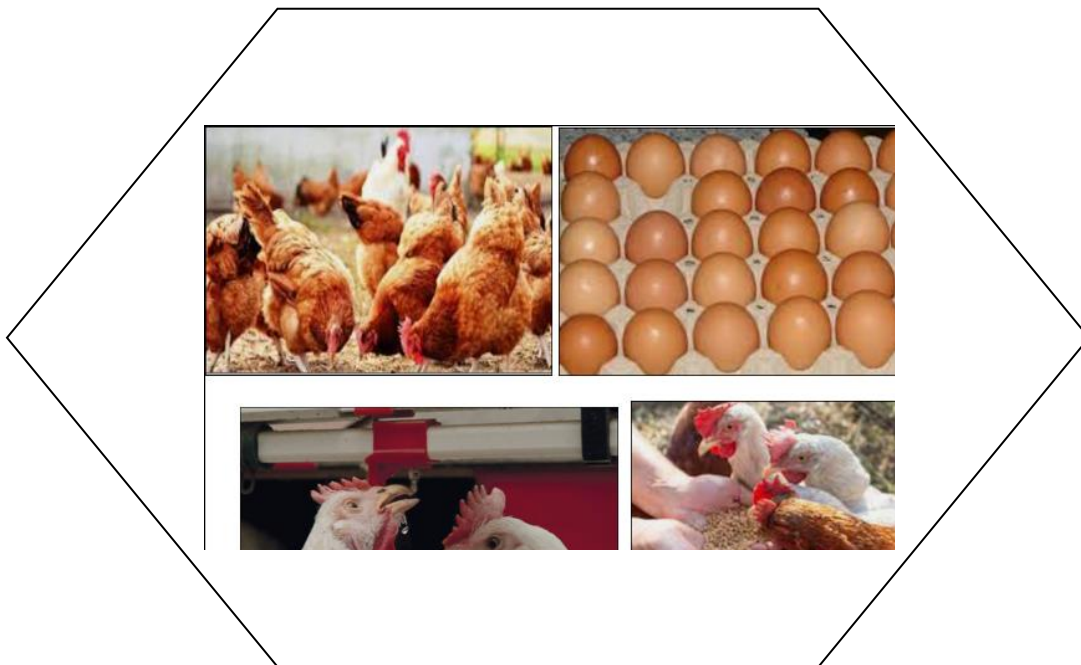


ANIMAL PRODUCTION

Level III

Based on March, 2022, Version 4 Occupational standard



Module Title: Performing Poultry Production

LG Code: AGR ANP3 M07 LO (1-5) LG (28-32)

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May, 2023

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Table Contents

Introduction to the Module	1
LO#1- Identify poultry production systems and their requirements.....	2
Instruction sheet	2
Information Sheet: 1	3
Self – check: 1	13
LO#2- Identify and select poultry breed and breeding.....	13
Instruction sheet	14
Information Sheet: 1	15
Self – check: 2.....	32
Operation Sheet: 2.....	34
LAP TEST: 2	36
LO#3- Plan poultry house construction and facilities.....	37
Instruction sheet	37
Information Sheet: 3	38
LO#4- Feed and Manage different classes of poultry	50
Instruction sheet	50
Information Sheet: 4	51
Self check: 4	73
Operation Sheet: 4.....	74
LAP TEST-2.....	75
LO#5- Prevent and control common poultry diseases	76
Instruction sheet	76
Information Sheet: 5	77
Self check: 5	93
REFERENCE	94

Introduction to the Module

This module covers the knowledge, skills and attitude required to perform poultry production that required in Identify poultry production systems and their requirements, Identify and select poultry breed and breeding, Plan poultry house construction and facilities, Feed and Manage different classes of poultry and Prevent and control common poultry diseases.

Page 1 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

LG#28	LO#1- Identify poultry production systems and their requirements
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Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Identifying poultry production systems
- Characterizing production plan
- Identifying each Requirements for poultry production
- Recommending Suitable and feasible production system

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify poultry production systems
- Characterize production plan
- Identify each Requirements for poultry production
- Recommend Suitable and feasible production system

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet: 1

1. 1. Identifying poultry production systems

Chicken can be reared in different management and production systems. Based on chicken breed type, input and output level, mortality rate, type of producer, purpose of production, length of broodiness, growth rate and number of chicken reared. In Ethiopia there are three types of chicken production systems. These are free-range production system, semi-intensive production system and intensive production system.

A. Free-range chicken production system

This chicken production system is practiced in most rural areas of the country and objectives of production are for household consumption and as source of additional income for the household. It covers 95-98% of the chicken production system of the country and it is not profitable since it is not market oriented. It contains small flock size (5-20 chickens per household) which are indigenous breed types mostly depend on locally available feed material as supplement with low health services and other management practices. The chicken does not have their own constructed chicken house rather maintained in the main house with the family. Chicken brooding and rearing is only the care they obtain from their mother/hen. Because of these there is high mortality of chicken and long broody periods and there is risk of exposure for different chicken diseases and predators. The major feed sources for chicken are worms obtained from free scavenging, legumes, cereals and sometimes there is supplemental feed during feed shortage. The amount given is small and do not fulfil their nutrient requirement. Because of this their productivity is low. Indigenous poultry breed in this system of production does not produce more than 60 eggs per hen per year.

Advantages of free-range chicken production system

The advantages of free-range chicken production system include, the chickens are healthy since they exercise in the open air freely, there is minimal infection with parasites if enough space is available, there is little or no labour input, the chickens in this type of production system

help to limit the amount of rubbish in a productive way and the direct costs of the system are low.

Disadvantages of free-range chicken production system

The disadvantages of free-range chicken production system include, it is difficult to control and manage the chicken especially the young chicks are easily exposed for predators and unfavorable weather conditions, the chickens eat sown seed when looking for feed, a large percentage of the eggs can be lost as the laying hens are not accustomed to laying nests, high diseases transmission and occurrence of high death, chickens are less productive.



Figure 1.1. . Traditional/scavenging system

B. Semi- intensive chicken production system

This type of chicken production system is better than free ranging production system since it uses inputs like supplemental feed, vaccine, etc Figure 2. It has a small house which accommodate laying nest and feeders which serves as chicken house for night time. The house has one or two side open door for easy movement of the chicken to the fenced area during the day time. The fence can be made from mesh wire or other materials and will not allow the chicken to escape above on it. The fenced area should be always clean and dry. Since the feed the chickens obtain from the scavenging is very low, they should be supplemented with

energy and protein feeds. Since the main objective of the production is to get profit, they should get better health management practice like vaccination against NCD than free scavenging system. They are more productive than the chicken in free scavenging system. It contains flock size of 50-200 birds/chicken per household which are improved breeds.

Advantages of semi-intensive chicken production system

The advantage of this system include, complete control over operation, useful for record purposes, operational throughout the year, economic use of land (free range) and there is better protection during winter.

Disadvantages of semi-intensive chicken production system

The disadvantage of this system of chicken production system include, high cost in fencing, danger of over stocking and exposure for different disease if the compass is not clean and dry.

C. Intensive chicken production system

This type of chicken production system use more inputs (feeds and feeding, breed, health, housing and other inputs) than the above two chicken production systems. It is market oriented and the main objective of production is to get better profit. The number of chickens involved are relatively high (more than 200 chicken). The chicken breed used is specialized improved breeds (layer or broiler). They should provide the expected product within that time.

There are three types of intensive chicken production systems which include deep litter system, cage system and full slated rearing which are stated bellow in detail.

i. Deep litter system

It involves rearing of chickens on a floor littered by 5-10 cm thickness litter (Figure 3). The litter can be made from locally available material such as dry hay, teff straw, coffee pulp and sow dust. The litter should be dry at any time otherwise it can cause occurrence of different disease. In addition to provision of comfort for the chicken, the litter absorbs any waste material excreted from the chicken and make the house dry. It is possible to place the feeders and drinkers in the house on the litter. But it is advisable to hang them as the age of the

chickens increase. It is also important to place laying nest in the house. In this way it is possible to rear either layer or broiler. At least once a week, the litter should be sprayed with disinfectant chemicals. Deep litter is recommended for both meat birds and layers. To keep healthy chicken in this type of system, the following points should be noted:

- The existing litter should be removed totally when the existing stock culled
- Before introduction of new stock, the house should be cleaned carefully and left free at least for two weeks
- Make sure that the litter should be dry at any time
- At any time the thickness of the litter should not be less than 5cm



Figure 1.1. Deep litter system

Advantage deep litter system

The advantages of the system included proper accommodation, prompt culling of unproductive birds, proper control of diseases and predators, good record keeping and high egg production. It has also advantageous in that land requirement is minimum, easy and economic management, scientific feeding and management, high degree of supervision, minimum labour, automation is possible and manure value is increased. Deep litter is a good

insulation. It protects chickens from cold weather, and during hot seasons they can nestle into it and reach the cool floor below. Studies show that when all other factors are equal, layers produce more eggs on deep litter than in cage systems. Chickens can be brooded and kept through their productive lives in the same house. Deep litter allows the bird to dust itself against lice and other parasites.

Disadvantage of deep litter system

The disadvantages of this intensive system of chicken production include high capital investment, problem of cannibalism and diseases outbreak. If the management is bad, liberation and accumulation of ammonia, wet litter problem dirty eggs, disease problems may result. There is a greater chance of worm and tick infestation and coccidiosis (internal protozoan parasites) than with cages or raised floor systems. The deep-litter system is inappropriate for very humid areas (80 - 90% humidity) damp litter spreads diseases. The litter must be turned often, particularly in damp weather, and this requires more labor than other systems.

ii. Cage system

This type of intensive production system involves rearing of chicken in one house on the prepared cages or nests and it is more appropriate for layers (Figure 4). The egg produced is used only for food since there is no cock. The chicken has no any access for free ranging. Therefore, the chicken should get the required nutrient through supplementation. The ration can be formulated in the house using locally available materials like maize, noug seed cake and other materials. Even though the system requires high initial capital investment, it is profitable. The rearing cage can be made from locally available materials like timber and wood. Cages are good for climates with high humidity, where labour costs are high, and when a farmer wants to keep a large flock of layers. Where ticks are a problem, cages are especially advantageous. Cages are recommended for layers, but not generally used for meat birds.

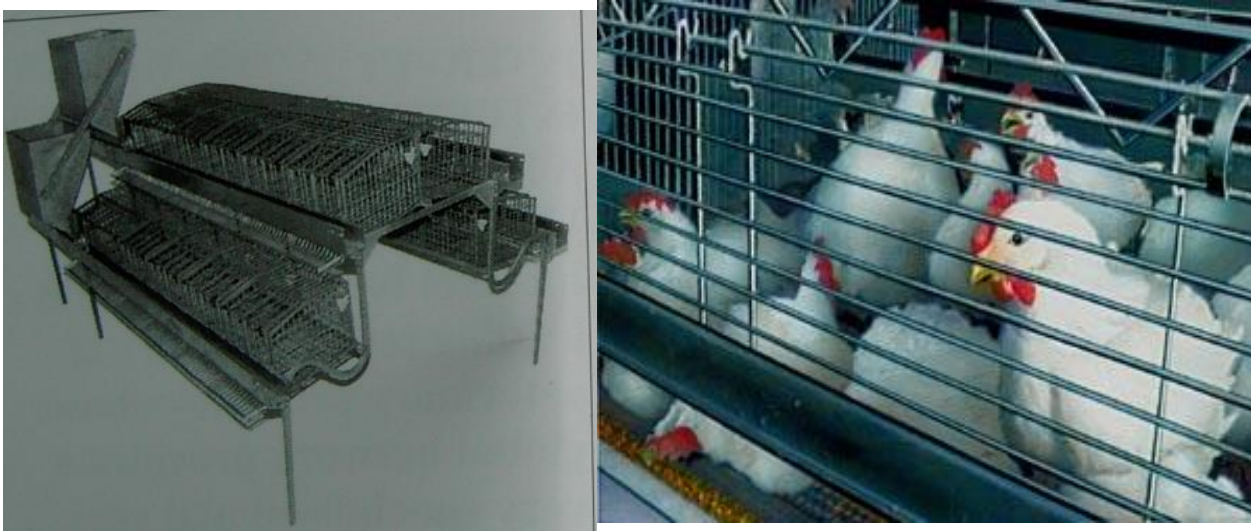


Figure 1.2. Cage system

Advantages of cage system

The advantages of the system include cages can be placed under existing roofs; thus, a special building may not be required. With cages more birds can be kept in a building than on deep litter. Less labour per bird is needed than other systems. Poor layers can be identified immediately and culled, thus saving feed. Problems with parasites, particularly ticks, are reduced, but nutrition may be a problem. When properly constructed, cages can last many years. Fewer disease problems are caused by transmission through faecal matter. Cages are a cheaper investment in the long run due to ease in care and feeding of the birds.

Disadvantage of cage system

The disadvantages of the system include high cost of installation, breeding is not possible unless artificial insemination is practiced, cage layer fatigue or paralysis is a problem if not attended to, cages are hard to construct properly, and they involve very high initial investment per bird. There must be constant and excellent ventilation. There are more broken eggs than with deep litter. The feed must contain all necessary vitamins and minerals needed by birds.

Table 1.1. Production and reproduction per hen per year under the different management systems

Production system	N° of eggs per hen/year	N° of year-old chickens	N° of eggs for consumption and sale
Scavenging (free-range)	20-30	2-3	0
Improved scavenging ^{1/}	40-60	4-8	10-20
Semi-intensive	100	10-12	30-50
Intensive (deep litter)	160-180	25-30	50-60
Intensive (cages)	180-220	-	180-220

1.2. Characterizing poultry production plan

There are local and exotic chicken breeds available in Ethiopia. Formerly the exotic ones were kept only in commercial farms with intensive management and local or indigenous breeds in backyard chicken production systems. Currently, exotic/cross breeds are being kept in backyard chicken production systems with certain inputs.

A. Indigenous Breeds:

There are local breeds of chicken mostly called by their local name, which are named after the color of their feathers or their location. Their performance and genetic potential has not been studied, but EARO is doing efforts in characterizing the breeds and improving their potential by cross breeding. Most of the urban and peri-urban community keeps these indigenous breeds because they are well adapted to the current environmental condition. Thus, these chickens can survive well with low input and the taste of their eggs and meats is flavourful.

B. Commercial or Exotic Breeds:

Commercial breeds are developed based on the demand of consumers. Currently the commercial breeds are either layers or broilers. There are also pure, exotic breeds but currently they are

not available in the commercial markets of Ethiopia. Formerly Rhode Island Red and White Leghorns were available in Ethiopia.

1. Layers

These breeds are used primarily for egg production. Most of the time, the eggs of the parent stock are imported. Then the generations are used for their egg production while the parent stock is used for hatchery purposes. Previously, several layer breeds were imported to Ethiopia, but currently there are just two hybrids used for egg production:

- **Bovans Brown:**

This breed was formerly known as Bovans Goldline and is a hybrid of Rhode Island Red (cock) and Light Sussex (hen). Bovans Brown is a brown feathered, brown egg layer which has the ability to meet the expectations of a variety of egg producers with different objectives. She is the bird of choice for today's egg farmers who expect high egg numbers and a forgiving bird—essential ingredients to keeping business profitable. She not only performs well for the egg producer with traditional production facilities, but is very docile making her the perfect bird for alternative production methods as well



Figure 1.3. Bovans Brown

- **Issa Brown**

Issa Brown: Also available in Ethiopia, this layer is a hybrid of Rhode Island Red (hen) and Rhode Island White (cock). It is known for its high egg production of approximately 300 eggs per hen in the first year of laying. They are easy to raise and prolific producers of large richly colored brown eggs of excellent shell quality. They are quiet and friendly and easily trained to lay in their nests



Figure 1.4. Issa Brown

2. Broilers:

Broilers are chickens raised specifically for meat production. Modern commercial broilers are specially bred for large scale, efficient meat production and grow much faster than egg laying Hens or traditional dual purpose breeds. They are noted for having very fast growth rates, a high Feed conversion ratio, and low levels of activity. Broilers often reach a harvest weight of 4-5 pounds dressed in only five weeks, although more slow growing free-range and organic strains reach slaughter weight at 12-16 weeks of age. Typical broilers have white feathers and yellowish skin. This cross is also favorable for meat production because it lacks the typical "hair" which many breeds have that necessitates singeing after plucking. Both male and female broilers are

slaughtered for their meat. Babcock is the chicken breed that is currently imported in Ethiopia and used for fattening purpose.

3. Dual Purpose Breeds:

Additionally, there chicken breed that is imported to Ethiopia from Egypt for trial purpose namely Fayomi breed. They are known for their best adaptability in the harsh, hot and arid environment of Egypt and they have been in trial in lowlands of Ethiopia by Ethiopian Agriculture Research Institute. They are breeds of dual purpose, and can be used both for egg production and meat. Since it is a short time they are introduce and still going on, there is no clear information about their performance in Ethiopia and they are only distributed in trial bases. Few years before Rhode Island Red chicken breeds; were imported in the country as dual purpose birds and distributed to the community both by government and NGOs. Currently, there is not importer that is importing this chicken breed in the country.



Figure 1.5. Dual Purpose Breeds

1.3. Identifying Requirements for poultry production

- feeders,
- waterers,
- nests,
- Lighting instruments
- waste disposal system,
- ventilation systems,
- cages,
- coops, and perches.
- install brooders or heaters,

Self – check: 1	Written test
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Name: _____ ID _____

I. Choose the best answer from the given alternative.

- _____ chicken production system is practiced in most rural areas of the country
 - Intensive
 - Free-range
 - Semi- intensive
 - Deep litter
- One is the advantage of free-range chicken production system
 - little or no labour input
 - Possible to control
 - economic use of land
 - chickens are less productive
- To keep healthy chicken in this type of system, the following points should be noted:
 - The existing litter should be removed totally when the existing stock culled
 - Before introduction of new stock, the house should be cleaned
 - Make sure that the litter should be dry at any time
 - All

II. Match

“A”

“B”

- | | |
|---|---|
| 1. deep litter system | A. major feed sources for chicken are worms |
| 2. Free-range chicken production system | B. proper accommodation |
| 3. Semi- intensive | C. major feed sources for chicken are worms |

III. Give short answer as directed

- List three poultry production system in Ethiopia
- List the two breeds of chicken and differentiate them
- List two breed chicken primarily for egg production

LG#29	LO#2- Identify and select poultry breed and breeding
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Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Identifying and characterizing poultry Breed
- Selecting appropriate poultry breed
- Identifying poultry mating

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify poultry Breed
- Select appropriate poultry breed
- Identify poultry mating

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
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Information Sheet: 1

2.1. Identifying poultry Breed

Poultry species originated from South East Asia and were domesticated from red jungle fowl. All domestic birds, such as chickens, turkeys, ducks, geese, ostriches, guinea fowls, and pigeons, are considered poultry. Because other forms of poultry are essentially unknown as sources of egg and meat, the term poultry is identical to domestic chicken (*Gallus domesticus*). Except for chickens, the others are found in their natural habitat in Ethiopia, although geese and turkeys are not. Ethiopian chickens are the most common, with chickens being owned by almost every rural family. They provide a crucial source of protein and revenue for the family. Chicken production is vital for developing countries' socioeconomic development.

I. Poultry Breeds

A. Exotic Breeds

- **Leghorn Chickens**

Color and Appearance

- Most Leghorn chickens have single combs but there are several color varieties that have rose combs. Recognized colours are white, red, black tailed red, light brown, dark brown, black, blue, buff, columbian, buff columbian, barred, exchequer and silver. *Brown Leghorn Chickens*



Origin of Leghorn Chickens

- The Leghorn breed was developed in Livorno, Italy.

Size of Leghorn Chickens

- Leghorns mature into smallish chooks, weighing from 3 lbs (1.4kg) to 4 lbs (1.8kg).

Temperament of Leghorn Chickens

- Leghorns are nervous types of chickens around humans and can fly, making them less popular as a homestead breed.

Uses of the Leghorn Chickens

- Leghorns are **fantastic egg producers**, laying around 280 white eggs a year. They are the world's top breed behind commercial egg producing lines.

- **New Hampshire Chickens**

Color and Appearance

- The mature birds are a rich chestnut red, of a lighter and more even shade than the Rhode Island Reds.

Origin of New Hampshire Chickens

- The New Hampshire originated in the state of New Hampshire in the United States.

Size of New Hampshire Chickens

- Roosters weigh in at around 8.5 lb (3.9 kg), whereas hens are lighter at 6.5 lb (2.9 kg).

Temperament of New Hampshire Chickens



Figure: 1.2. New Hampshire Chickens

- New Hampshire's are competitive and aggressive.

Uses of the New Hampshire Chickens

- While it is a fair producer of large brown eggs, the New Hampshire was developed more for **meat production** than egg production. Medium heavy in weight, it matures early and dresses a nice, plump carcass as either a broiler or a roaster. The hens are prone to go broody and make good mothers.

- **Orpington Chickens**

Color and Appearance

- The Orpington are large types of chickens with a soft appearance. It has a wide chest, broad back, and small head and tail. They originally came in black, white, buff and blue. Other varieties have also been developed including porcelain (speckled), red, mottled and birchen.



Figure 1.3. Orpington Chickens

Buff Orpington Chickens pictures

Origin of Orpington Chickens

- The original Orpington (the Black) was developed in 1886 by William Cook. He crossed many different breeds of chickens, chiefly Minorcas, Langshans and Plymouth Rocks, to create the new hybrid bird.

Size of Orpington Chickens

- The Orpington is a heavy breed, weighing from 7 lb (3.2 kg) to 10 lb (4.5 kg). Its soft, profuse feathering makes it appear even larger than it is.

Temperament of Orpington Chickens

- Docile, affectionate and easily handled types of chickens.

Uses of the Orpington

- The Orpington was breed as a **dual-purpose breed**, famous for good egg laying capacity (from 110 to 160 beige eggs/year even through winter), moderately early maturity, and good carcass qualities. Hens may go broody
- **The bovan goldline breed**

The Bovine Gold line Breed is a cross or hybrid breed and can be very friendly and with their strong immune system, they are known for their egg laying. This breed of chickens will eat right out of your hand and can lay up to **330 brown eggs** in their first year. With shades of brown and cream feathering, these chickens are hardy and are easy to handle for first time breeders. They

are naturally inquisitive and love to please which is evident from the amount of eggs they can produce, along with their pleasant nature.

- **Rhode Island Red Chickens**

Color and Appearance

- These chooks normally have hard rust colored feathers, but may be darker or almost black.



Figure: 1.4. Rhode Island Red Chickens

Origin of Rhode Island Red Chickens

- The Rhode Island Red are types of chickens originally bred using an infusion of Malay chicken bloodlines in Adamsville, Rhode Island in the USA.

Size

- Rhode Island Reds are large: roosters weigh in at around 8.5 lb (3.8 kg), the hens 6.5 lb (3 kg).

Temperament of Rhode Island Red Chickens

- They are generally good pets to keep. However the roosters, and sometimes hens, can be quite aggressive.

Uses of the Rhode Island Red

- They are a tough utility bird, **raised for meat and eggs**. Indeed they are among the best laying types of chickens. With good feeding their egg production is excellent, being from **250 to 300 large**, light brown eggs a year. They are moderately early maturing. Rhode Island Reds are also used for creating many modern hybrid types of chickens. However, their large comb makes them susceptible to frost bite.
- **Sussex Chickens**

Color and Appearance

- The most famous Sussex chooks are the Light Sussex. These are very distinctive types of chickens having a white body with a black tail and black wing tips, neck being white striped over with black. Other colors include Brown, Buff, Light, Red, Speckled, Silver, White and Coronation.



Figure: 1.5. Sussex Chickens

Origin of Sussex Chickens

- The Sussex chicken was created over a century ago in the county of Sussex, England.
- Size of Sussex Chickens**
- Cocks should weigh approx 9lbs (4.0 kg), and the hens (females) 7lbs (3.2 kg).

Temperament of Sussex Chickens

- The Sussex chicken is an alert, docile breed that can adapt to any surrounding, comfortable in **both free range and confined spaces**.

Uses of the Sussex

Sussex are dual purpose types of chickens that are good foragers, and understandably

- **Hamburg Chickens**

Color and Appearance of Hamburg Chickens

- Hamburgs come in a wide variety of colors including: Silver-Spangled, Golden-Spangled, Golden-Penciled, Silver-Penciled, White, and Black.



Figure: 1.6. Hamburg Chickens

Origin of Hamburg Chickens

- The Hamburg (or Hamburgh in Britain) was developed in Holland before 1700 and may even date back to ancient times.

Size of Hamburg Chickens

- Hamburg are small with roosters weighing around 5lb (2.25kg) and hens about 4lb (1.75 kg). There are also bantam Hamburgs, weighing around 1.5lbs.

Temperament of Hamburg Chickens

- The breed is apt to fly and tends to be nervous around people.

Uses of the Hamburg

- Hamburgs are hardy, active types of chickens that forage well, mature quickly and are very good producers of small white eggs.

- **Faverolles**

Color and Appearance

- The Faverolles is a large and cloddy breed. They are unusual types of chickens, sporting beard, muffs, feathered feet, and five toes per foot. The most common color is Salmon which is expressed differently according to sex, hens being cream and coffee colored, and males darker, with black, brown, and straw-colored feathers. Less common colors include white, black, cuckoo, splash, and blue.



Figure: 1.7. Faverolles

Origin of Faverolles

- The ancestors of the Faverolles were first developed by French farmers in the early 1800's. However, many different breeds of chickens have been used to develop it further since then.

Size of Faverolles

- Roosters are around 10 lb (4.5 kg), hens around 8.5 lb (3.8 kg).

Temperament of Faverolles

- Faverolles are friendly, docile and quiet chickens.

Uses of the Faverolles

- Originally a **dual purpose utility breed**, **Faverolles mature rapidly into a good quality meat bird**. Hens are also above average layers of medium-sized, light brown to pinkish eggs. However, today they are kept primarily for show, which has - as it does in all types of chickens - resulted in deterioration of their utility aspects.
 - **Cornish Chickens**

Color and Appearance

- Cornish chickens are chunky birds with large breasts and thighs, and close fitting feathers. Color varieties include white, white laced red, dark birds with brown patterning on a dark blue-green background (the Cornish Game) or lighter birds with the same patterning on a light wheaten background (Jubilee Cornish Game).



Figure: 1.8. Cornish Chickens

Origin of Cornish Chickens

- The Cornish originated in England and was first known as the Indian Game.

Size of Cornish Chickens

- Though they may grow heavier, the standard weight for a male is 7.5 lb (3.4 kg) and for a female is 6 lbs (2.7 kg).

Temperament of Cornish Chickens

- A loud and active breed that is not especially docile, but takes confinement well.

Uses of the Cornish Chicken

- Of all the different breeds of chickens, the **Cornish are the definitive meat bird**, consuming substantial amounts of feed and growing rapidly. Their skin is yellow. Crossed with white Plymouth Rocks, they form the basis to most commercial broiler production. They are poor layers (50/year) of brown eggs of low fertility, are winter hardy and apt to go broody.

B. Indigenous (local) Breed

The general characteristics of the indigenous chicken breeds summarized as:

- Non-descriptive breeds closely related to the Jungle fowl.
- They vary in color, comb type, body conformation
- Vary in weight and may or may not possess shank feathers.
- Broodiness (maternal instinct) is pronounced.
- Slow growth rate
- Late maturity
- Relatively resistant to disease than exotic breeds
- Low egg production,

Page 24 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

- Small sized eggs
- Low survivability of chicks
- Low feed utilization efficiency

Some of the Ethiopian indigenous chicken ecotypes are:-

- **Farta indigenous chicken breed**

- ✓ Found in the Amhara regional state in northern Ethiopia.
- ✓ They are maintained under scavenging regimens with occasional supplementation and sheltered in the family house.
- ✓ The chickens have predominantly white body plumage that occurs at similar frequency in both sexes.



Figure: 1.9. Farta indigenous chicken

- **Horro indigenous chicken breed**

- ✓ Found in Horro Guduru Wollega Zone,
- ✓ Improved local chicken breed
- ✓ Horro is good for meat and eggs
- ✓ capable of hatching 180 eggs per year
- ✓ High-production under low-input systems
- ✓ Medium sized chicken

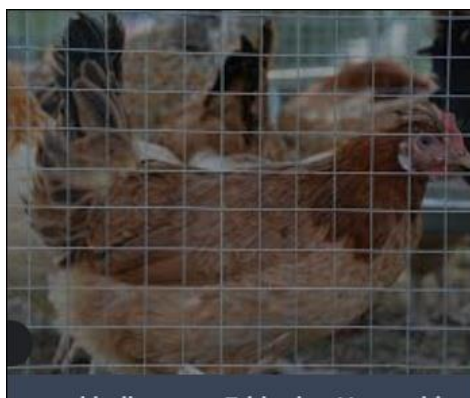


Figure: 1.10. Horro indigenous chicken

- **Sheka indigenous chicken breed**

- ✓ Egg production potential of local chicken is 30 to 60 eggs/year/hen
- ✓ They are not good layer, but good for meat production
- ✓ They are medium sized chicken
- ✓ The chickens are disease resistant and
- ✓ productive under low-input systems

- **Mandura indigenous chicken breed:**

- ✓ Found in the Benshangul Gumuz regional state in northwest Ethiopia
- ✓ They are reared by mixed communities of Amhara Gumuz and Agaw
- ✓ Complete red is typical of males' plumage but absent in females
- ✓ Brown is the most predominant plumage in the population followed by red, white and white or grayish strips on brown or reddish background



Figure: 1.11. Sheka indigenous chicken

- **Konso indigenous chicken breed**

- ✓ Found in the Southern NNRS in south Ethiopia.
- ✓ Few hens have naked necks
- ✓ Most of the cocks have different color: red body plumage, brown, zigrima and black are the prominent plumage colors in hens



Figure: 1.11. Konso indigenous chicken

2.2. Selecting appropriate poultry breed

Chickens have the unique ability to adapt to a wide range of conditions, more than most species of Livestock. Even with their adaptability, each breed is best suited for one type of environment more than another.

Criteria for selecting poultry breeds

- A. Carcass Quality and Other Uses
- B. Feather Color
- C. Temperature Tolerance
- D. Disposition
- E. When you crowd birds, like is the case in a small coop or moveable pen, aggressive tendencies result in more injuries, infections, broken eggs, and even dead chickens, so consider this before you put aggressive breeds in with overly docile ones.

- F. Considering the space you may have your birds in, disposition is key to keeping birds healthy
- G. Size Matters
- H. Egg Color and Laying Ability
- I. A good laying record

At least one season of recording which hen lays which egg, and on what day, is needed to build up an accurate laying record. Obviously, individual layers need to be identified with leg rings, and trap nests used so that records can be kept. (Trap-nests are those that allow access but not exit so frequent checking is required on humanitarian grounds, so that the hen can be released when she has laid her egg).

J. Precocity

The average age at which pullets began to lay eggs was traditionally between 18-21 weeks. In recent years, this has gradually been reduced so that hybrids start laying much earlier. The amount and intensity of artificial light also has a bearing on precocity and if too much is given the pullets can start to lay before they have finished growing. From the point of view of birds destined for free-range conditions, this is not a good idea. They need to be well grown before egg laying starts otherwise they will not be able to cope with the demands of outside conditions. A good pullet for free-range would therefore be one with a precocity of around 18 weeks.

K. Intensity

This refers to the number of eggs laid over a given period, such as a month, without skipping a day. The greater the degree of intensity, the better the hen. Again, scrupulous recording is required.

L. Persistency

This is the ability to lay over a long period of time in the first season of lay. The longer the period, the greater the persistence and the better the hen for selection purposes.

M. Lack of broodiness

Hens which are always going broody and sitting tight on the nest, wanting to hatch out a clutch of eggs, are not going to be laying as well. This is an undesirable characteristic for the egg producer, although it may be welcome by those who want a broody hen to incubate and brood some eggs.

N. Moulting

This is a natural process of losing old feathers and replacing them with new ones. All birds moult, but the time and duration are to some degree inherited. The pattern can be a useful indication as to whether a hen is a good layer or not. As a general rule, a hen that moults early is a poorer layer than one who moults later. It is not quite that simple however, for an early moulter that goes through the moult quickly, is better than one whose moult lasts a long time.

Another factor to bear in mind is that the first moult may take place in the following year after the pullets have been bought. Autumn and winter hatched birds will tend to moult between July and August, while those hatched after March will normally continue until October or November.

O. Vent and abdomen

The abdomen of a hen enlarges when she starts laying and the vent becomes more moist and rounded. A bird that is a poor layer will tend to have a smaller, more shriveled vent. The pelvic bones also gradually move further apart. This can be measured quite easily by picking up a hen and seeing how many fingers will fit in between the bones. At first, it will be two fingers wide, but as the laying period continues, it measures three or even four fingers wide. When viewed from above, a good layer will be considerably narrower at the front than the back.

The bottom of a good layer is fairly well endowed with fluffy feathers, while that of a poor layer is more skimpily clad. There is another factor here, however, and that is that some breeds have been developed to maximize 'fluffy bottoms' because it was thought to look better. This is a show characteristic rather than a utility one, so an excess of fluffy feathers will tend to indicate a poorer layer.

2.3. Identifying poultry mating

Chickens are birds, which mean that fertilization occurs inside the female's body before she lays the eggs. Many animals have a life cycle that begins with eggs, including humans. However, in the animal world, fertilization of eggs often occurs outside of the body, as is the case with fish or insects. This is not the case with most birds.

To make fertilization occur, birds have cloacas. This is a set of organs that includes their bladders, their reproductive organs, and their anuses. Essentially, there is one entrance and exit hole through which birds and chickens urinate, defecate and reproduce.

In order for chickens to mate, their cloacas have to be in direct contact with each other. In short, they have to be anal opening to anal opening.

No, chickens do not walk backward and mash their derrieres together, although that could work. Instead, after the rooster either does his strut and dance or his violent assault on a hen, he arches his back and shoves his anal opening and cloaca downward into close contact with the hens.

He rapidly shakes his behind for a few seconds to transmit the sperm to fertilize the eggs that are currently developing inside the hen's ovaries.



Figure: 1.12. Poultry mating

Roosters will mate with intense frequency to ensure that their lineage lives on. Roosters can, and will, mate multiple times an hour, sometimes with the same hen, and sometimes with any willing hen in the coop. Because only a small amount of sperm is transmitted at a time, and because most hens are only going to lay one egg at a time, this frequent mating is necessary to fertilize enough eggs to fill a nest. The success rate of a rooster depends on a couple of factors. One, the age of the rooster is important. While a very old rooster can still mate, his ability to transmit sperm may be on the decline.

Additionally, an older rooster may not be able to grab and hold on to a hen during mating long enough to do the job correctly. Older roosters are also only able to manage mating with less than a dozen hens.

The behavior of a rooster may terrify your hens such that they will do anything to get away from a savage rooster, and thus, mating may fail. Be sure to find a well-behaved rooster if you want several nests of chicks. You should also know that hens will lay eggs with or without insemination, so you will have to be careful about taking eggs out of the hen house for food if you have a rooster walking about.

Hens are essentially ready to mate when the rooster has wooed them. There is really nothing they need to do to physically prepare for the fertilization process because they are constantly producing eggs. If there wasn't a rooster around, the hens would lay eggs anyway, but the eggs would never hatch into chicks.

The eggs that are unfertilized in the absence of a rooster become your breakfast. Most hens are fertile all of their lives. It is only when a hen is much older that she may slow down or stop producing as many eggs.

Self – check: 2	Written test
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Name: _____ ID _____

I. Choose the best answer from the given alternative.

- One is not considered as poultry
 - Chickens
 - Turkeys
 - ducks,
 - Geese
 - Ostriches
 - None
- _____ chickens have single combs but there are several color varieties that have rose combs
 - Rhode Island Red Chickens
 - Leghorn Chickens
 - New Hampshire Chickens
 - Orpington Chickens
 - The bovan goldline breed
- Criteria for selecting poultry breeds
 - Carcass Quality and Other Uses
 - Feather Color
 - Temperature Tolerance
 - All

II. MACHING

A

B

- Leghorn
 - Orpington
 - Cornish
- Dual purpose
 - Fantastic egg poroucer
 - Have large Brust

III. SHORT ANSEWER

Page 32 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1 May, 2023
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1. List three exotic poultry breed
2. List three indigenous poultry breed
3. List three criteria to select best poultry breed

Operation Sheet: 2

2.1. Techniques of Egg selection

A. Materials tools and equipment

- Cleaning agents
- Egg
- Egg tray
- Candler
- PPE
- towel

B. Procedures

- Collect/ buy/ eggs
- Select hatching eggs by using egg selection criteria (size, shape, smoothness, shell thickness, etc)
- Take sample egg and break it to know whether it is fertile or not.
- Observe the broken egg and if there is spot (sperm) the egg is fertile.
- Finally, Incubate only the selected eggs

2.2. Techniques of Good Egg layer hen selection

A. Materials tools and equipment

- Hen
- Cleaning material
- PPE
- Towel

B. Procedures

- Bright prominent eye.
- Full warm, waxy, red comb.
- Flat shanks, well bleached.
- Feet free from disease.
- Late rapid molter
- Flexible pelvic bones, wide apart.
- Large abdominal capacity with soft pliable fat.
- Worn plumage from spring until molting.
- Active, alert, vigorous, healthy.

LAP TEST: 2	Performance Test
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Name..... ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2** hour. The project is expected from each student to do it.

- **Task 1: Perform Egg selection**
- **Task 2. Perform Good Egg layer hen selection**

LG#30	LO#3- Plan poultry house construction and facilities
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Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Selecting appropriate site for poultry house establishment
- Identifying and determining types of poultry house
- Identifying Requirements for poultry house construction
- Determining space requirement for different poultry classes
- Planning farm layout and chickens house
- Constricting farm design
- Identifying facilities

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Select appropriate site for poultry house establishment
- Identify and determine types of poultry house
- Identify Requirements for poultry house construction
- Determine space requirement for different poultry classes
- Plan farm layout and chickens house
- Constrict farm design
- Identify facilities

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets

6. Do the “LAP test”

Information Sheet: 3

3.1. Selecting appropriate site for poultry house establishment

- The site should not be swampy
- The soil should be water absorbent
- The site should have access to transport, water, electricity and other infrastructures
- It should be far from homesteads
- It is preferable where there is trees in the surrounding which serve as wind break and as a shade
- The site should be good for future expansion.

3.2. Identifying and determining types of poultry house

A. Chicken house importance and construction

Housing is essential to protect against predators, thieves, rough weather (rain, sun, very cold winds, dropping night temperatures) & to provide shelter for egg laying and broody hens. A suitable or comfortable chicken house is also important for efficient production and convenience of the chicken farmer.

B. Cares to be taken for chicken house

- It should be cleaned properly
- If there were other stock before, all the old stock and the different waste materials should be culled, removed, cleaned properly and left free at least for 15 days.
- The floor and wall of the house should be cleaned properly and sprayed with pesticides such as formalin.
- Before introduction of the poultry, the floor should be deep with 5-10 cm thickness litter (hay, straw, saw dust, etc).

- Feeders, drinkers and other poultry house equipments should be placed in a proper place.

C. Chicken house types

Depending on availability of materials, weather and tradition, there are different types of chicken houses and shelters in tropical regions. Choice of chicken house should be built upon a rationale involving an estimate of the costs, durability, and immediate gain of using a house for chicken. Even though there are different types of chicken house around the world, the main ones are five types. These are:

I. All side open chicken house

All the open side is closed with sieve wire to protect the chicken from theft and different predators. It is mainly common in hot areas and should be constructed far (at least 50m) from other chicken houses. The open side should be in the wind direction to remove the unwanted smell and should have guard which allow protecting the rain dropping and wind.

- **Width of Poultry House**

The width of the open-sided poultry house should be about 30 ft (9.8 m) and no more than 40 ft (12.2 m) wide. Houses that are wider will not provide ample ventilation during hot weather. Wide houses also require additional interior supports that may interfere with equipment or manure removal. This width recommendation is basic for growing birds, broilers, and laying hens.

- **The shape of the roof**

Practically all poultry houses built today have a gable roof, the pitch varying from one-quarter to one-third. A good overhang should be provided to protect the inside from driving rains and to afford interior shade.

- **Roof exhausts**

Houses should be equipped with a covered exhaust area at the peak of the roof to allow excess heat to escape. Various systems are available to close the exhaust during the colder months in order to conserve heat.

- **Insulation**

Even with the conventional poultry house, it is well to provide some type of insulation. The roof may be insulated, using special products for this purpose, or an attic, or partial attic, may be installed. Attics should be ventilated with suction cupolas, or by vents.

- **Building materials and construction.**

Open-sided and environmentally controlled houses use a variety of building materials. The choice is dependent on the structural strength required, the insulative characteristics of the material, material availability, and material cost. Galvanized steel or aluminum is most commonly used for roofing and siding. Framing is usually done with wood or steel and some houses constructed recently have used the tilt-up concrete wall method of construction. Most open-sided houses have a stud that is 8 ft (2.4 m) long. The stud represents the distance from the foundation to the roofline. In areas where the temperature is exceptionally high throughout the year, the stud length should be increased to 10 ft (3 m). High-rise houses, with manure storage areas below the cages or slats, should be as high as 14 ft (4.3 m) or more at the eaves.

- **Foundation**

A solid and adequate foundation should support the building. Concrete, concrete blocks, bricks, or other permanent and termite-proof material should be used. The evenness of the foundation is important, for it will determine the evenness of the completed structure.

- **Floor**

With certain disease-control programs, concrete or similar floor is mandatory. It is also necessary when the soil is very dense and can absorb and transfer moisture from the lower subsoil, but in certain areas, where the soil is sandy, and where commercial broilers or commercial layers, or breeders are kept, a concrete slab is not used when birds are placed on the floor. Cage houses usually have concrete walks to facilitate the movement of hand egg collection carts and mobile feed carts. The area beneath the cages may or may not be paved depending on the manure removal program and method.

- **Doors**

Doors at the end of the house should be large enough for a truck, tractor, or manure-handling equipment to pass through. Such equipment will be used when the house is cleaned.

- **Orientation**

Houses must be oriented in a direction to take advantage of prevailing airflow patterns. Orientation must also be considered relative to solar heat transfer into the building from exposed roofs or sidewalls. Pullet-rearing areas should always be located upwind from adult birds.

II. One side open chicken house

This type of chicken house construction differs from all side open house in that there is only one side open. It is preferred in areas where the daily temperature is 15-30°C. The height of the house should not be greater than 9 m.

III. Chicken house with guard

The house has guard in two sides which allow controlling the temperature and the openness of the guard should be 1-1.5 m in hot areas and 0.3-0.6 m in cold areas. The guard should be closed from the lower to the higher/top to prevent the effect of coldness on the chicken.

IV. All side closed chicken house

Page 41 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

This type of chicken house construction is important to control the effect of extreme hot and cold weather conditions on the chicken. It is suitable for areas which are very cold and very hot weather conditions. The majority of the different activities, such as control of internal temperature, in this type of chicken house are accomplished by mechanical way.

V. House with deep pit

This type of chicken house is suitable for layers reared in cage or open slated system and the waste material from the layer/chicken is collected in the deep pit for several years (5-10 years). The objective is by collecting and mixing of the waste material to minimize its wetness (to make it dry). Since there will be flies, rats and smell of the waste material in the surrounding particularly during the wet season it will create a problem on the work.

3.3. Identifying Requirements for poultry house construction

- **Preconditions before chicken house construction**

Once the site has been selected, the chicken house can be constructed in different type and quality. The house to be constructed should fulfil the following points.

- ✓ **Comfortable for the chicken:** it should provide for the chicken enough space, well ventilated, allow entrance of light and should not be wet. These make the chicken productive and free from diseases.
- ✓ **Protect the chicken from unfavourable weather conditions and predators:** It should protect the chicken from predators such as rat, wild predator birds etc; parasites; theft and from unfavourable weather conditions such as rain, wind, etc.

- **House Orientation (Direction)**

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

- **Size**

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

- **Length**

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

- **Width**

The open sided poultry houses in tropical countries should have a width not more than 22 to 25 feet in order to allow ample ventilation and aeration at the mid-portion. Sheds wider than this will not provide adequate ventilation during the hot weather. If the width of the shed is more than 25 feet, ridge ventilation at the middle line of the roof top with proper overhang is a must. Hot air and obnoxious gases which are lighter than air move upward and escape through ridge ventilation. In environmentally controlled poultry houses, the width of the house may be even 40 feet or more since the ventilation is controlled with the help of exhaust fans.

- **Height**

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

- **Foundation**

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

- **Floor**

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

- **Doors**

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

- **Side walls**

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

- **Roof**

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

- **Overhang**

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

- **Lighting**

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

3.4. Determining Space requirement of chicken

Page 44 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

Ventilation management is directly related to the stocking density of the house. In highly dense poultry houses there will be a high volume of droppings, with high ammonia production and moisture content. These conditions can only be solved by maintaining the stocking density at the recommended standard and improving the ventilation of the house. Stocking densities (maximum)

- ✓ Chickens 0-6 weeks old: 10-12 birds/m² Floor size 5m x 2m /100 birds
- ✓ Pullets to 16 weeks old: 5-7 birds/m² Floor size 2m x 2m / 25 birds
- ✓ Laying hens: 5 birds/m² Floor size 5m x 2m / 25 hens
- ✓ Hens in layer cages, floor space may be 12-15 birds/ m²
- ✓ Cage size for 3 hens: 40 cm long x 30 cm wide x 45 cm high, for 5 hens: 50 cm

The stocking density for broiler chickens is recommended to be between 12 and 15 chicks per m² Table 2 provides the standard stocking conditions in areas where the temperature is 23–260 °C.

Table 3.1: Stocking density per m²

Type of chicken	Age in weeks		
	0–8 weeks	8–18 weeks	18–72 weeks
Laying hens	14	12	7-9
Breeder flock	14	10-12	6-8
Dual purpose	14	10-12	6-9
Broiler	10		

3.5. Planning farm layout and chickens house

A small size poultry farm doesn't require any special layout as it involves construction of only one house. The medium and large size farms require special considerations for placement of building in the farm premises. The basic principles to be observed for layout are

- Layout should not allow visitors or outside vehicles near the birds.
- The sheds should be so located that the fresh air first passes through the brooder shed, followed by grower and layer sheds. This prevents the spread of diseases from layer houses to brooder house.
- There should be a minimum distance of 50-100 feet between chick and grower shed and the distance between grower and layer sheds should be of minimum 100 meter.
- The egg store room, office room and the feed store room should be located near entrance to minimize the movement of people around the poultry sheds.
- The disposal pit and sick room should be constructed only at the extreme end of the site.



Figure3.1. Layout of poultry farm

3.6. Constraining farm design

The proper poultry house is not expensive. Local prices and the kind of material used will determine the cost. It is important that the house be properly ventilated but not drafty, dry; well

insulated, to be as little affected as possible by sudden outside temperature changes; well lighted, roomy, and convenient both for the birds and for the operator. The convenient house is apt to be a sanitary house.

Since the location can materially affect the proper functioning of a house, the situation of the building should be studied before the foundation is laid. No house, however well built, will remain dry if the soil or air drainage is faulty. A house should no more be placed in a hollow, where air pockets exist, than it should be put on wet, soggy ground. The ideal soil is a light sandy or gravelly one. where the house must be placed on gumbo or heavy soil it is wise to put in tile to provide propel' drainage.

If the house be built into the south slope of a bank, drainage ditches must be made to carry surface water away from the back and sides. The ideal spot for the house is on a knoll, but protected from wind and weather.

The house should face: the south to assure maximum sunlight, a consideration which is particularly important during short winter days.

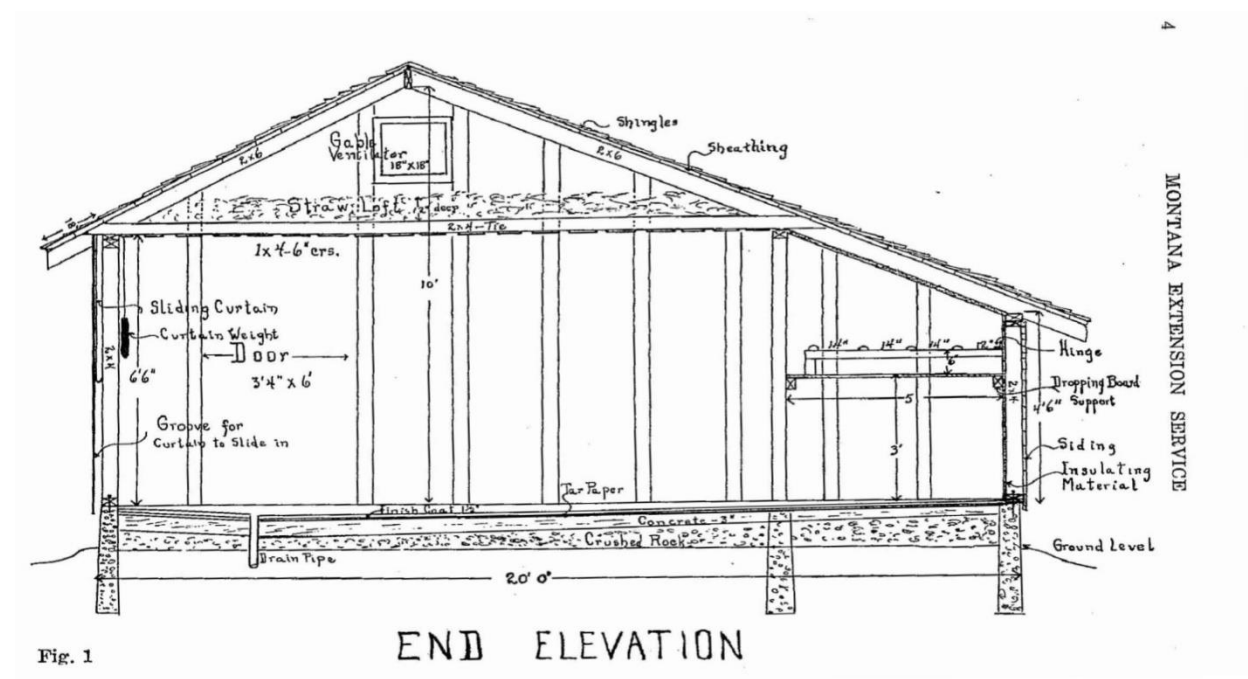


Figure 3.2. Constricting poultry farm design

Page 47 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

3.7. Identifying facilities

- Feederers
- Waterer
- Floor space
- Roosts
- Nests
- Bedding materials
- Thermometer
- Hygrometer
- Heater
- Cooler
- House orientation
- Lightening
- Ventilation
- Incubators

Self check: 3

Name: _____ ID _____

I. Choose the best answer from the given alternative.

1. Poultry house is essential for
 - A. Protect against predator
 - B. Thief C. Sun D. All
2. Types of poultry house constriction is important to control the effect of extream heat and cold weather
 - A. House with deep pit
 - B. All side closed house
 - C. One side open
 - D. Chicken house with guard
3. Stocking density per m2 for layers at Laying hens 18–72 weeks
 - A. 7-9
 - B. 9-10
 - C. 8-9
 - D. 9-11

II. Match

“A”

“B”

1. Chicken 0-6 week old A. 10-12 bird/m²
2. Pulrt 16 week B. 5bird/m²
3. Laying hen C. 5-7bird/m²

IV. Give short answer as directed

1. List two Preconditions before chicken house construction
2. List three points to select appropriate poultry house
3. List three basic principles for farm layout

LG#31	LO#4- Feed and Manage different classes of poultry
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Instruction sheet

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Identifying digestive system
- Recognizing poultry feed
- Identifying and recognizing management activities
- Formulating ration for different class of poultry
- Providing feed and water
- Determining chicken feeding system

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify digestive system of poultry
- Recognize poultry feed
- Identify and recognize poultry management activities
- Formulate ration for different class of poultry
- Provide feed and water
- Determine chicken feeding system

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet: 4

4.1. Identifying digestive system

Terminology

- **Nutrients**

Nutrients are the chemical components, which are indispensable for life. They play an essential role in the metabolism of animals.

- **Feed stuffs**

Feed stuffs are materials to be used as animal feed. Generally these are single materials (no mixture), but they can be utilised to make mixed feeds. In that case also terms like “raw materials” or “feed ingredients” are used

- **Ration**

A ration is the feed allowance of one animal for one day. A ration may consist of various different components such as roughage(s), concentrate(s), premix(es), etc.

- **Compound feed**

A compound feed is a mixture of various different feed stuffs, supplemented with minerals, vitamins, and/or other additives. The term compound feed is more or less identical to the term mixed feed. Not necessarily, but in many cases the term compound feed (or concentrate!!) is considered to be identical to 'balanced feed' and/or 'complete feed'.

- **Concentrate**

A concentrate is a feed stuff rich in (digestible) nutrients in comparison to its volume. Concentrates are feed stuffs low in fibre (e.g. CF< 18%) and high in energy.

A concentrate might be either a single feed stuff. or a mixture of various different feed stuffs. In many occasions the term 'concentrate' is used as the opposite of 'roughage'.

A concentrate may not necessarily meet the requirements of animals. The term 'concentrate' is not identical to the terms 'balanced feed', 'complete feed' and/or 'compound feed'.

- **Premix**

In general the term premix refers to a mixture of various different minerals and/or vitamins, meant to be mixed with one or more feed stuffs in order to balance the mineral- and vitamin-supply with the requirements of a particular class of animals. Many different compositions of premixes exist. The components of a premix are pre-mixed with a carrier (e.g. ground cereals, skim-milk powder, etc.). The inclusion rate of a premix normally is less than 5%.

- **Balanced feed (= complete feed)**

The term 'balanced feed' refers to a feed consisting of various different ingredients (raw materials) which are mixed in such rations (proportions) that they (all together) meet the requirements of a particular class of animals. A 'balanced feed' is a compound feed. A 'compound feed' is not necessarily a balanced feed. The term 'balanced feed' is identical to the term 'complete feed'.

4.1.1. Digestion and digestive system

Digestion: the process of breaking nutrients (proteins, carbohydrates, and fats) down into smaller compounds which can be absorbed through the gut wall.

Digestive enzymes play an important role in digestion. Enzymes are also called biocatalysts, necessary for the chemical reaction (breakdown). Digestive enzymes are produced by glands situated along the digestive tract (organs and walls of the gut).

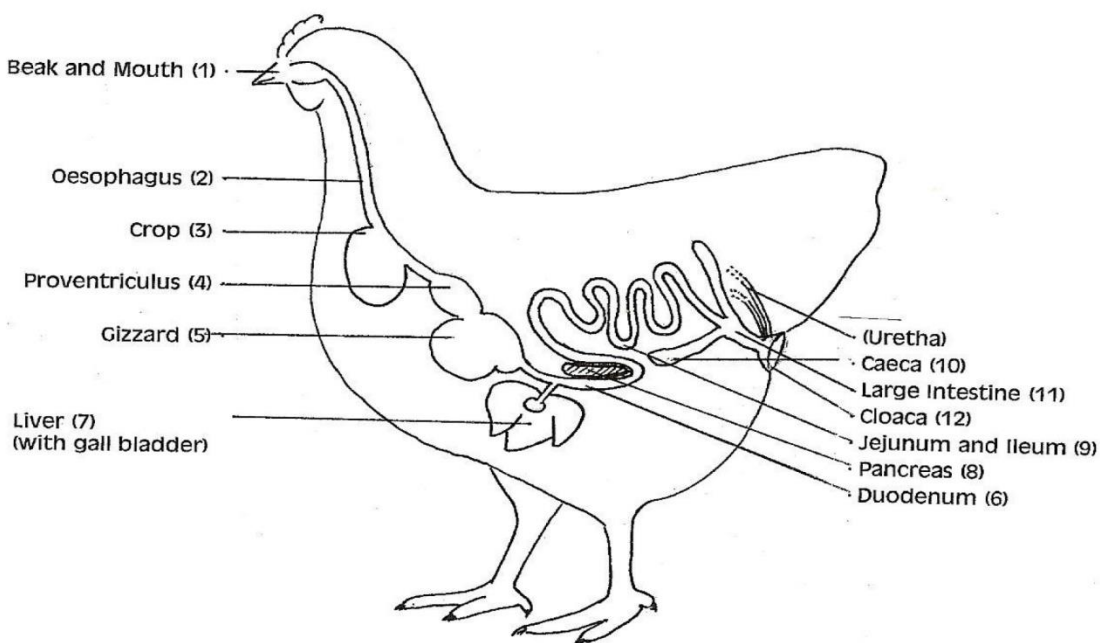


Figure 4.1: The digestive tract of the chicken

Beak and Mouth: The beak is used to pick up the feed and by mouth and tongue the feed is swallowed. A little saliva is added here.

Oesophagus: The oesophagus, or gullet, is dilatible and transports the feed from the beak to the crop and from there to the stomach. No enzymes are produced in the oesophagus.

Crop: The crop is an expanded part of the oesophagus; it stores and moistens the food. The crop wall produces mucus to wet the food. No enzymes.

Proventriculus: The proventriculus (glandular stomach) secretes gastric juice containing the enzyme ‘pepsin’, which has to be activated by HCL (Hydrochloric acid). The stomach wall also produces HCL.

Pepsin: is the enzyme that starts breaking down proteins. The acid is essential as a barrier against micro-organisms (pH as low as 2.0)

Gizzard: The gizzard is unique to birds. The gizzard wall is strong and muscular and its lining is tough, leathery and keratinised. No enzymes are produced here. The gizzard contains grit (stones, pebbles) which replaces teeth for grinding the feed. Pepsin continues to work here.

Duodenum: The first part of the small intestines. The products of two organs (liver and pancreas) are deposited in the duodenum.

Liver: The liver produces, bile, which is, stored in the “gallbladder” and flows through the bile duct into the duodenum. The bile acids emulsify the fat-fraction in the feed: i.e. fat droplets (in the gut contents) are broken down into smaller droplets. In this way the inside of a fat droplet can be reached easier by fat digesting enzyme (lipase).

The functions of bile can be listed as follows:

1. Emulsification of fats.
2. Activating peristaltic movement of the intestines.
3. Neutralising the content of the intestines (together with pancreas).
4. Giving specific colour to the faeces.

Pancreas: The pancreas produces pancreatic juice, which contains:

- Sodium bicarbonate to neutralise the acid gut contents
- Digestive enzymes:
 - ✓ Amylase and a little bit of maltase for the digestion of carbohydrates,
 - ✓ trypsin for a further breaking down of proteins,

- ✓ lipase to digest fats.

Jejunum + ileum: The jejunum and ileum (small intestines) produce intestinal juice containing the following digestive enzymes:

- Erepsin to digest proteins and break them down into their final products
- Lipase to digest fats
- Maltase and saccharase to digest carbohydrates and break them down into their final products.

The small intestine is the main site of absorption. It contains the villi (microscopic finger-like projections) which greatly increase the surface available for absorption of nutrients.

- ✓ Amino acids are the products of protein digestion.
- ✓ Glucose is the product of carbohydrate digestion.
- ✓ Glycerol and fatty acids are the products of fat digestion.

Caeca: Birds have two caeca, where bacteria and other microorganisms use crude fibre as the most important medium to live on. They produce the enzyme cellulase in order to digest cellulose. At the same time, the bacteria produce Vitamin K and B12. Water is re-absorbed in the caeca.

Colon: The colon, or large intestine, and rectum are very short. Faeces can be stored here temporarily and a little absorption of water takes place.

Cloaca: The cloaca is the cavity at the end of the digestive tract where the digestive tract meets with the urinary and genital systems.

4.2. Recognizing poultry feed

The major production cost incurred in intensive chicken production system is feed and feed related costs which account 60-70%. Therefore, there should be proper utilization of the feed since it determines the profitability and the sustainability of the farm. The type and amount of ration given should be safe for their production or growth.

Improved chicken breeds can express their potential if they are provided with balanced ration and if they are fed properly. The importance of provision of balanced ration include for maintenance, growth, production, disease prevention, to produce well and have good resistance against diseases, etc. Young chickens should be fed separately from the adult chickens. They will often have a special diet and it is best for them not to have to compete with the adults for food.

Laying hens should have easy access to calcium rich food that may be supplemented by calcium-rich sources such as crushed snail or egg shells. Do not hatch new chicks if you don't have enough feed for them. If you hatch too many chicks, they may die from starvation or malnutrition, or their resistance to diseases may be reduced.

A broody hen should be separated from the flock to prevent other hens from disturbing her. Keep the hen in a separate nest with free access to fresh water and feed within a short distance. Supplementary feed and clean water should be given at least early in the morning and again in the evening when the chicken are returning to the house for the night. The major nutrients required for chicken include the following.

1. Carbohydrate/Energy

The amount of energy in the ration is the major nutrient that determines the daily feed consumption of the chicken. The main aim of feeding is to satisfy their energy requirement. At least $\frac{3}{4}$ of the chicken diet is made of energy feeds. Energy feeds are the most important feeds to maintain body temperature, exercise levels of the chickens, for maintenance, walking, feed searching, to trap insects, to protect from predator, for growth and production, etc. Major energy source feeds include cereal grains such as maize, sorghum, rice, wheat, barley, finger millet, industrial/cereal by products such as wheat bran and wheat middling.

2. Protein

Protein is needed for growth, keeping up a good health status, for maintenance, roduction, to grow feather, etc. No more than $\frac{1}{5}$ of a diet is protein-rich feeds, as they are normally very expensive. Harmful substances are present in some protein-rich plants, e.g. beans and the

proportion in the diet should thus be kept low. The level depends on the type of plant, and whether the feed is being prepared before feeding.

Protein source feeds are obtained from both animal and plant origin. Chicken unable to produce amino acids rather they are 100 percent depends on farmers feed for protein. Plant origin protein source feeds include oil crop by products (contain high fat and protein nutrients), oil factory by products such as cakes. Animal origin protein source feeds include grounded blood, grounded meat, grounded meat and bone, fish by product such as fish meal; green legumes and grasses, etc. Examples of protein-rich locally available feeds include maggots, termite eggs, insects, worms, meat scraps, fish scraps, fish meal, meat meal, bone meal, blood meal, feather meal, peas, beans, and oil cakes from e.g. ground nuts, cotton seeds, palm kernels and coconuts.

3. Vitamins

Vitamins are important for different purposes such as for disease prevention, to produce strong & healthy chicken and to motivate different chemical changes that take place in their body. Scavenging chickens get vitamins by eating green grass, vegetables and through sunlight. Confined chickens always need additional vitamins mixed with their feeds. The major vitamin source feeds are green legumes, grass species, vitamin mixes produced by factories, etc. Sunlight and green grass or green fodder normally provide Vitamin A and D. Vitamin B may also be added by giving Riboflavin tablets. Additional vitamins may be given in very small quantities and purchased from drug stores or feed sellers.

4. Minerals

Minerals are important for bone & eggshell formation, to develop strong bone & muscle, for blood circulation and to produce good feather. The most important minerals are calcium and phosphorous. To produce strong shells for their eggs, laying hens need free access to calcium (limestone or crushed shells), and adult chicken are usually able to balance their intake according to their needs. When phosphorous rich feeds are added, it should be balanced with calcium, since too high levels of one may cause deficiency of the other.

Major mineral source feeds are salt, locally available grounded bone & crushed oyster egg shell, snail shells, bone meal, burned eggshells, limestone, sand and calcium phosphate. Using bone meal or eggshells is a good way of balancing the calcium and phosphorus levels. Eggshells should always be scorched or cooked before re-use in diets to remove any disease germs.

5. Cool and clean water

It is very important for chicken particularly small chicks always to have access to clean water as they may easily die from dehydration. Chicken requires clean water two times their daily feed consumption. Water is important for digestion, excretion, thermo-regulation, egg production, chicken and layer to keep them healthy & productive and to rear chickens properly. At any time, there should be clean water in the drinker.

4.3. Identifying and recognizing management activates

1. Housing management

Under the backyard and semi-intensive production systems, poultry are usually enclosed at night to discourage thieves and predators, and under intensive production, are totally confined day and night. Some village households keep their few chickens inside the house or even under their bed at night, to discourage theft.

A. Nest:

Given a choice of a place to lay their eggs, hens will choose a soft “litter” base, and they prefer an adequately sized (a cube of approximately 30 cm), darkened nest with some privacy.

B. Space:

Hen groups are comfortable at a stock density of three to four birds per square meter. If more space is allowed, a greater variety of behavior can be expressed. Less space creates stressed social behavior, allowing disease vulnerability and cannibalism and leaving weaker birds deprived of feed or perch space.

Table 4.1 Requirement of chickens for floor and perch space

Chicken types	Floor Space (birds/m ²)	Floor Space (ft ² /bird)	Perch Space (per bird)
Layer	3	3.6	25 cm (10 in)
Dual Purpose	4	2.7	20 cm (8 in)
Meat	4-5	2.1-2.7	15-20 cm (6-8 in)

C. Debeaking:

Cannibalism can be prevented by debeaking 1/3-1/2 of the beak of chickens. Chicks are debeaked at the age of **6-10 days** but it is possible up to the age of 18 weeks. In layers, debeaking causes stress, reduces feed intake and affects egg production. Thus, other preventative methods should be used to reduce the incidence.

Cannibalism in chicks is a habit of picking one another's feathers, toes, beaks, heads, combs, backs, vents and other parts of the body.

Cannibalism is caused by unsatisfactory diets, overcrowding, overheating and bright light.

D. Ventilation:

A building with open sides is ideal; otherwise, cross-ventilation at bird-level should be allowed in the form of floor level inlets, open in a direction to allow the prevailing wind to blow across the width of the building.

E. Lighting

A well-lit house is essential. A dark house leads to lethargic, inactive, unproductive birds. Light is important for feeding, as poultry identify food by sight. This is especially important for intensively managed day-old chicks, which need very bright 24-hour lighting for their first week of life. Light is also an important factor in sexual maturity. An increasing light proportion in the day, as naturally occurs from mid-winter to mid-summer, will accelerate sexual maturity in growing pullets, bringing them to lay sooner. If hens are already laying, the increasing light proportion will increase egg production. The opposite effect is also true: as the light proportion of the day decreases (as naturally occurs from mid-summer to mid-winter), then sexual maturity is slowed in growing stock, and egg production is reduced in laying hens. These effects are somewhat

F. Protection: shelter sheds and buildings

Many factors influence the type and choice of housing to protect poultry from the effects of weather and predators. These include the local climate, the available space, the size of the flock and the management system. In extensive systems, birds must be protected from disease and predators but also be able to forage. Traditional large animal fencing using live plants is not enough protection against predators such as snakes, kites, rats and other vermin.

A simple and effective system to deter predator birds is to tie parallel lines of string across the main scavenging area, the intervals between which measure less than the predator's wingspan; or, alternatively, a fishing net supported on poles can be spread across the side of the run where predator birds could swoop on the scavenging chicks.

2. Feeding management

i. Feed

The mechanics of feeding are nearly as important as the feed itself. Supply enough feeder space so that all the birds can eat at the same time. When space is limited, some birds don't get enough to eat. Keep feed such as corn, barley, oats, or wheat, which are relatively low in protein and high in energy or fiber depending on which grains are used. When fed in concert with prepared feeds, they dilute nutrient levels in the carefully formulated diets.

ii. Water

Water is the single most important nutrient that chickens consume. Therefore, it is necessary to provide adequate amounts of clean, fresh water daily during growth and egg production. Chickens will drink between two and three times as much water by weight as they eat in feed. Their consumption of water increases in warm weather.

3. Health Management:

Health is the condition in which all the organ systems and body structures are working in full harmony. Disease is deviation from normal health.

Disease is always a big risk to poultry man.

Stress. Stress can arise from any of number of internal and external factors.

Internal factors: includes

- Heredity: some birds have natural, hereditary protection against certain disease
- Age: some disease occurs at certain age e.g. coccidiosis occur at young age
- Immunity: some birds have more immunity to more disease

External factors:

- Stocking density of birds: overcrowding leads to social problems
- Feed: properly fed birds are more resistant to disease than poorly fed ones.
- Water: provision of insufficient or impure water affects productivity of birds
- Climate: a sudden change in temperature, humidity, air composition makes chicks susceptible to disease
- Light changes: sudden change in length of exposure to light affects metabolism and can make birds more susceptible to disease.

A. Culling

Culling is used to immediately remove unproductive hens and sick chickens from the population during the production period. This in Small-scale chicken production increases the production efficiency because you do not waste feed on unhealthy or unproductive chickens. You can already start culling during the growing period. Several weeks before the hens start laying you can make a rough selection, removing those chickens which are too light, pale, or underdeveloped.

4. Manure management

Whatever the type of confinement, proper attention must be paid to manure management. Adult birds produce 500 g of fresh manure (70 percent moisture content) per year per kg of body weight. To preserve its fertilizer value, manure should be dried to about 10 to 12 percent moisture content before storage. This will retain the maximum nitrogen content for fertilizer value. Nitrogen in the form of urea is the most volatile component of manure, and is lost as ammonia if moisture content is too high in the stored material. If the moisture content is too

high, then the stored manure releases ammonia, carbon dioxide, hydrogen sulphide and methane, which can have serious physiological effects on humans. Some of these components are also greenhouse gases, which contribute to the global increase in ambient temperature. Poultry manure is very useful as an organic fertilizer, as animal and fish feed and as a raw material for methane gas generation in biogas plants for cooking fuel.

Formulating ration for different class of poultry

Ration formulation: is a process by which different feed ingredients are combined in a proportion necessary to provide the animal with proper amount of nutrients needed at a particular stage of production

Factors to be considered when formulating ration are:-

- Nutrient requirement of poultry
- Nutrient composition of feeds
- Age of the animal
- Poultry classes
- Cost of feed currently
- Availability
- Breeds

Information required in formulating poultry ration

- **Nutrient requirement table:** the nutritional requirements of chickens vary according to their utility and age. Scientific feeding of poultry is based on the research recommendations of national research council or agricultural research council, developed and used in USA and UK respectively
- **Feed composition table:** a mixture of different ingredients has to be supplied in order to fulfill the nutrient requirement of poultry. The successful rations are made up of a combination of cereal grains, protein, mineral and vitamin supplements. The existing information about the composition and nutritive proportions of feed stuffs permits one to

choose the ingredients of diet on the basis of their ability to serve as source of one or more specific nutrients

Ration formulation methods

- Person square
- Algebraic method
- Try and error method
- Computer method

Formulating poultry diets using the Pearson square

One can formulate chicken rations by using the Pearson square method (psm) or the simple algebraic method for small scale production. This technique is used to formulate ration for one nutrient only (metabolisable energy or protein) If it is desired to achieve asset percentage of nutrient in a final mix using two ingredients only the PSM can be used.

E.g. "Formulate a 14% CP diet using corn (8.8% CP) and a Protein supplement (38% CP), and check the results."

<i>Pearson square:</i>			
Corn	8.8% CP	$\begin{array}{c} \diagup \\ 14\% \\ \diagdown \end{array}$	24.0 parts corn
Supplement	38% CP		5.2 parts supplement
			<hr/> 29.2 total parts
24.0 parts corn		$\times 100 =$	82.19% corn
29.2 total parts			
5.2 parts supplement		$\times 100 =$	17.81% supplement
29.2 total parts			

82.19 lb corn	$\times 8.8\% \text{ CP}$	= 7.23 lb CP
17.81 lb supplement	$\times 38.0\% \text{ CP}$	= 6.77 lb CP
100.00 lb diet		14.00 lb CP

Eg. 2 PSM can be used to formulate poultry rations using more than two ingredients provided that the various food stuffs are put into two groups and an average is produced for each group

Calculation of a diet for a layer, regarding protein

Feedstuff	Content of crude protein (%)
Maize	8
Sorghum	10
Soy bean meal	44
Fish meal	65

Suppose maize is cheaper and more plentiful than sorghum, and soybean meal is cheaper than fish meal. Including all 4 ingredients makes the feed more reliable, as the ingredients complement each other. 5 – 8 ingredients in a mixed feed may be optimal. In our example, you can make a cereal mix with two parts of maize (8% crude protein) and one part of sorghum (10% crude protein) from one group, to be combined with a protein-rich mix of 3 parts of soy bean meal (44% crude protein) and one part of fish meal (65% crude protein):

Cereals - weighted mean:

* Maize 2 x 8% = 16%

* Sorghum 1 x 10% = 10%

Weighted mean for the cereals $26\% / 3 = 8.7\%$ protein

Protein feeds - weighted mean:

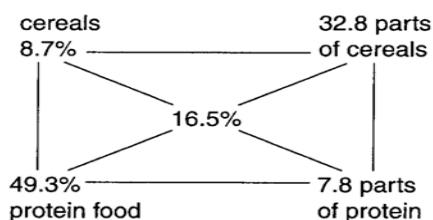
* soy bean meal 3 x 44% = 132%

* fish meal 1 x 65% = 65%

Weighted mean for protein feed

$197\% / 4 = 49.3\%$ protein

The weighted means of the cereals and the protein feeds must be put on the left-hand side of the Pearson square, in order to find which combination of the two will result in the required 16.5% of protein.



The protein level required in the complete diet is placed in the middle of the square and the percentage of protein content in each food on the two left-hand corners of the square. To work out the proportion of each foodstuff that is required, subtract the small number from the larger one diagonally across the square, as shown below. The resulting figures on the right-hand side of the square indicate the proportion of each mixture needed to achieve a diet containing 16.5% protein. In this case, this requires a ratio of 32.8 parts of the cereal mix to 7.8 parts of the protein feeds (3 soybean meal : 1 fishmeal). Expressed in percentages of the total mixture, the diet will be made up as follows:

$$32.8/32.8+7.8 \times 100\% = 81\% \text{ cereals}$$

$$7.8/32.8 + 7.8 \times 100 = 19\% \text{ protein mix}$$

The cereals feed consists of sorghum and maize in the ratio 1 : 2

$$81\% / 3 = 27\% \text{ of sorghum (1/3), and } 54\% \text{ of maize (2/3)}$$

For the protein mix, the same procedure is used to divide the 19 % in the ratio 1: 3

$19\% / 4 = 5\% \text{ of fish meal (1/4), and } 14\% \text{ of soybean meal (3/4). With this combination of the 4 feed ingredients,}$

i. Types of poultry ration

Chickens differ markedly in their growth rate, egg production and feed conversion efficiency. Broilers are fast growing and are efficient in converting feed in to meat they need both high energy and high protein feeds. Layers are slow growing and are efficient in converting feed in to eggs rather than meat. They need low energy and protein. Fast growth and early maturity is not desired in layers adlibitum feeding of layer chicks and pullets for early maturity resulted in lower egg production, decreased in size of eggs, prolapsed vent and more mortality. So feeding layer

chicks and pullets should be aimed at maintaining a normal and sustainable growth up to the point of lay

- **Broiler feeds (rations)**

There are three different types of rations in broiler feeding

- **Broiler starter ration:**

Is a ration that is fed to chicks aged 0-21 days or up to 4 weeks. it is high in protein 22% cp. It is comparatively lower in energy= 3100 kclME/kg of ration but it should not be < 2800kclME/kg of the diet.

- **Broiler grower ration:** more or less similar to the starter ration

- **Finisher ration:**

Is fed to chickens starting from 25or 41 days of age depending on the feeding programme .it is high in energy(3200KCLME/kg) but low in cp(19-20%) compared to starter and grower ration

- **Layer feeds (ration):** there are three types of rations for egg producing type of chickens

- **Layer starter ration:**

Is fed to layer chicks up to 8 wks of age .it contains 20% cp and 2800KclME/kg. an individual chick requires 1.5-2.5 kg feed from the age of 0-8 wks (25-42)gm/day. It contains higher protein and energy than grower and layer ratios

- **Layer grower ration:**

Is fed to pullets 9-20 wks. it contains 18% cp and 2700KclME/kg. restricted feeding should be practiced either by decreasing the quantity of the feed or or skipping feeding for a day. bird requires 6-10kg during the growing period or 60-100gm daily

- **Layer ration:**

Is fed to egg laying chickens. Laying chickens should be fed adlibitum of layer ration. Restricted feeding affects production and initiates moulting. It contains 16% cp, 2700kclME/kg of feed and 3% ca just before the point of lay, ca content of the feed should be increased to 6% because pullets start to deposit ca in their bones.

- **Starter, grower and layer diets**

If the production is based on improved breeds for egg production, different types of commercial diets may be given. The diet of chicken is divided into three distinct categories with

decreasing amount of protein as starter/chick, grower and layer diet. The ration formulated for chicks should contain more protein nutrient until age of 8 weeks (0-8 weeks). The ration can be produced or obtained from chicken multiplication centers, private feed producers and in the locality. It should contain enough amount of the nutrient protein since it affects the growth and reproductive performance of the starter. The ration formulation for the different categories of chicken is presented below (Table 4.2).

Table 4.2. Ration formulation for starter, grower and layer

Ingredient	Starter (%)	Grower (%)	Layer (%)
Maize	45.9	52.9	50.4
Wheat bran	7.5	7.5	7.5
Dried and grounded trifolium	2	2	2
Grounded bone and meat	4	4	4
Noug seed cake	37	30	30
Limestone	1	1	4.5
Grounded bone	2	2	1
Salt	0.35	0.35	0.35
Vitamin & mineral mix	0.25	0.25	0.25
Chicken ration formulated by feed win software using different ingredients			
Noug seed cake	10	10	10
Maize	45	60	55
Wheat bran	10	10	10
brewery dried grain	3	5	5
Soya bean meal	12	3	8
Salt	0.5	0.5	0.5
Alfalfa	3	0.5	1
Limestone	1.5	2	3.5
Sesame cake	15	9	7

4.4. Providing feed and water

A. Feeders

Feeders are the same, whether being used in free-range, semi intensive systems or intensive systems. They should always be kept clean to prevent spread of diseases and big enough for all chickens of the same age to feed at the same time. One metre trough or a 35 cm (diameter) tube feeder is big enough for 20 adult chickens to eat. It is important that the feeders are constructed in such a way that feed waste is avoided. Also feed waste can be decreased if feeders are not filled to the top.

Characteristics of good feeders:

- Avoid wastage of feed, prevent contamination of feed
- Easy to clean, durable & strong and easy to fill and cheap

Table 4.3 Feed and feeder space requirements for 100 chickens

Age (weeks)	Daily feed consumption (kg)	Suggested feeder depth (cm)	Feeder (m)
1 – 4	1.4 - 5.0	5	2.5
4 – 6	3.2 - 7.3	8	3.8
6 – 9	5.0 - 9.5	9	6.1
10 – 14	7.3 - 15.9	12.5	9.6
15 and above	9.1 - 11.4	15	12.7

B. Drinker

Drinkers are the same, whether being used in free-range, semi intensive systems or intensive systems. They should always be kept clean to prevent spread of diseases, big enough for all birds of the same age to drink at the same time and easily be produced out of local materials. One metre trough or a 35 cm (diameter) tube drinker is big enough for 40 chickens to drink.

Table 4.4. Minimum water and watering space requirements for 100 birds in hot dry conditions

Age (weeks)	Daily consumption (litres)	Water space (m)
0 – 1	3	0.7

2 – 4	10	1.0
4 – 9	20	1.5
9 or more	25	2.0
Layer	50	2.5

Characteristics of good quality drinkers:

- Can give enough, clean and fresh water
- Strong, durable and stable
- Easy to clean and fill
- No splashes of water and cheap

4.5. Determining chicken feeding system

Today, after their ingredients have been mixed, most poultry feeds undergo some form of processing, which involves a wide range of thermal treatments including extrusion, expansion, conditioning and pelleting. Most of the feed used in the production of meat chickens is fed in pelleted or crumbled form, which enhances the economics of production by improving feed efficiency and growth performance. These improvements are attributed to decreased feed wastage, higher nutrient density, reduced selective feeding, decreased time and energy spent on eating, destruction of pathogenic organisms, and thermal modification of starch and protein. Introduction of pellet feeds is a notable feature in countries seeking to improve the production efficiency of the poultry sector.

The objective of feed processing is to:

- alter physical form
- prevent spoilage
- isolate specific parts
- improve palatability
- detoxify poisons



Figure 4.2: Processed feed forms (Mash, Crumble and Pellets)

A. Grain feed processing

Grain processing mainly improves digestibility and efficiency of utilisation the hull or waxy seed coat is broken which provides a better access of the digestive juices. A physical disruption of the starch granules and a partial gelatinisation provides a maximal utilisation of the starch. The particle-size is an important factor in density, passage through machinery and through the digestive tract; besides that, particle size influences the palatability.

Grain processing methods:

- I. Dry method: grinding, dry rolling (cracking), roasting/toasting, etc
- II. Wet method: soaking, pelleting with steam, etc

Heating

- to dry
- it allows storage without refrigeration
- preservatives
- ensiling
- to sterilize : it kills micro-organisms
- to alter : it changes chemistry of proteins or carbohydrates
- to detoxify: it destroys plant toxins

B. Mash feed production

Objectives of grinding/milling

The main objective of milling is to improve the digestibility of the grain for human or animal consumption. A typical grain (Figure 2) is surrounded by a hard coat or husk, which protects the germ and the endosperm, the energy-rich starchy centre of the grain. The layer between the husk and the endosperm is called bran. The awn is the spiked part at the end of the grain.

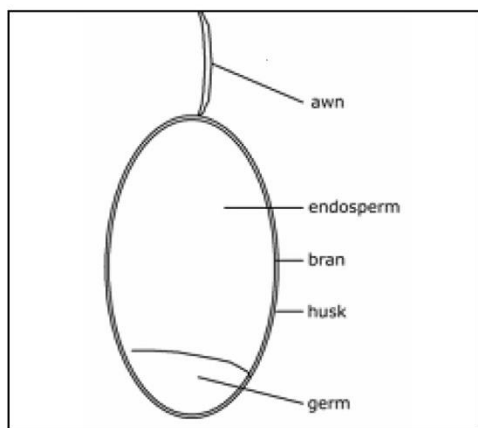


Figure 4.3: Structure of cereal grain

The main purpose of milling animal feed is to prevent the grain passing straight through the animal without being fully digested. There is little to be gained from producing very fine flour from a digestive point of view. Very dusty animal feed can also cause respiratory problems when fed dry.

Grinding reduces the in particle size which:

- provides a more homogeneous mixture
- gives more surface area for chemicals and digestive juice, which improves the digestibility.
- However, especially the vitamins in presence of trace minerals or of unsaturated fatty acids are easier destroyed by oxidation after grinding.
- The most simple and most common process.

- The equipment allows some control of particle size (hammer mill sieves).
- Grinding improves the digestibility especially of hard small seeds like sorghum.
- Finely ground meals may be dusty and less palatable.
- A mixture of finely and coarsely ground ingredients may segregate in transport or storage systems; birds prefer coarse above dust, so the intake of nutrients at the beginning compared with the end of a feed chain might be different.

C. Pellet feed production

Pelleting

- Ground feed is pressed through a thick die.
- Pelleting will increase the density of the diet. Each pellet is a balanced ration on its own.
- The pellet holds its shape better when being steamed or moistened before pelleting.
- Variation can be made in diameter, length and hardness.
- Animals in general prefer the physical nature of pellets.
- When floor feeding is practised pellets cause less wastage of feed and are not blown away.

Advantages pelleted feed product:

- easier consumption (more intake)
- less selective intake (poultry)
- kills germs of diseases (Salmonella)
- less wastage
- better growth, feed conversion
- masks flavour of unpalatable ingredients
- inactivation of heat-labile toxins

Disadvantages

- It is costly process

Regrinding

Page 72 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

- ✓ Breaking the pellets into smaller particles: crumbs.
- ✓ Especially poultry eat more easily ground pellets than mash.
- ✓ Crumbs have the same advantages and disadvantages as pellets.
- ✓ Compared with pellets a reduction of bulk.
- ✓ Compared with mash crumbs flow easier through the feeding equipment.

Self check: 4	Written test
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Name: _____ ID _____

I. Choose the best answer from the given alternative.

1. is the feed allowance of one animal for one day
 - A. Nutrients
 - B. Ration
 - C. Compound feed
 - D. Concentrate
2. a mixture of various different minerals and/or vitamins, meant to be mixed with one or more feed stuffs in order to balance the mineral- and vitamin-supply
 - A. Ration
 - B. Premix
 - C. Concentrate
 - D. Compound feed
3. _____ breaking nutrients (proteins, carbohydrates, and fats) down into smaller compounds
 - A. Absorption
 - B. Digestion
 - C. Assimilation
 - D. Excretion

5. MACHING

A

- A. Amino acids
- B. Glucose

B

1. Carbohydrate digestion
2. Protein digestion.

C. Glycerol

3. Fat digestion.

D. SHORT ANSWER

1. List three function of bile
2. List the six class of nutrient
3. List four factors to be considered when we formulate ration

Operation Sheet: 4

4.1. Techniques of debeaking

A. Materials, tools and equipment

- PPE
- Debeaker (scissor or electric debeaker)
- Chicken
- Waste handling materials

B. Procedures

- Assemble all the required materials such as debeaker.
- Clean and disinfect debeaker.
- Handle the chicken properly (Handling is best achieved by two person)
- Cut the beaks of older birds separately; always cut the upper beak first.
- Cut 1/3 to 1/2 of the upper beak first.
- Cut the lower beak to the same length or make it (slightly) longer.
- Prevent stress as much as possible.
- Clean and sanitize the materials used during debeaking.

4.2. Formulate poultry ration by pirson squer methiod

A. Materials and equipment

- PPE

- 100 Kg Maize contains 9% CP
- 100 Kg Concentrate 30% CP
- Obtain 100 Kg mixed ration contains 16% CP by using the above two ingredients

B. Procedures

- Draw square
- Put the ingredient at the left corner
- Put the required at the middle
- Subtract diagonal
- Put the result in front of

LAP TEST-2	Performance Test
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Name..... ID.....

Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour. The project is expected from each student to do it.

Task 4.1: Perform debeaking

Task 4.2: perform ration formulation by pearson square

LG#32	LO#5- Prevent and control common poultry diseases
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Instruction sheet	
<p>This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none"> • Identifying common poultry disease • Determining farm bio-security • Determining Routine vaccination program <p>This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Identify common poultry disease • Determine farm bio-security • Determine Routine vaccination program 	
Learning Instructions:	
<ol style="list-style-type: none"> 1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 	

6. Do the “LAP test”

Information Sheet: 5

5.1. Identifying common poultry disease

- **What is disease?**

It is any abnormality which disturbs daily movement/activity of an animal by injuring either internal or external part of the body. If an animal's normal activity/movement is disturbed or decreased by injuring all of either the internal or the external part of the body that animal is called diseased/sick animal. Particularly when chicken disease occurs in one area once, it can transmit fast and disturb the production process through death of many chicken which intern cause high economical loss as well as the farm to be closed.

- **Identification of healthy and unhealthy chicken**

It is very important for the farmer to learn how to detect an unhealthy or sick bird. So he can initiate the right action. You will find the main characteristics of healthy and unhealthy birds. Healthy birds may be able to fight against the diseases themselves whereas unhealthy birds will have difficulties in fighting diseases. It is important to isolate unhealthy or sick birds from the healthy flock in order to ensure a minimum of loss. Characteristics of healthy and unhealthy chicken are mentioned as follows.

Healthy chicken

Page 77 of 99	Ministry of Labor and Skills Author/Copyright	Animal production Level -III	Version -1
			May, 2023

- Externally they are clean and alert
- Have normal position head and neck
- Well to move and walk freely
- Have strong leg and normal voice
- Have bright eyes and comb
- Eat and drink normally
- Lay eggs normally and have smooth and neat feathers
- Soft and compact droppings
- Breathe quietly

Unhealthy chicken

- Heavy head and close their eyes
- Tired and lifeless
- dull eyes and comb
- Sit or lie down
- Eat and drink less
- Lay less or stop laying eggs
- Ruffled and loose feathers
- Wet droppings with blood or worms
- Diarrhoea, cough, sneeze and breathe noisily, drooping wings
- Body parts mainly around anus there is waste material
- Unable to move and abnormal voice

1. Major chicken diseases

According to the disease causing agent and based on the attacking ability of the disease, chicken diseases are classified as acute and chronic disease.

A. Acute disease

The majority of the disease causing agent enter to the body of the animal and multiply immediately. After this time the disease start fast and ends within short period of time. The diseased animal can die or survive.

B. Chronic disease

Small number of disease causing agent enter to the body of the animal. Through progress they multiply and make the animal injured for a long period of time and finally it can cause death of the animal.

On the other hand, based on the nature of causative agents chicken diseases are classified as follows.

I. Viral infections

A. Newcastle disease

Newcastle disease is a viral disease that can spread rapidly through a flock. It is the first disease which is suspected during any disease outbreak in Ethiopia. Several different strains of virus exist and are circulating in Ethiopia, ranging from mild strains to ones which can cause 100% mortality in an unprotected flock. Symptoms: the mild form of the virus generally causes respiratory symptoms (nasal discharge, coughing), and low mortality; but the severe one generally causes high mortality, with respiratory and nervous system problems including twisting of the head.



Figure 5.1. Twisting of head due to Newcastle disease.

Diagnosis: Mainly by serology (hemagglutination inhibition or HAI test).

Transmission: Infected birds shed virus in the feces, which is probably the main mode of transmission between birds in a scavenging environment. Virus can also be transmitted directly between birds through the air and in discharge from the nostrils, if birds are in close contact, such as in an intensive farm. The disease can also be transmitted from wild birds, chicken carcasses, and materials, such as feed, water, footwear, clothing, equipment and litter.

Prevention/control: prevention of Newcastle disease is best achieved through a vaccination program that is tailored for the local conditions and disease status. Vaccination is the only cost effective means of disease prevention in all production systems but its application in most developing countries is very limited (see vaccination section). Vaccination, coupled with good hygiene and husbandry practice, is the best way to prevent and stop the spread of Newcastle disease.

In the case of an outbreak of Newcastle disease, increased biosecurity measures should be implemented rapidly to stop spread to neighbouring farms. Sick chickens should be culled, and carcasses burnt or buried deep enough so that scavenging animals, such as dogs, cannot dig them up. Healthy birds should be isolated and closely monitored for signs of disease. Selling

apparently healthy birds from a flock where Newcastle disease is present is one of the major routes of spread of disease into other areas, as birds may carry the virus for 3–5 days before showing any signs of sickness.

Therefore, selling live birds should be avoided. Chicken houses should be cleaned with disinfectant, as should any tools and equipment, and bedding should be burned. It is advisable to wait for around six weeks before bringing any new chickens onto the farm.

B. Infectious bursal disease (IBD) or Gumboro

Cause: IBD is an immunosuppressive disease caused by a Birna virus 1. Virus strains can be divided in classical and variant strains. The virus is very stable and is difficult to eradicate from an infected farm. The disease is considered endemic in most part of Ethiopia.

Transmission: IBD virus is very infectious and spreads easily from bird to bird via droppings. Infected clothing and equipment may also act as a mean of transmission within and between farms.

Clinical signs: IBD infection may result in a chronic or acute form of disease. In both cases the infection targets the Bursa of Fabricius leading to the loss of B lymphocytes which are the cells that produce antibody. The main effect of IBD is that birds become immunosuppressed and susceptible to many other infections as they produce little antibody and of course will respond poorly to vaccination. Infection in young birds of less than three weeks old typically leads to chronic infection. Acute IBD occurs in birds around 3–6 weeks of age and causes both immunosuppressive and a disseminated infection with damage throughout the body. Affected birds are listless and depressed, become pale and often huddle together. Usually, entry of IBD to a previously unaffected farm may result in a mortality rate of about 5 to 10% (but it may be as high as 60% depending on the pathogenicity of the strain involved). In subsequent infections on the same farm, mortality is lower and eventually, with successive attacks, there is no mortality noted.

Diagnosis: both serology (ELISA) and molecular methods can diagnose infection in a flock. Treatment and control: No treatment is available for IBD. Vaccination of parent breeders and/or

young chicks is the best means of control and is widely applied on most commercial farms in Ethiopia. The induction of a high maternal immunity in the progeny of vaccinated breeders, together with the vaccination of the offspring is the most effective approach to successful IBD control. Application of control in village production systems is not currently practical in Ethiopia.

C. Marek's disease

Marek's disease is caused by a herpesvirus that can lead to a range of pathologies. Classical Marek's disease affects the nervous system leading to paralysis typically leading to birds with a 'hurdle jumper' appearance. Infection may also lead to eye infection. Classical Marek's is most likely to be seen in low intensity production environments. In commercial production, the neoplastic or tumor-forming disease is more prevalent. This is caused by more virulent variants that have evaded older vaccines. Infection leads to transformation of lymphocytes in the blood causing them to become cancerous. This leads to lymphoma or cancer of the blood system which is usually fatal. Marek's disease virus may also persist or become latent within the chicken where it can persist for life or re-emerge to cause lymphoma. The virulent form of Marek's disease virus is easily transmitted in feather dust in commercial production leading to spread throughout flocks.



Figuer 5.2. The paralysis in Marek's disease is caused by lesions of the affected nerves

Symptoms: Gray eyes and blindness, lameness, paralysis, unthriftiness.

Transmission: The Marek's disease virus can spread via feather dander, dust, feces and saliva. Herpesviruses are robust and can persist for several months in poultry houses. Infected birds carry virus in blood for life and remain a source of infection for other birds. In intensive commercial production, the virus is easily spread by feather dander and dust as birds are kept in close proximity to each other in enclosed housing.

Diagnosis: Both the paralytic and lymphoma-forms of the disease can normally be diagnosed based on their clinical signs. Serology (ELISA) and molecular methods, such as PCR, can be used to detect carrier birds.

Prevention/Control: There is no treatment for Marek's disease. Preventive strategies include vaccination at hatchery. Affected birds should be culled to prevent transmission to other birds. A range of mainly live attenuated vaccines are usually delivered via spray in commercial hatcheries. In the USA DNA-based and live vaccines for Marek's disease virus are delivered to the developing embryo in ovo. Vaccination is important for commercial production but is of less value in village systems.

D. Fowl pox

Fowl pox is slowly spreading viral disease affecting chickens. It is endemic in poultry in Ethiopia. The disease is mainly observed in commercial farms and among exotic chickens kept under a scavenging system.

Symptoms: Fowl pox causes raised scab-like lesions on un-feathered areas (head, mouth, legs, vent), reduced production and, in the case of the wet form of the disease, high mortality rates high due to lesions in the mouth and windpipe. These lesions in the mouth and windpipe cause impaired feed intake, increase susceptibility to secondary bacterial infections and, ultimately, death.

Transmission: Air-borne transmission of the Fowl pox virus can occur via dust or dander. The air-borne virus can enter the blood stream through the eye, skin wounds or the respiratory tract. Another possible route of transmission is via the bite of insects (including mosquitoes and other biting insects).

Prevention/Control: There is no treatment for Fowl pox. Preventive and control strategies include reducing the local insect population, reducing skin trauma from fighting, and vaccination in endemic areas. Supportive care and appropriate antibiotic therapy may provide protection from secondary bacterial complications.

E. Avian influenza

Avian influenza (AI) is a Type A influenza virus. Influenza is an Orthomyxovirus with an RNA genome that allows it to change, or evolve, rapidly. Influenza viruses can be carried by many birds but particularly waterfowl such as ducks.

AI can be found as a High Pathogenicity (HPAI) or Low Pathogenicity (LPAI) variant. AI can be transmitted to humans (zoonotic infection).

Symptoms: AI presents as a similar disease to Newcastle disease. Birds may have respiratory distress, diarrhea, swollen head, torcolitis and, in HPAI variants, high mortality.

Transmission: The infection is transmitted via feces and other secretions (such as respiratory secretions) between birds in a flock. Transmission into flocks can be from introduction of infected chickens, or from wild birds or other animals such as rodents.

Diagnosis: Serology. PCR or by growing the virus in embryonated eggs.

Prevention/Control: There is no treatment for AI and vaccination is extremely difficult due its variability. Affected birds should be culled and incinerated or buried along with any bedding or litter. Prevention of contact between wild birds and chickens reduces the likelihood of transmission into a flock. New birds brought into a flock should be held in quarantine to prevent potential introduction of AI.

II. Bacterial diseases

1. Infectious Coryza

Coryza is caused by the bacterium *Hemophilus paragallinarum*. It is a common problem in some parts of Ethiopia.

Symptoms: Signs of coryza include swelling of the head and wattles, nasal discharge, rattles, egg production drop and diarrhea.

Transmission: Coryza is transmitted from bird to bird through direct contact, and via contaminated feed and water. Birds which have recovered from the disease remain carriers.

Prevention/Control: Careful attention to sanitation and biosecurity is the only option for prevention and control in Ethiopia. Measures such as avoiding mixing of flocks and the use of an appropriate antibiotic may be helpful. However, birds tend to relapse once medication is withdrawn. Vaccines are not available.

2. *Escherichia coli*

Escherichia coli (*E. coli*) is a bacterium that can act as a cause of both primary and secondary bacterial disease. It is a common inhabitant of intestinal tract of birds and mammals, but some variants can cause disease in largely healthy birds whereas others can lead to secondary, or opportunistic, infections following a viral infection. The disease is not specific to a particular body system and may affect a range of organs and systems. The disease mainly occurs among immunocompromized birds, such as those with an underlying viral infection, and young chicks, but it can also affect other age groups and chickens with good health status.

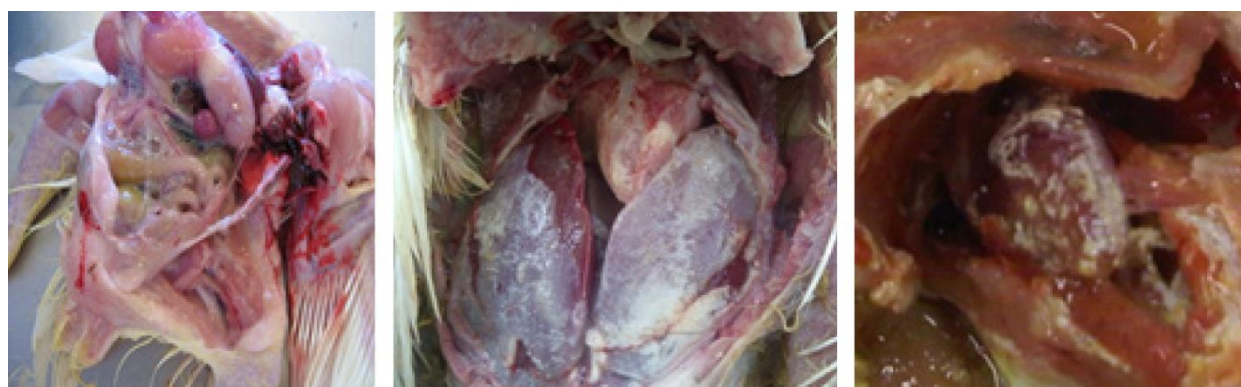


Figure 5.3. : Air sacculitis (A), perihepatitis (B) and pericarditis (C) caused by *E. coli*

Symptoms: *E. coli* infection can result in non-specific signs including ‘sick bird syndrome’, mortality, diarrhea, respiratory signs and lameness. In young birds, it may cause a systemic infection throughout the body (colibacillosis), or it may specifically target the air sacs (air sacculitis) or the heart and liver with fibrinous lesions. It may also infect the reproductive tract of mature hens leading to ‘egg peritonitis’.

Transmission: *E. coli* is an environmental pathogen spread by contaminated air, water, feed, and litter and from bird-to bird via feces.

Prevention/control: Prevention and control requires attention to strict sanitation in the hatchery and on the farm.

This requires thorough and proper implementation of bio-security and hygienic measures.

3. Avian salmonellosis

Cause: Avian Salmonellosis is caused by the Gram negative bacterium *Salmonella enterica*. Salmonellosis in the chicken takes two main forms. The first are two severe systemic or typhoidal diseases; Pullorum disease caused by *Salmonella Pullorum* and fowl typhoid caused by *Salmonella Gallinarum* which can result in high mortality in birds of all ages. The second form is infection by variants such as *Salmonella Typhimurium* or *Enteritidis*. These can cause severe disease in chicks, but can persist without disease in older birds. This latter type of *Salmonella*

can cause disease in humans and can be transmitted from chickens to people by feces or poorly cooked meat and eggs.

Transmission: Pullorum can be transmitted vertically by infected (carrier) breeder hens through their eggs. Chicks that hatch from such infected eggs will have typical pullorum disease (white diarrhoea) and high mortality. Infected chicks can also infect other chicks via droppings.

Fowl typhoid is typically a disease of adult chickens, with high mortality and morbidity. It is transmitted horizontally through infected droppings, dead bird carcasses and infected clothing, shoes, utensils and other fomites used on the farm.

Clinical signs: In chicks, Pullorum causes a typical white diarrhoea and high mortality. Infected (carrier) adult breeders do not show clinical signs of the disease but may have internal lesions in the ovary (misshaped, dark coloured follicles).

In adult chickens, fowl typhoid causes listlessness and sulfur (yellow) coloured diarrhoea. Affected birds have generalized infection with swollen livers, spleens and kidneys, with haemorrhages in these tissues. Mortality is usually 25–60%.

Treatment and control: Treatment of pullorum disease is supportive only and will not lead to cure. Treatment is undesirable from a standpoint of eradication. It is far more practical to control the disease by elimination of infected carrier breeder hens.

The best control method for fowl typhoid is eradication of infected birds. Breeder flocks should be blood tested and typhoid carriers eliminated. Such ‘test and cull’ approaches have been successful in largely eliminating the disease in North America and western Europe.

Vaccination for Salmonella is largely practiced in developed poultry industries to reduce the risk of foodborne zoonotic infection. However, vaccination may be employed for fowl typhoid (with cross protection for Pullorum disease). The live attenuated 9R vaccine was developed 60 years ago but is still effective and has previously been used in Ethiopia.

4. Mycoplasma

Cause: Four species of Mycoplasma may cause disease in chickens but Mycoplasma synoviae (MS) and Mycoplasma gallisepticum (MG) are the most important.

Symptoms: Avian mycoplasmosis may result in a range of symptoms though most frequently present as respiratory disease. MG infection typically leads to chronic respiratory disease whereas MS lead to a more acute disease. Both can lead to co-infection with E. coli which, in turn, leads to airsacculitis and a range of signs as previously described. MS can lead to infection and inflammation of joints in the legs and wings which can lead to a creamy exudate within the joints and extending into tendons. In some cases, ‘breast blisters’ can be formed on the breast/stern bone area of the chicken.

Transmission: Vertical transmission (via the egg) from MS-infected breeder hens is the major mode of transmission of MS. Horizontal transmission from bird to bird and by infected equipment, clothing, shoes, egg boxes and other fomites occurs with both MS and MG. Both can also be transmitted via dust in commercial production.

Diagnosis: Serological tests including agglutination or ELISA, or via molecular detection via PCR. Prevention/control: Mycoplasma infections can be treated with antibiotics with variable degrees of success (for example: tetracycline, erythromycin, tylosin, tiamulin) but prevention and eradication of MS and MG following testing is more effective.

5. Fowl cholera

Cause: Fowl cholera is caused by the non-motile Gram negative bacterium Pasteurella multocida.

Transmission: Transmission of fowl cholera is mainly from bird to bird by water or feed contamination. Vermin (rats and mice) also appear to play a role in contamination of water and feed with P. multocida.

Clinical signs: Acute fowl cholera is a rapid septicaemic disease of high morbidity and mortality. Birds will frequently show inflammation of the spleen and liver accompanied by

lesions and, at latter stages, diffuse hyperaemia, haemorrhage and inflammation. The acute disease can easily be mistaken for fowl typhoid.

In chronic forms of *P. multocida* infection the affected birds are frequently depressed and have decreased appetite. Chronic fowl cholera does not cause high mortality, although there will be an increase in deaths. A swollen face including the comb and wattle is a common feature of chronic fowl cholera.

Diagnosis: Both bacterial culture and PCR can detect *P. multocida* but further typing is needed as only avian-specific variants cause Fowl cholera, whilst strains associated with sheep and cattle rarely cause disease in avian species and vice versa.

Treatment and control: Treatment with appropriate antibiotics can be successful in halting mortality and restoring egg production but chronic carrier birds may remain in flocks of chickens after treatment meaning disease often reappears when treatment stops. As such antimicrobial therapy is often ineffective. As with *Salmonella*, removal of carrier birds from flocks and prevention of bird-to-bird spread is essential. Rodent control is also very important to prevent reintroduction of the infection. Vaccines, including killed bacterial vaccines or bacteria, are often effective as part of control strategies.

5.2. Determining farm bio-security

Developing and practicing daily biosecurity procedures as best management practices on poultry production will reduce the possibility of introducing infectious diseases. Disease outbreaks (from pathogenic bacteria and viruses) in poultry can spread and significantly affect poultry growing enterprises. The risk of disease developing is influenced by many factors, including the management of litter, feed, and water; disinfection of poultry house; disposal of used litter and dead birds; and the effectiveness of biosecurity measures adopted for people and equipment.

Bio security measures are very crucial in the poultry production like wearing of protective clothes (Tuta and Boot), gloves and use the footpath in front of the entrance like formalin and braking. Standards for bio-security measures are in progress. There must be an awareness program to farmers' level to update bio-security needs. A clean poultry production system will

make hygienic food chain and contribute towards improved production. Bio-security will not only maintains a good environment but also minimize in-fectious and zoonotic diseases and subsequently enhance public health.

5.3.Determining Routine vaccination program

A vaccination program for a given area should be tailored to local conditions including the type of production, vaccine availability, vaccine cost, the burden of disease, the presence of other infections that may interfere with vaccination, and the resources available to deliver the vaccine itself. There are three vaccination strategies that may be appropriate in different situations.

2. A routine vaccination program which may take place in areas where the disease is endemic. The aim should be to reduce the effects of the disease (including mortality) and may also contribute to eradication campaigns.
3. An emergency vaccination program is an option during introduction of an infection in previously unaffected area. This may be used to reduce the impact of the disease in that area and help prevent spread to other areas.
4. A preventive vaccination program may be applied wherever a high risk of introduction and further spread of a contagious poultry disease has been identified. Prophylactic vaccination should be applied while the risk of infection exists.

Even if vaccination is an effective means of disease prevention method, its failure may happen due to a range of different factors. These factors relate both to the vaccine itself and with other related components of the vaccine and the vaccination program. These factors may be inter-related; for example, a vaccine of moderate-to-poor immunogenicity (the ability to produce and immune response) may give satisfactory results if very carefully applied, while it may have little or no effect if poorly applied. Vaccination is said to be good if the immune response to the vaccine is protective and stable for the targeted period of time. This may be affected by the vaccine itself, the way it is stored (including the cold chain), the duration of storage, the efficacy of administration and the health of the recipient birds.

Vaccination of chickens can fail to result in protective immunity if the vaccine is not administered correctly. Routes of vaccination affect the outcome of the vaccines. For example,

sometimes when mass vaccination strategies using drinking water or feed are implemented, some birds may remain unvaccinated if they fail to consume adequate water/food, and these unvaccinated individuals may cause of vaccination failure in the flock. Therefore, it is important to consider uniformity of the flock before starting a mass vaccination program. Live vaccines, which allow some lateral spread of the immunizing virus among birds, reduce the necessity for uniformity at time of application. The diluents used for live virus vaccines are very important to ensure that an adequate vaccine dose reaches the birds.

The previous exposure status of the bird to a pathogen, and passive protection, may affect the response to vaccination. Passive immunity results from passage of maternal immunity to chicks and this can influence the response to vaccination. If the breeder flock has high levels of circulating antibodies which pass to the progeny through the egg, this may interfere with the replication of live vaccines. This will decrease the immune response to the vaccine because it is not stimulating the immune system for the necessary duration or extent. Therefore, to induce higher protection levels it is necessary to accurately follow vaccination program designed for each particular area.

A vaccine may appear to fail to fully protect against a disease if the birds were infected prior to, or soon after, vaccination; however, this is considered to only be an apparent (rather than true) vaccine failure. Stress of any sort is well known to reduce disease resistance and can also be expected to affect response to vaccination.

Table: 5.1. Vaccination schedule

Type of vaccine	Age of bird	Route of administration
Marek's vaccine	Day 1	Subcutaneous
Newcastle disease HB1 vaccine	Day 3	Eye drop
Gumboro vaccine	Day 7 and 21	Eye drop/water
LaSota Newcastle disease vaccine	At day 27, 63, 112 and every 3 month	Eye drop/water
Fowl typhoid vaccine	At 6 and 12 weeks of age	Subcutaneous
Fowl pox vaccine	From day 70-90	Wing web

Source: DZARC, vaccination schedule

Improper vaccine administration is the most common cause of vaccine failure. Prior to application of the vaccine, the details of the whole process must be well planned. This includes ensuring that the vaccination team is correctly trained in handling and applying the vaccine. Relying on replication of a live vaccine in chickens and then horizontal transmission of the vaccine from bird to bird is not a good practice as it cannot guarantee vaccination of every bird and may also lead to the differential onset of immunity within a flock which may still lead to transmission during disease challenge. It is also a good idea to monitor vaccine efficacy in a few random birds within a flock to ensure the vaccine is working and is being administered properly.

Self check: 5	Written test
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Name: _____ ID _____

I. Choose the best answer from the given alternative.

- One is different from the other
 - Newcastle disease
 - Infectious bursal disease (IBD) or Gumboro
 - Avian salmonellosis
 - Avian influenza
- _____ is caused by a herpesvirus that can lead to a range of pathologies
 - Newcastle disease
 - Avian salmonellosis
 - Marek's disease
 - Fowl pox
- _____ is caused by the non-motile Gram negative bacterium *Pasteurella multocida*.
 - Avian salmonellosis
 - Fowl pox
 - Fowl cholera
 - Newcastle disease

III. MACHING

A

B

- | | |
|------------------------------------|----------------------|
| 1. Management practices on poultry | A. Marek's disease |
| 2. Viral disease | B. Bio security |
| 3. Bacterial disease | C. Infectious coryza |

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