placed inside the box, so that eggs do not break while being laid. Feeding and watering of layers: • Pullets should not be given layer feed till they attain 5 % egg production. • The birds should be give feed twice a day. • Each bird requires about 110 to 115 gms of feed per day in case of whiter eggers. For brown eggers the feed requirement is 120-125 gms per day per layer. • Birds should be provided with fresh drinking water every morning. • It may be noted that layers drink 3-4 times more water than the feed they consume per day. Lighting: • There exists positive relation between light hours provided to bird and their egg production. • Lighting should be increased gradually from 20th

week i.e. on set of egg production till it reaches 16 hours per day and maintained at that level thereafter. • The bulb should be fixed at 8 feet above the floor and good reflectors should be used to direct all light to the bird areas. The bulbs should be checked and cleaned regularly. Collection of eggs: • Eggs should be collected 4 times in a day. • The first collection to be done at 9 AM followed by 12 AM, 2 PM and lastly at 4 PM. • Eggs should be collected in egg trays or bamboo made basket.

Culling: Year round culling of unproductive stock will fetch better profit. Culling is based on physical characters, which reflect the physiological changes related to egg production.

Culling for better returns

Birds which do not perform well are culled to optimize profits. Culling is practiced on the basis of outward appearance of available records. Stunted growth and physical deformity do not pose any problem. Culling for poor production or non-production requires handling of all the stocks in the laying pen. Since culling may be a source of annoyance to the flock thereby causing a drop in production it should be practiced in the night.

Culling from outward Appearance

The appearance of a bird though not an index of its laying ability gives an idea about its health and vigour. The main characteristic for distinguishing a layer from a non-layer is given below.

Character	Laying hen	Non-laying hen
Comb and wattle	Full, red, waxy, warm and velvet like	dry, hard cold, coarse and shrunken with white scabs
Beak	Stocky, well curved, worn -out and less yellow	Very long, thin and sharp pointed, yellow
Eyes	Bright and alert	Dull and sleepy
Ear lobes	Full, waxy and velvet like	Shrunken, wrinkled and coarse
Pelvic bones	Usually spread apart more than 2 fingers, thin and pliable	practically close together thick and stiff
Abdomen	Large, spread 3 to 5 fingers, soft and less of fat	Small usually less than 2 fingers, hard and more of fat
Vent	Full, large and moist	Small, dry and puckered

Culling on the Basis of Moulting:

Moulting which refers to the shedding of feathers provides some indication about the laying capacity of a bird. Good layers not only moult late but also complete the moulting period quickly and sometimes continue to lay even during moulting. Poor layers on the other hand moult early, take a long time to complete the process and do not lay any eggs during the moulting period. It is possible to determine the beginning of moulting by counting the stiff primary feathers in the wing. The first one to be dropped is the inner one next to the axial feather which separates the primate is from the secondaries. It takes about 6 weeks for the first new primary feather and 2 weeks for each additional full-grown feather. A wing having 4 new primaries during moulting season indicates that the bird has been in moulting for 12 weeks.

Laying flocks are generally to be liquidated after one year of production, since keeping them longer into second year of production may be uneconomical. If there is any outbreak of vertically transmitted diseases, like salmonellosis, total culling is recommended.
(Source: Dr.Acharya, Handbook of Animal Husbandry)

PRACTICAL No: 9 **Date:_____**

Topic: Housing and feeding of layers

Housing

At 18 weeks of age all under grown pullet chicks are to be culled and disposed off. Careful selection at the time of housing enables better returns and fewer culls later. The stock can either be reared in the same house where it was grown or transferred to laying house. Optimum housing density should be maintained for best utilization of house, equipment and labour. Provide 65 feet of floor space per egg type bird. Nest boxes must be introduced to laying house two weeks prior to the onset of lay to help birds to get used to nest. The nests should be roomy, dark, cool, well ventilated and located on one side of the building. Nest boxes made of cheap deal wood, measuring 30 x 30 x 40 cm each may be provided at the rate of one box for every five hens. Clean nesting materials should be placed inside the nest boxes and the nesting materials should be changed periodically. If needed, top-dress the litter with new material.

Light: Use correct lighting schedule to ensure better performance. While light period should not be increased for growing birds, it would be advantageous to increase the light period or photoperiod for laying chicken from 22nd week of age onwards at the rate of 15 minutes per week so as to reach 16 hours of total photoperiod (natural plus artificial). When the birds have been in lay for about 6 months, the photoperiod may be increased to 17 hours per day. The light period may be constantly maintained throughout the rest of laying period. There is no special advantage in increasing the photoperiod over 17 hours per day. The lighting programme, if started, should be followed systematically.

Feeding: A good quality layer mash should be provided to the laying birds.
Ration of layer mash for chickens

Ingredients	Percentage
Yellow Maize	47
Soyabean meal	12
Gingelly oil cake	4
Groundnut oil cake (expeller)	6
Rice polish	13
Wheat bran	4
Fish meal/dried unsalted fish	6
Dicalcium phosphate	1
Salt	0.25
Mineral mixture	1.75
Shell meal	5
Total	100.00

The feed may be given in linear feed troughs or in hanging feeders. Provide five hanging feeders, each 50 cm in diameter with 20 – 25 kg capacity for 100 layers. Place the feeders within 3 meters of water. Stir the feed few times a day to promote eating.

Water space of 2.5 linear cm per bird should be provided. Increase watering space 25% when temperature goes above 27oC. The feeders in the laying pen must be positioned in such a way that the upper edge is slightly higher than the back of the birds. The feeders should not be filled more than 1/3 full.

Cage Layer Management

The advantages of cage rearing are easy management, housing of more number of birds in limited space, clean egg production, less problem due to parasites and other diseases, easier culling, etc. Some of the disadvantages include high initial investment, wet dropping, odour and fly problem. To offset these problems, elevated cage houses are useful.

Four birdcages are ideal for commercial layers. The specification of a 4 bird cage is as follows.

Length (Frontage)	45 cm
Height at back	38 cm
Height at front	42 cm
Width	42 cm

Since there are two different measurements in height, the floor of the cage will have a slope towards front. Most material for laying cage floors is welded wire fabric. Sometimes the wire is coated with plastic. Most cage floors are constructed of 14 gauge wire to give necessary strength. Usually cage floors are constructed of wire with a mesh size of 2.5 x 5.0 cm (1 x 2"). The wire floor should be extended past the front of the cage for 18 cm and rounded up so as to collect the eggs there. To conserve space, thereby reducing the investment in the house in which the laying cages are placed, many methods have been developed to house birds in a given area. Single-deck, double-deck or triple-deck arrangement can be adopted.

The floor of the cage should be about one meter higher than the ground level. In order to collect the droppings from the cages a shallow pit at a depth of 30 cm from the floor level at length-wise just under the cages may be constructed.

Long, continuous troughs are used for feeding caged layers. Water is supplied by channel running the length of the cage unit. The water channel is usually placed above the feed trough outside the cage. Instead of water channel, nipple drinkers can also be provided. Birds should be dewormed once in every 3 months.

PRACTICAL No: 10 **Date:_____**

Topic: Vaccination, Medication and Bio-security measures in Layer farm

Design of a vaccination programme for poultry is interdependent on the parent stock vaccination programme. Vaccination in the hatching, at day old, for Infectious Bronchitis (IB) and Ranikhet Disease is more effective than vaccination on the farm after delivery of chicks. A vaccination schedule for broiler and layer are given in Table no 12&13 respectively.

Vaccination guidelines: The following guidelines are appropriate for successful vaccination:

- Follow the recommendations of the vaccine manufacturer in terms of transport, storage of vaccine and dose per bird, route and method of administration.
- Record vaccine details and check expiry date. Do not use vaccine, which is beyond expiry date.
- Ensure that all birds get equal dose of vaccine.
- When administered live vaccine in water, it is essential to neutralize chlorine in water. A method to neutralize chlorine is the addition of skimmed milk powder in water.
- Do not use UV chlorination treated water during vaccination.
- Do not vaccinate sick birds.

Important considerations

- Combine vaccination with good bio-security.
- Design vaccination programme in consultation with local veterinarians.

Table No. Vaccination Schedule for layers (0-72 weeks)

Sl.No	Age	Type of vaccine	Route
1	1 day	Marek's Disease vaccine	Subcutaneously
2	5th day	Newcastle Disease vaccine ('F' strain or lasota)	Intranasal or Intraocular
3	3rd week	Gumboro disease vaccine	Intraocular or drinking water
4	4th week	Newcastle Disease vaccine('F' strain or lasota)	drinking water
5	8th week	Newcastle Disease vaccine (R_2B strain)	0.5 ml subcutaneously
6	9th week	Fowl Pox Vaccine	Wing web puncture
7	15th week	Newcastle Disease vaccine (R_2B strain)	0.5 ml subcutaneously
8	16th week	Fowl Pox Vaccine	Wing web puncture
9	18th week	Lasota	Drinking water

Note: Before First dose of R_2B, bird should be dewormed and given lasota vaccine.

PRACTICAL No: 11 **Date:_____**

Topic: Marketing of eggs and culled birds

Marketing Eggs are an important and fundamental foodstuff for developing countries. The greater the distance between producer and consumer, the more complex is the marketing organization required to ensure that eggs reach consumers in the form, place and time desired. Poultry egg and meat processors and marketers continue to meet consumer-driven needs. Steady growth in per capita consumption of value-added poultry products and successful competition with other food sources indicate that efficient processing and marketing have been important in sustaining the poultry industry. Continuous growth assures the sustainability of the poultry industry in meeting consumer needs for improved and healthy further-processed products. This growth will continue in both national and international markets. Because of this favorable growth, jobs will continue to be available in the poultry industry – especially in the areas of food and health science, product processing, product research and development, domestic and foreign marketing, and international trade. Marketing of eggs and meat is not fully organized. Live and fresh dressed chicken meat account for the bulk of sales while sale of processed meat is limited (below 5%). The major channels through which farmers sell their egg and chicken in the markets are direct sold to the consumers. Unlike eggs and meat from commercial hybrid birds, local consumers generally prefer those from indigenous stocks. The availability of poultry eggs and meat is grossly inadequate in rural areas leading to higher prices as compared to urban areas forcing rural people to spend more on such items. With increase in income, growing middle class and transition from joint to nuclear families, there is growing demand for egg and meat, creating a vast marketing opportunity in the rural sector. Most of the birds in rural areas are sold live or slaughtered at the place of sale. Similarly eggs are sold in open without consideration for preservation of their quality. Development of reliable and stable market chain round the year is a must for effectively absorbing the rural surplus production. Also facilities for hygienic slaughter and preservation of eggs should be made available at market places in rural areas.

So Producers may decide to market their produce directly to consumers – direct marketing – or may choose from a variety of marketing organizations that make up a marketing channel.

MARKETS AND MARKETING CHANNELS

Marketing of the product is probably the most important aspect of any business? It is one of the weakest links in the rural poultry development program, whereas, it is the strongest link in cities and metros. Presently, the market for poultry products is concentrated in peri-urban and urban areas. The overall impression of the market is that it is not well organized and there is exploitation by brokers or middlemen, reducing the margin of profit for farmers who are under threat by weather, price fluctuations and productivity.

Markets for Eggs and Meat

Agencies like National Egg Coordination Committee (NECC) established in 1982 and All India Broiler Farmers Marketing Cooperative Limited (BROMARK) are declaring prices for eggs and broilers based on market dynamics and have participation of farmers, which helps to solving the problem of middlemen to some extent. Broiler Coordination Committee (BCC)

also declares sale price of live broilers from time to time. Infrastructure like cold storage and retail outlets will help stabilize the market in terms of price fluctuations. On the basis of area and space, markets can be classified as local markets, national markets and international markets. In villages, you may find the markets arranged on fixed day, time and place. Normally, the products are sold through direct or indirect or integrated or cooperative method.

Egg market

Like other food commodities, you can find various types of markets dealing with disposal of table eggs. The size of markets may be small to big. In district or subdivision level, wholesale markets (Mandi) are available where one can purchase eggs in bulk quantities. The eggs are also sold out through daily hawkers, eggthelas, egg-trollies, egg-kiosks, groceries-shops, hotels, restaurants and shoppingmalls. The table eggs are generally marketed as they are produced without cleaning, grading and chilling and only about 5% of the total eggs produced are utilized as an ingredient for egg-based products by food and non-food industries. Most smallflock producers, base their prices on the current store prices in the area they live. However, many organized producers market their eggs as a specialty item and receive premium prices. Brown eggs and organic eggs often will bring higher prices.

Marketing Channels for Eggs and Meat

The following are the identified marketing channels for eggs and meat in our country: ” From farm to consumer (Direct). ” The raw finished product rolls from one hand to another and then finally reaches to the end user. This means that between producer to consumer the brokers/ middlemen, bulk buyers/ institutional buyers/stockiest/whole sellers and retailers play vital role in marketing of raw or finished product. Producer Broker/Middleman Wholesale Retailer Consumer ” Small or big shops, retail outlets, canteens, hotels, restaurants, refrigerated display cabinets and fast food shops are also involved as different marketing channels. ” The NECC established in 1982 has about 25000 poultry farmers as members and carries out different programmes such as market intervention, price support operations, egg promotion campaigns, consumer education, market research, rural market development and liaisons with the government on vital issues concerning the industry to declare egg price. ” Similarly, the BROMARK and BCC are also engaged in price fixation and marketing of broilers in our country. ” The quality assurance is very important in marketing channels. The AGMARK is involved in grading and maintenance of quality of egg and meat products.

So here are major methods of marketing eggs:

1. **DIRECT MARKETING**

Egg producers who are situated a short distance from consumers may be able to practise direct marketing such as:

- Sales from the farm
- Door-to-door sales/street hawking
- Sales to any local retail shops

2. **MARKETING INTERMEDIARIES**

- **Wholesale distributor:**

Wholesalers usually have a good knowledge of the market, access to the best information on trends and prospects and working capital to carry business risks as required.

Wholesalers usually obtain eggs from central wholesale markets, assembly merchants, collectors and local country markets; however, in some instances they go directly

to the producers. Eggs may be purchased directly or accepted for sale on a commission basis. Many wholesalers have their own storage facilities too. Wholesale distributors may engage specialized transport agencies to transport eggs or operate such services on their own account.

Central wholesale markets receive shipments from large farms and from country markets, and constitute a supply source where wholesalers and retailers can obtain the various types of produce they need. General wholesale markets sell many different products, including eggs. Because it is the focus point of many smaller markets and also the point of contact for suppliers to important groups of consumers,
And a central market is usually the primary price-making mechanism for the production areas it serves. In this way it balances demand and supply also.

- **Retailer**
  In urban areas, egg sales are made through retailers. Four types of retailers usually carry eggs in their shops:
  – **poultry shops** where only eggs and poultry are sold; –**food shops** specializing in eggs, poultry, cheese, butter, meat and fish;
  –**general food shops** and supermarkets selling all kinds of foods and household goods; and
  – **meat markets** where all types of meat are sold and eggs are also offered for sale.

3. **DIGITAL MARKETING**

Last but not the least, Digital has now become new normal especially after Corona Pandemic worldwide. So digital platform can be the perfect platform for the producers to directly sell their eggs online from their farms or by making new partners online.

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. Collect the eggs in clean filler flats or in well-ventilated wire plastic baskets. Market eggs frequently. If the percentage of dirty eggs is more, check the management of layer house and take corrective measures.

PRACTICAL No: 12 **Date:_____**

Topic: DPR on layer farming

Business idea 4: Poultry chick production

PRACTICAL No: 13 **Date:_____**

Topic: Study on general Hatchery Management
Management of Incubators:

The Incubator Room : In the selection of a successful incubator room, factors such as heating, humidity, ventilation, and sanitation should all be considered. Optimum results can be expected if the temperature can be maintained at between 24 and 27^0C, with uniform humidity below the level that is required in the incubator. Tropical climates (heat & humidity) make it difficult to maintain good incubator room conditions. Good ventilation and a constant supply of oxygen to remove excess carbon dioxide from the environment surrounding the incubating eggs is necessary for the developing embryo. High altitude reduces available oxygen.

Incubators : Incubators are the most important equipment in the hatchery process. Many kinds of incubators are manufactured; however, the general principles of all modern machines for commercial hatchery production are the same. Incubator setting capacity ranges from approximately 14,000 to 100,000 eggs.
During incubation, the hatching eggs are set vertically, with the large ends up in trays or flats in a setter and turned mechanically until about three days prior to hatching (setting period). The eggs are then transferred to a hatcher (hatching period) in a horizontal position and not turned during the hatching process. Both setters and hatchers have forced-draft air circulation, automatic temperature, humidity and cooling controls.
For small backyard poultry operators, there are small, still-air machines. Capacity of these incubators varies from 12 to 200 eggs. The eggs are set in a horizontal position and are usually turned manually. This type of incubator may be used for the entire incubation period for any kind of eggs. The source of heat is a thermostatically controlled heating element or light bulb. Humidity is supplied in most cases by water in a pan below the eggs, and ventilation controlled by small air vents or holes. Most still-air machines have transparent plastic domes through which the incubation process can be observed.

The Principal Factors in Incubation: The seven main factors affecting incubation, listed in order of importance are: temperature, humidity, ventilation, position, turning of the eggs, testing (candling), setters and hatchers and incubation time.

Temperature: The fertile egg will resume development when it is placed in the incubator. But maintenance of the proper temperature is of prime importance for good hatchability. Depending on the type of incubation, optimum temperatures range from 99- 100 degree F. Overheating is much more critical than under heating. It will speed up the rate of development, cause abnormal embryos in the early stages and lower the percentage of hatchability.

Humidity: Humidity is of great importance for normal development of the chicken embryo. During embryonic development, moisture is lost from the egg contents through the shell. This increases the size of the air cell, which after 19 days of incubation occupies about one-third of the egg.

Although a variation of 5-10 % is acceptable, the relative humidity of the air within an incubator for the first 18 days should be about 60%. During the last 3 days, or the hatching period, it should be nearer 70%. Lower humidity than recommended causes excess evaporation of water, while high humidity prevents the evaporation of sufficient amounts of water from the egg. In both cases hatchability is reduced.

Ventilation: As the embryo develops, it uses oxygen and gives off carbon dioxide. Thus, sufficient ventilation within the incubator is required to assure an adequate supply of oxygen and the proper removal of carbon dioxide. The best hatching results are obtained with 21% oxygen in the air. The embryo will tolerate a carbon dioxide level of 0.5%, but it will die if this level reaches 5%. Since the normal oxygen and carbon dioxide concentrations present in air seem to represent an optimum gaseous environment for incubating eggs, no special provision to control these gases is necessary other than to maintain adequate circulation of fresh air at the proper temperature and humidity.

Position of eggs and turning: The embryo head must occupy a position in the large end of the egg for proper hatching. Thus, the egg must be incubated with large end up as gravity orients the embryo with its head uppermost. Somewhere between the 15^{th} and 16^{th} day, the head of the embryo is near the air cell.

Eggs should be turned from 3-5 times a day between the 2^{nd} and the 18^{th} day. The purpose of this turning is to prevent the germ spot from migrating through the albumin and becoming fastened to the shell membrane. That is turning the eggs prevents an adhesion between the chorion and the shell membrane.

Proper turning consists of rotating the eggs back and forth, not in one direction (a 30 degree to 45 degree angle is best)

Modern incubators are equipped with turning devices that are able to rotate egg trays through a 90 degree angle. Also they are equipped with timing mechanisms; and usually the

eggs are turned every hour, which is probably more often than necessary.

Testing (candling): Under some circumstances, it may be advisable to check incubating eggs for fertility or embryo mortality. This is done by candling the eggs, using a 75 watt blue bulb. With suitable equipment, infertile eggs may be detected after 15- 18 hours of incubation. The 2nd test may be made 14-16 days after incubation, at which time the dead embryos may be removed.

Setters and hatchers: In commercial hatcheries two separate incubators are used during the incubation process. The bulk of the incubation (usually through the 19th day) is done in setters while the end of the process is in hatchers. The main reason for separate hatchers and setters are:

a) The machine are kept in two separate rooms, thereby i) isolating the down, egg debris and micro-organisms that accompany hatching from the eggs in the hatchery, and ii) permitting the hatchers to be cleaned, disinfected and fumigated without disturbing the eggs in the setter.
b) The temperature of the hatchers is lowered to 98 degree F because there is some evidence that the hatch may be slightly improved by the lower temperature.
c) The hatchers are equipped with special chick holding trays, not needed in setters.

Incubation time: The incubation period varies for different species of birds. The larger the egg, the longer the incubation period. Also, the incubation period may vary with the temperature and humidity of the incubator. The normal incubation periods for several species of birds are-

Chicken- 21 days
Quail- 17 days
Duck- 28 days
Turkey- 28 days
Pigeon- 18 days
Ostrich- 42 days.

Other Factors Affecting Incubation

1. Improper Fumigation: Excessive and improper fumigation can result in high mortality in developing embryos.

***2.Egg Selection*:** Poor quality hatching eggs do not hatch as well as eggs of good quality. The term "quality" refers to the condition outside the shell, the condition of the shell itself and that of the contents. Eggs with inferior characteristics, as discussed in "Selection and Care of Hatching Eggs," should not be set.

3.Sanitation: Eggs used for hatching should be clean and stored in clean containers in a sanitary egg holding room. Eggs contaminated with bacterial organisms usually do not hatch well and this poor quality is reflected in the chicks that do hatch.

4.Egg Handling: Rough handling of hatching eggs before they are set will increase the number of dead embryos, with mortality occurring between the 4th and 13th day of incubation. Also, jarring eggs during incubation may result in the rupture of the egg shell membrane and thereby lower hatchability.

Large fluctuations in temperature and humidity during storage will have a major adverse affect on hatchability. Refer to "Selection and Care of Hatching Eggs" for proper egg storage procedure.

5.Toxicity: If the interior of an incubator is painted or varnished, or if the trays are varnished, the percentage of hatch will be reduced, possibly by as much as 25%. This adverse effect disappears in about 30 days, suggesting that the ill effect is eliminated by oxidation of the paint.

This problem may be overcome without any reduction in percentage of hatch if the incubator is fumigated with formaldehyde gas at the concentration recommended for proper hatchery fumigation. The gassing should be done as soon as the paint is dry and with the incubator operating at recommended temperature and humidity for incubating eggs.

Automatic Equipment: The addition of automatic equipment has eliminated many of the problems with incubators, however, such hazards may occur when automatic devices fail. During hatching all automatic devices, such as cooling coils, automatic dampers, tray turners, alarm bells, etc., should be checked at regular intervals. Electrical failure may require that automatic equipment be reset. After an incubator is purchased, it is important to know how every part operates.

Egg Candling: Candling chicken eggs on the 7th and 18th day of incubation, may be recommended for small poultry producers. Egg candling will detect infertile eggs and early dead germs. Therefore, problems within the hatching flock can be identified without waiting until the incubation period is completed.

Fumigation of Incubators: The killing of bacterial organisms by formaldehyde gas is based on the concentrations of the gas, exposure time, temperature, and humidity of the incubator. The chemicals potassium permanganate and formalin (which is 40% formaldehyde gas) have proven to be the most effective method of destroying bacterial organisms in the hatchery. To accomplish the proper release of the gas, one and one-half parts (by volume) formalin is added to one part (by weight) of potassium permanganate. This will release the formaldehyde as gas or fumigant. When the reaction is complete, a dry, brown powder will be left. If the residue is wet, not enough permanganate was used; if the residue is purple, too much permanganate was added.

Concentration: The recommended concentration for effective fumigation is 50cc of 40%

formalin added to 25-30 g of potassium permanganate per 100 cubic feet of space to be fumigated.

Caution: Never add the permanganate to the formalin. Heat is generated when the two chemicals are combined, and care should be taken. Formaldehyde gas is generated quickly. Do not allow the fumes to get into the eyes. Personnel should use a respirator or wear a mask to avoid unnecessary exposure. Ventilate the incubator room to remove fumes that escape from the incubator.

Time: It is not recommended to fumigate setters with hatching eggs in them, but if such treatment becomes necessary, embryos between 24 and 96 hours of age should not be exposed to the above concentration of formaldehyde. Hatching compartments should be fumigated after the eggs are transferred from the setter to the hatcher, again after the hatch has been taken off and before the refuse has been removed from the trays, and finally after the hatcher has been thoroughly cleaned. Do not fumigate chicks with this concentration of formaldehyde gas. Small still-air incubators should be fumigated after the chicks have been removed and prior to discarding the refuse from the tray and again after the incubator has been thoroughly cleaned.

Fumigation Procedure:

1. Make sure the temperature and humidity of the incubators are at normal operating conditions.
2. Measure the inside volume of the machine in cubic feet or cubic metres (length x width x height).
3. Close the ventilators, but leave the fans on.
4. Weigh the required amount of potassium permanganate into a wide enamelware or earthenware vessel large enough to accommodate the boiling and splattering action experienced when the formalin is added. Place the vessel and the permanganate in the area to be fumigated; then add the formalin.
5. Close the door immediately and leave closed for 20 minutes.
6. After 20 minutes, open the ventilators.
7. Open the doors of the machine for five minutes, leaving the fan on to allow more of the formaldehyde gas to escape, or neutralize it with a 25% solution of ammonium hydroxide equal to one-half the amount of formalin used. The hydroxide should be thrown directly on the floor of the machine and the doors closed. The formaldehyde gas will quickly be neutralized.

Continuous Fumigation of Hatcher:

The greatest increase in bacterial organisms occurs during the hatching period. These can be reduced, but not completely eliminated, by slow release of formalin in the hatcher during the last 48 hours of the hatching period. For continuous fumigation to be effective, hatching eggs should also be fumigated at transfer time with the recommended concentration. Place formalin in pan about 25 mm in depth, allowing 58 cm^2 of pan for each cubic metre of hatcher space, or a pan about 1 in. deep, allowing 30 $inch^2$ of pan for approximately 1000 ft^3 of hatcher space. Do not use permanganate. The pan should be placed in the open area of the hatcher in direct line with the airflow. Place the pan of formalin in hatcher 48 hours prior to hatch completion. To overcome fluff deposited on the formalin, add more formalin about 24 hours before hatch is complete to increase evaporation.

If the fan stops (mechanical failure etc.) and reduces the airflow, remove the pan of formalin immediately. If hatchers are only partially full, continuous fumigation is not recommended, as a reduction in airflow will create an excessive build up of formalin in the hatcher.

Effects of Fumigation:

1. Properly carried out, fumigation should not affect hatchability.
2. Fumigation will only kill bacteria that are present on the surface of hatchery refuse. Fumigation will not kill bacteria inside unhatched or pipped eggs. It is important to dispose of hatchery refuse carefully to minimize hatchery contamination.
3. The hatchery room must be separate from the tray dumping room and from the chick processing area. Air flow and traffic must be controlled to prevent contamination of the chick processing and holding areas.
4. Efficient fumigation along with other sanitary measures should control navel infection (omphalitis).
5. Fumigation is not intended to replace a thorough cleaning program.

SUMMARY OF SOME IMPORTANT FACTORS

1. Feed breeder flock hatching ration that is well fortified with essential nutrients.
2. Use healthy breeding stock.
3. Provide good egg-holding facilities.
4. Avoid holding eggs in storage for more than one week.
5. Pre-5warm eggs for 6 to 8 hours at incubator room temperature.
6. Set clean, good quality eggs. Delay setting small eggs (those more than 10% less than average) for 8 to 16 hours.
7. Maintain correct incubation temperature, humidity and ventilation. Make sure air intake does not draw contaminated air into the incubator.
8. Turn hatching eggs frequently.

9. Maintain incubator room temperature between 21 and 24BC with good ventilation and relatively high humidity.
10. Fumigate regularly.
11. Clean vaccinating and beak trimming equipment. Newly hatched chicks may pick up contamination and infection in the hatchery from vaccinating and beak trimming equipment. This equipment requires a very rigid sanitation schedule.
12. Practice strict sanitation; cleanliness is very important for successful hatching operation. Make sure belts, equipment and workers hands used to move eggs or newly hatched chicks are kept clean.

EXERCISE:

1. Mention the temperature and humidity maintained in hatchers and setters.
2. Name the different instruments and appliances required in a hatchery unit.
3. What are the different routine works performed in a hatchery.
4. How hatchability is calculated?
5. Name the different causes of poor hatchability.

PRACTICAL No: 14 **Date:_____**

Topic: Hatchery layout and design

HATCHERY DESIGN:

Hatchery layout is important for a good sanitation program. Arrange the hatchery so that there is a one-way flow of material from the point where the hatching eggs are brought in to where the processed chicks go out.

Hatcheries should be designed so that the flow of eggs, chicks and personnel does not spread contamination from one room to the next. Doors, including one-way doors, help to stop cross contamination between rooms. Positive air pressure prevents contamination through an open door. Workers should change outer clothing and wash hands before moving from one work station to another.

Hatchery Equipments:

a) Egg Setter:
b) Hatchery :
c) Hygrometer:
d) Maximum and minimum Thermometer:
e) Dry and wet bulb Thermometer:

f) Egg Candler:
g) Marek´s Disease Vaccinator:
h) Egg weighing balance: For weighing eggs.

EXERCISE: Draw the lay out plan of a hatchery unit and show the different units.

PRACTICAL No: 15 **Date:_____**

Topic: Marketing of chicks

PRACTICAL No: 16 **Date:_____**

Topic: DPR on poultry hatchery

Business idea 5: Value added poultry products and marketing

PRACTICAL No: 17 **Date:_____**

Topic: Poultry products processing equipment

These equipments are used to produce high quality 'Ready – to – cook' and 'Ready – to – eat' value added processed poultry products. These equipments are usually made up of high quality 'food grade' stainless steel(SS).

1. **Deboning table**: It is a rectangular SS table where deboning (separation of meat from bone) of dressed birds / food animal carcasses is carried out. It should be of optimum height for comfortable working. It is easily cleaned and sanitized.

2. **Deboning set**: It contains SS knives which are used to separate meat from bones.

3. **Meat tray**: Stainless steel rectangular tray used to collect boneless meat for further use.

4. **Meat Grinder / Mincer:** It is an electrically operated machine used for comminution (reduction in particle size) of deboned meat.

5. **Bowl chopper / Silent cutter:** This equipment is used to prepare meat batter / emulsion for production of various comminuted meat products. It works on the principle of simultaneous cutting and mixing thereby producing a fine meat batter.

6. **Sausage stuffer:** It is used to stuff meat batter in to the casings for preparation of sausages.

7. SS **Moulds:** These are rectangular SS boxes used to pack the meat batter for further processing.

8. **Heating / Meat Cooking devices:** These include LPG gas stove, OTG electric oven, Microwave oven, etc. for thermal processing of different types of meat products.

9. **Impulse sealer:** It is used for sealing if LDPE packages containing meat products for storage / marketing.

10. **Vacuum / Modified atmosphere packaging machine:** This packaging machine is used for special packaging of meat products for maintaining quality and increasing shelf life of processed meat products.

PRACTICAL No: 18 **Date:_____**

Topic: Processing, packaging and storage of value added poultry products

Production of high quality finished products requires good quality raw materials, proper processing machineries and skilled personnel handling the process. Similarly, for production of high quality processed poultry products care should be taken on following aspects.

1. **Selection of ingredients:**

i) Meat

ii) Fat

iii) Non-meat ingredients include: salt, sugar, spices, refined wheat flour (maida), onion – garlic paste, alkaline polyphosphate (food grade), water, packaging materials, etc.

2. **Mincing** of deboned / boneless meat and fat using plates of suitable diameter.

3. **Preparation of meat batter / emulsion using bowl chopper:** Following sequence of mixing of ingredients should be followed for good quality processed products. Deboned meat should be taken in the bowl chopper followed by addition of measured quantity of salt, sugar, alkaline polyphosphate and water. Machine is run for 1.5 to 2 minutes. Then required fat / vegetable oil is added and the machine is run for 1 min more. Next, onion – garlic paste, spices and maida are added and further mixed for 1 minute. Now the meat batter / emulsion is ready.

4. **Forming:** Different value added poultry products can be prepared by using different forms and thermal processing methods. These products include nuggets, balls, sausages, patties etc.

5. **Thermal processing:** Depending on the product type different thermal processing procedures are used. Cooking schedule (Time – temperature combination) should such that

internal temperature of the product must reach 74 - 80℃ at the end of cooking / thermal processing.

6. **Packaging and storage**: Products should be cooled to room temperature and packaged depending on the marketing needs. As the meat / poultry products are highly perishable, they must be stored at low temperature (4℃ for immediate use and -18℃ for long term storage).

PRACTICAL No: 19 **Date:_____**

Topic: Marketing of value added poultry products

Effecting marketing of any product depends on product quality, attractive packaging, advertizing and quick delivery to the customers. In recent years marketing of various products using Apps has become highly popular and effective.

Traditional channels of marketing include:

i) Producer – wholesaler – retailer – consumers

ii) Producer – retailer – consumers

iii) Producer – consumers

iv)Through various Apps – receiving orders from the consumers – supply through deliver persons to the consumers.

Marketing of value added poultry products needs maintenance of cold-chain to preserve the quality of the products during storage and transportation.

PRACTICAL No: 20 **Date:_____**

Topic: DPR on value added poultry products

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