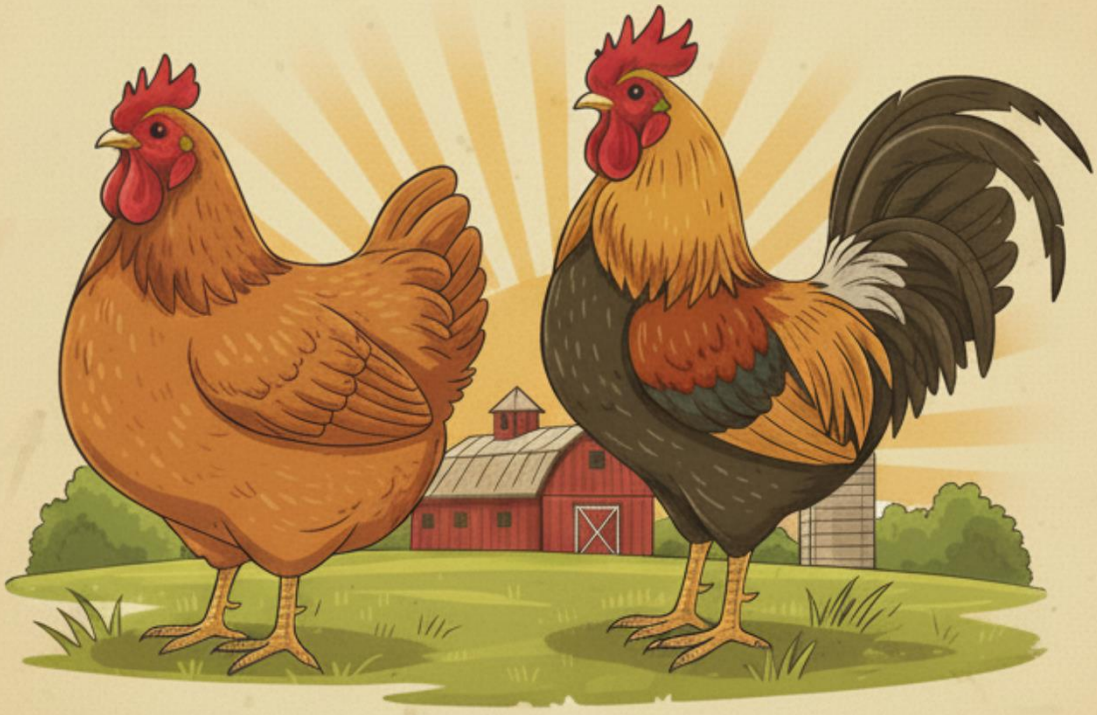
ISBN: 978-81-991070-6-9

AS PER NEP-2020 (2.0) SYLLABUS OF SHIVAJI UNIVERSITY, KOLHAPUR

# Practical Handbook of

# POULTRY FARMING



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Bhumi Publishing, India
First Edition: 2025

# PRACTICAL HANDBOOK OF POULTRY FARMING

## (B. Sc. II Sem III)

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**(IMPLEMENTED FROM JUNE 2025)**


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**Published by:**

Bhumi Publishing

**BHUMI PUBLISHING**

**Nigave Khalasa, Tal – Karveer, Dist – Kolhapur, Maharashtra, INDIA 416 207**

**E-mail: bhumipublishing@gmail.com**

## *PREFACE*

*It gives us immense pleasure to present this book entitled "Poultry Farming" for B.Sc. Part – II, Semester – III, Skill Enhancement Course (SEC), designed meticulously in alignment with the New Education Policy (NEP) 2020. This book strictly adheres to the revised syllabus implemented by Shivaji University, Kolhapur, effective from June 2025. The content has been developed to provide a comprehensive understanding of poultry farming with an emphasis on skill development, entrepreneurship, and practical applicability.*

*In recent years, poultry farming has emerged as a vital segment of the agricultural economy, offering immense potential for self-employment, rural development, and nutritional security. Recognizing its importance, NEP 2020 encourages skill-based education to bridge the gap between academic learning and industry needs. This course is structured to empower students with fundamental knowledge and practical skills in poultry management, breeding, housing, feeding, disease control, and marketing.*

*This book is designed to serve as a student-friendly, practical guide, featuring well-organized chapters, diagrams, case studies, and recent developments in the poultry sector. Each chapter provides clear learning objectives, simplified explanations, and self-assessment exercises to enhance comprehension and retention. Special emphasis is placed on sustainable practices and modern technologies that align with current industry standards.*

*We are confident that this book will not only fulfill the academic requirements of the syllabus but also ignite an entrepreneurial spirit among students. By focusing on both theoretical concepts and hands-on applications, it prepares learners to pursue careers or start their own ventures in poultry farming.*

*We extend our sincere thanks to Shivaji University and all contributors who supported the development of this textbook. Constructive suggestions for future improvement are warmly welcomed.*

**- Authors**

**B. Sc. PART – II SEMESTER – III (NEP 2.0)**

**SKILL ENHANCEMENT COURSE (SEC): POULTRY FARMING**

I. Morphology of Poultry Birds

II. Poultry Breeds

- a. Indian
- b. Exotic

III. Types of Poultry Breeds

- a. Layers
- b. Broiler
- c. Dual Purpose Breeds

IV. Poultry Housing Systems

- a. Extensive/Open Yard System
- b. Semi-Intensive System
- c. Intensive System
  1. Deep Litter System
  2. Cage System
  3. Slat System

V. Feeding and Nutrition

- a. Nutritional requirements
- b. Feeding ingredients for poultry birds

VI. Poultry Breed Management

- a. Management of Hatchery and Chicks - Chick care and management
- b. Management of Layer Birds -Housing, feeding and care
- c. Management of Broiler Birds - Housing, feeding and care

VII. Poultry Farming Equipment

- a. Types of Poultry Feeder and Waterer
- b. Other essential poultry Equipment

VIII. Health Care in Poultry

- a. Common Diseases
- b. Vaccination
- c. Cleaning and Disinfection

IX. Study of the followings

- a. Nutritional Value of Poultry Meat and Eggs
- b. By products of Poultry Farming
- c. Economic Importance of Poultry Farming

Field visit and submission of report

**Introduction:**

Poultry farming is a vital branch of animal husbandry that involves the rearing of domesticated birds such as chickens, ducks, turkeys, and quails for meat, eggs, and other by-products. Among these, chickens dominate the global poultry industry due to their rapid growth, high productivity, and adaptability to various farming systems.

This agricultural practice plays a crucial role in enhancing food security, generating employment, and contributing to the rural economy. Poultry products—especially eggs and chicken meat—are rich sources of protein, vitamins, and essential minerals, making them indispensable in the human diet. Their affordability and nutritional value have led to a steady rise in global demand. Modern poultry farming has evolved significantly from traditional backyard setups to highly organized commercial enterprises. These systems incorporate scientific methods in breeding, feeding, housing, and disease management. Broiler farming focuses on meat production, while layer farming specializes in egg production. Intensive systems use climate-controlled housing, automated feeding, and vaccination programs to maximize yield and ensure bird welfare.

Economically, poultry farming offers quick returns on investment due to the short production cycle and relatively low input costs. It provides livelihood opportunities for small-scale farmers, entrepreneurs, and large agribusinesses alike. In countries like India, the poultry sector has witnessed exponential growth, with government support and private investment driving innovation and expansion.

Environmentally, poultry farming has a smaller carbon footprint compared to other livestock industries. Poultry manure is also a valuable organic fertilizer, contributing to sustainable agriculture. Despite its benefits, the industry faces challenges such as disease outbreaks, fluctuating feed prices, and ethical concerns around animal welfare. Addressing these issues through sustainable practices, biosecurity measures, and technological advancements is essential for long-term growth. Poultry farming is a dynamic and essential component of agriculture that supports nutrition, economic development, and rural livelihoods. With continued innovation and responsible management, it holds immense potential to meet the growing global demand for protein-rich food.

**India's Poultry Industry: At Glance**

| | |
|---|---|
| Annual Turnover | ₹30,000 crores (~US$7.5 billion) |
| Global Egg Production Rank | 3rd (after China & USA) |
| Broiler Production Rank | 19th globally |
| Per Capita Egg Consumption | ~42 eggs/year (recommended: 180) |
| Per Capita Meat Consumption | ~1.6 kg/year (recommended: 10.8 kg) |

**Practical Approach to Poultry Farming**

A successful poultry farming venture requires a blend of scientific knowledge, local adaptability and hands-on management. Here's a step-by-step guide to help you get started:

**1. Choosing the Right Model**

- **Backyard Poultry**: Ideal for rural households and cottage industry setups. Requires minimal investment and space.
- **Semi-Commercial**: Suitable for small entrepreneurs with 500–2000 birds.
- **Commercial Farming**: Large-scale operations with automated systems and thousands of birds.

**2. Selecting the Breed**

- **Broilers**: Fast-growing birds for meat production.
- **Layers**: High egg-yielding breeds.
- **Dual-purpose or Indigenous Breeds**: Hardy, disease-resistant, and preferred in rural markets (e.g., Vanaraja, Giriraja).

**3. Housing and Infrastructure**

- Ensure proper ventilation, lighting, and protection from predators.
- Maintain dry litter and clean water supply.
- Use locally available materials to reduce costs.

**4. Feeding and Nutrition**

- Provide balanced feed with proteins, vitamins, and minerals.
- Use agricultural by-products like maize, broken rice, and oil cakes.
- Supplement with greens and kitchen waste in backyard setups.

**5. Health and Biosecurity**

- Vaccinate against common diseases (e.g., Ranikhet, Marek's).
- Maintain hygiene and isolate sick birds.
- Regular deworming and veterinary check-ups.

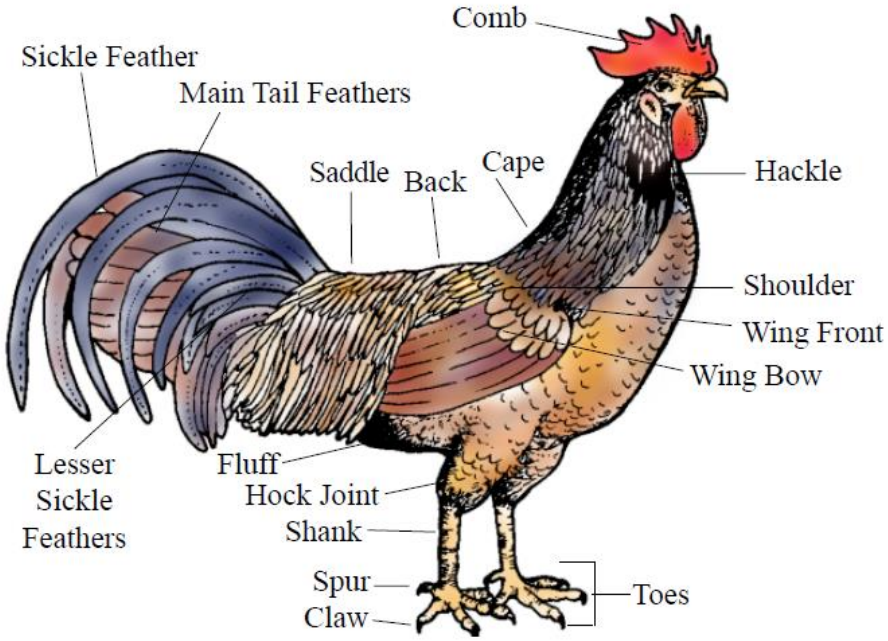
**6. Marketing and Income**

- Sell eggs, meat, and manure locally or through cooperatives.
- Explore niche markets for organic or native poultry products.
- Use social media or local fairs to promote products.

**7. Training and Support**

- Attend government or NGO-led training programs.
- Connect with Krishi Vigyan Kendras (KVKs) or NABARD schemes.
- Join poultry farmer groups for shared learning and bulk purchasing.

## I. Morphology of Poultry Birds




**External Morphology:**

1. **Size and Body Shape:** Generally medium-sized with a rounded body. While wild junglefowl can fly, the flight muscles of chickens and other domesticated poultry breeds have become heavier, allowing them to fly only for short distances.
2. **Head:** Small in proportion to the body, adorned with a fleshy comb (or cockscomb) and wattles (flaps of skin under the beak). Comb and wattle size and shape vary by breed and are more prominent in males. Some breeds have beard-like feathering below the face.
3. **Beak:** Short and used for foraging and pecking. Beak coloration varies between breeds, and can be influenced by diet and genetics.
4. **Ears:** Lack external earlobes like humans but have openings covered by feathers. Ear lobe color is breed-dependent and can be red or white.
5. **Eyes:** Large in proportion to the head, positioned on the sides of the head, providing a wide field of vision, but limited eye movement. They have a third eyelid, or nictitating membrane, for cleaning and protection.
6. **Feathers:** The outer covering provides insulation, waterproofing, protection, and plays a role in mate attraction and camouflage. There are various types of feathers, including contour feathers for body shape, down feathers for insulation, and specialized feathers like hackles and sickles, particularly noticeable in roosters. Plumage color and patterns vary widely between breeds.

7. **Legs and Feet:** Featherless legs in most breeds, ending in feet with four toes, typically three pointing forward and one backward, used for scratching and walking. Some breeds have feathered shanks and toes.

**Some prominent body parts and their functions:**

| Body Part | Structure | Function |
|---|---|---|
| Comb | Fleshy, red, on top of head | Thermoregulation, sexual dimorphism |
| Beak | Hard, pointed | Pecking, feeding |
| Wattles | Fleshy, under the beak | Cooling, secondary sexual character |
| Feathers | Varies by region | Protection, insulation, flight |
| Wings | Small, limited flight in broilers | Balance, mobility |
| Shanks and Toes | Scaly, with claws | Locomotion, scratching soil |
| Tail Feathers | Prominent in males | Balance, mating display |

**Difference Between Male and Female Morphology in Poultry Birds**

| Morphological Feature | Male (Rooster/Cock) | Female (Hen) |
|---|---|---|
| **Body Size** | Larger, heavier, more muscular | Smaller and lighter |
| **Comb** | Larger, more prominent and brightly colored | Smaller, less prominent |
| **Wattles** | Long, thick, and well-developed | Shorter and thinner |
| **Tail Feathers** | Long, curved sickle feathers in the tail | Short, rounded tail feathers |
| **Hackle Feathers** | Long, pointed, and shiny (neck area) | Shorter and rounded |
| **Saddle Feathers** | Long, pointed feathers on the lower back | Absent or very short |
| **Spurs** | Prominent bony spurs on shanks (legs) | Usually absent or very small |
| **Voice/Crow** | Loud crowing sound | Soft clucking or no crowing |
| **Behavior** | More aggressive and dominant behavior | Docile and nurturing behavior |
| **Feather Coloration** | Often more vibrant and colorful (breed-dependent) | Duller coloration for camouflage (especially in nests) |
| **Cloacal Region** | Narrow, elongated | Broader for egg-laying |

## II. Poultry Breeds

Poultry breeds refer to the various types of domesticated birds raised for meat, eggs, or ornamental purposes. These include chickens, ducks, turkeys, and geese, with chickens being the most common. Poultry breeds are classified based on their utility—layers for egg production, broilers for meat, and dual-purpose breeds for both. Each breed varies in size, temperament, growth rate, and adaptability to environmental conditions. Popular breeds include the White Leghorn, Rhode Island Red, and Cornish Cross. Selecting the right breed is crucial for efficient poultry farming, depending on the farmer's goals, climate, and available resources. Breed selection impacts productivity and profitability.

Poultry breeds are broadly classified into indigenous and exotic types, each with distinct characteristics and purposes. Indigenous breeds are native to specific regions and are well-adapted to local climates and conditions. They are hardy, disease-resistant, and play a vital role in rural livelihoods—examples include Aseel, Kadaknath, and Ghagus. On the other hand, exotic breeds are imported from other countries and are often selectively bred for high productivity. These include popular commercial layers and broilers like White Leghorn, Rhode Island Red, and Cornish Cross. Understanding these types helps farmers choose breeds suited to their goals, whether for eggs, meat, or dual-purpose use.

**Indian/ Indigenous Poultry Breeds:**

| Breed Name | Region of Origin | Key Traits |
|---|---|---|
| **Aseel** | Andhra Pradesh, Punjab | Muscular build, excellent meat, aggressive |
| **Kadaknath** | Madhya Pradesh | Black meat, high protein, medicinal value |
| **Vanaraja** | Developed by ICAR | Dual-purpose, hardy, disease-resistant |
| **Gramapriya** | Developed by ICAR | Good egg layer, backyard farming friendly |
| **Kuroiler** | Commercial hybrid | Fast growth, high egg and meat yield |
| **Giriraja** | Karnataka | Large size, dual-purpose, adaptable |
| **Nicobari** | Andaman & Nicobar Islands | Small size, good egg production |
| **Ankaleshwar** | Gujarat | Flavorful meat, local adaptability |
| **Tellicherry** | Kerala | Hardy, good for free-range systems |

**Indigenous Poultry Breeds of India**

**1. Aseel**

- **Origin**: Aseel is native to Andhra Pradesh, Tamil Nadu, and Punjab, and is one of the oldest game bird breeds in India.
- **Appearance**: It has bold eyes, a compact and muscular body, tight feathering, strong legs, and a distinctive pea comb.
- **Traits**: Known for its upright posture, aggressive temperament, and powerful build, making it easily recognizable.
- **Weight**: Adult males typically weigh between 5 to 8 kg, while females range from 3 to 4 kg.
- **Use**: Traditionally bred for cockfighting due to its strength and stamina, but also valued for its high-quality meat.
- **Eggs**: Aseel hens are poor layers, producing around 40 eggs per year, but they are excellent natural brooders.
- **Meat**: The meat is lean, firm, and flavorful, making it highly preferred in traditional Indian cuisine.
- **Hardiness**: This breed is extremely hardy, showing strong resistance to common poultry diseases and adapting well to harsh climates.
- **Behavior**: Roosters are highly territorial and aggressive; even hens may show combative behavior, including toward their own chicks.
- **Special Characters**: Aseel birds are known for their loyalty to humans and their ability to defend themselves against predators like snakes.

**2. Kadaknath**

- **Origin**: Native to Jhabua and Dhar districts of Madhya Pradesh; traditionally reared by tribal communities like Bhils and Bhilalas.
- **Appearance**: Entire body is black—including feathers, skin, beak, legs, comb, and even internal organs—due to high melanin content.
- **Traits**: Dual-purpose breed with jet black, golden, and penciled varieties; known for adaptability and resilience.

- **Weight**: Adult birds weigh around 1.4–1.5 kg at 40 weeks.
- **Use**: Raised for both meat and eggs; meat is highly valued for its medicinal properties and low fat content.
- **Eggs**: Lays about 100–120 brown eggs per year; eggs are also believed to have therapeutic benefits.
- **Meat**: Black meat is rich in amino acids and iron, low in fat, and used in traditional medicine for treating asthma, headaches, and postnatal issues.
- **Hardiness**: Thrives in semi-arid climates; resistant to many common poultry diseases.
- **Behavior**: Generally calm and hardy; suitable for backyard and free-range systems.
- **Special Characters**: Kadaknath has received a Geographical Indication (GI) tag and is considered one of the most valuable poultry breeds in India.

**3. Vanaraja**

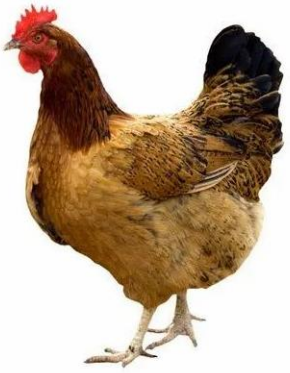
- **Origin**: Developed by the ICAR-Directorate of Poultry Research, Hyderabad, for rural backyard farming.
- **Appearance**: Large, multi-colored birds with attractive plumage and strong legs; resembles native desi fowl.
- **Traits**: Dual-purpose breed with rapid growth, high immunity, and ability to thrive on low-nutrition diets.
- **Weight**: Birds reach 1.2–1.5 kg by 10–14 weeks; adult males can exceed 3 kg under good management.
- **Use**: Suitable for both meat and egg production; ideal for backyard and semi-intensive systems.
- **Eggs**: Lays 150–200 brown eggs per year; production improves under free-range conditions.
- **Meat**: Lean, tasty, and preferred by rural consumers; good market demand.
- **Hardiness**: Performs well in harsh rural environments; resistant to common poultry diseases.

- **Behavior**: Calm and adaptable; forages well in open conditions and integrates easily into mixed farming.
- **Special Characters**: Low-cost maintenance, high return; designed to empower small and marginal farmers.

**4. Gramapriya**

- **Origin**: Developed by the ICAR-Directorate of Poultry Research, Hyderabad, for backyard poultry farming.
- **Appearance**: Available in white and multi-colored varieties; slim body, alert eyes, and active posture.
- **Traits**: Hardy, fast-growing, and excellent for egg production; adapts well to free-range conditions.
- **Weight**: Adult males weigh around 2–2.5 kg; females range from 1.5–2 kg.
- **Use**: Primarily an egg-laying breed; also suitable for meat in rural households.
- **Eggs**: Lays 200–250 brown eggs per year; starts laying at around 175 days of age.
- **Meat**: Tender and flavorful; especially preferred for dishes like tandoori chicken.
- **Hardiness**: Performs well in varied climates; resistant to common poultry diseases.
- **Behavior**: Active, alert, and docile; integrates well into backyard systems.
- **Special Characters**: Low feed cost, high immunity, and excellent performance under minimal care.

**5. Giriraja**



- **Origin**: Developed by the Karnataka Veterinary, Animal and Fisheries Sciences University, Bangalore, for backyard poultry farming.
- **Appearance**: Large-bodied birds with multi-colored plumage, strong legs, and a robust frame; visually similar to desi fowl.
- **Traits**: Dual-purpose breed with high egg and meat yield; hardy and adaptable to rural conditions.
- **Weight**: Adult males weigh around 3–4 kg; females range from 2.5–3 kg.

- **Use**: Suitable for both egg and meat production; ideal for small-scale and backyard farming.
- **Eggs**: Lays about 130–150 brown eggs per year, each weighing around 52–55 grams with good hatchability (80–85%).
- **Meat**: Tasty and nutritious; preferred in traditional dishes like curry and tandoori chicken.
- **Hardiness**: Resistant to many common poultry diseases; thrives in free-range systems with minimal care.
- **Behavior**: Calm and good scavengers; forage well in open fields and integrate easily into mixed farming.
- **Special Characters**: Known as "King of the Mountain"; supports rural livelihoods with low input and high return.

**6. Nicobari**

- **Origin**: Endemic to the Nicobar Islands; traditionally reared by Nicobarese tribes in backyard systems.
- **Appearance**: Compact body with short legs, small comb, and glossy black or brown plumage; adapted for tropical climates.
- **Traits**: Hardy, active, and excellent for free-range conditions; known for high egg production among indigenous breeds.
- **Weight**: Adult birds weigh around 1.5–2 kg; moderate growth rate under low-input systems.
- **Use**: Primarily raised for eggs; also consumed locally for meat in tribal communities.
- **Eggs**: Lays up to 160–180 eggs per year; eggs are medium-sized and white or tinted.
- **Meat**: Tender and flavorful; consumed locally but not widely commercialized.
- **Hardiness**: Highly resistant to tropical diseases and environmental stress; thrives in humid coastal conditions.
- **Behavior**: Active and alert; good scavengers; well-suited for backyard and free-range systems.
- **Special Characters**: Considered endangered due to limited population

**7. Ankaleshwar**

- **Origin**: Native to Gujarat, especially Bharuch and Narmada districts; named after the Ankleshwar region.
- **Appearance**: Small to medium-sized birds with striped or spotted plumage—yellow with black stripes or white with black streaks; single or rose comb; yellow skin and shanks.
- **Traits**: Dual-purpose breed known for both egg and meat production; hardy and well-suited for backyard systems.
- **Weight**: Adult males average 1.8 kg; females around 1.58 kg.
- **Use**: A vital source of income for tribal communities; raised for food—eggs and meat.
- **Eggs**: Lays approximately 79–140 eggs per year depending on diet and management; light brown shell; average egg weight ~35 g.
- **Meat**: Locally consumed; lean and flavorful; not widely commercialized but valued in rural areas.
- **Hardiness**: Adapted to free-range scavenging; resistant to common diseases and suited for low-input farming.
- **Behavior**: Stationary and calm; maintained in small flocks (5–10 birds); good scavengers.
- **Special Characters**: Shows traits like dwarfism, feathered legs, cap and beard feathers, frizzle, and naked neck in some lines.

**8. Tellicherry**

- **Origin**: Native to Kerala, especially the Tellicherry region in Kannur district; well adapted to coastal and humid climates.
- **Appearance**: Medium-sized birds with multi-colored plumage, strong legs, and a prominent single comb; resembles desi fowl.
- **Traits**: Dual-purpose breed known for good egg production and decent meat yield; hardy and active.
- **Weight**: Adult males weigh around 2.5–3 kg; females range from 1.8–2.2 kg.

- **Use**: Suitable for backyard farming; raised for both eggs and meat in rural households.
- **Eggs**: Lays about 150–180 eggs per year; eggs are medium-sized with brown shells.
- **Meat**: Tasty and lean; preferred locally for traditional dishes and home consumption.
- **Hardiness**: Performs well in free-range systems; resistant to common poultry diseases.
- **Behavior**: Active and alert; good scavengers; integrates well into mixed farming setups.
- **Special Characters**: Known for its adaptability to Kerala's climate and low-input farming systems; supports rural livelihoods.

**Exotic Poultry Breeds in India**

| Breed Name | Origin | Key Traits | Use in India |
|---|---|---|---|
| **Rhode Island Red** | USA | Hardy, reddish plumage, good layers | Popular for both meat and eggs; widely farmed |
| **White Leghorn** | Italy | Small body, white plumage, prolific layers | Leading commercial layer breed in India |
| **New Hampshire** | USA | Fast-growing, reddish plumage | Used in broiler and dual-purpose systems |
| **Plymouth Rock** | USA | Barred plumage, calm nature | Dual-purpose; good for backyard and commercial farms |
| **Sussex** | England | White body with black neck and tail feathers | Adaptable; used in small-scale and organic farms |
| **Australorp** | Australia | Black plumage, excellent layers | Used in egg production and backyard farming |
| **Orpington** | England | Buff or black plumage, large size | Good for meat and eggs; ornamental appeal |
| **Brahma** | USA | Large size, feathered legs | Popular among enthusiasts; cold-hardy and ornamental |
| **Cornish Cross** | England | Broad chest, fast-growing | Main commercial broiler breed in India |

**1. Rhode Island Red**

- **Origin**: Developed in the United States in the 1850s, specifically in Rhode Island, through crossbreeding of Malay, Leghorn, and other breeds.
- **Appearance**: Brick-shaped body with rich dark red to mahogany plumage, yellow legs, and a prominent single or rose comb.
- **Traits**: Dual-purpose breed known for excellent egg production and good meat yield; hardy and adaptable.
- **Weight**: Adult males weigh around 3.8–4 kg; females about 2.9–3 kg.
- **Use**: Popular for both commercial and backyard farming; raised for eggs and meat.
- **Eggs**: Lays 250–300 brown eggs per year; eggs are large and weigh around 55–60 grams.
- **Meat**: Tender and flavorful; yields more meat than lighter breeds like White Leghorn.
- **Hardiness**: Performs well in varied climates; resistant to many common poultry diseases.
- **Behavior**: Calm, docile, and easy to manage; suitable for beginners and small-scale farmers.
- **Special Characters**: Recognized by poultry associations worldwide; used in breeding programs to develop high-yielding hybrids.

**2. White Leghorn**

- **Origin**: Originated in Tuscany, Italy, and named after the port city of Livorno (anglicized as Leghorn); widely adopted in the U.S. for commercial egg farming.
- **Appearance**: Sleek white plumage, yellow legs, white earlobes, and a prominent single or rose comb; lightweight and elegant build.
- **Traits**: Highly efficient layer breed with excellent feed conversion; active and alert with strong foraging instincts.
- **Weight**: Adult males weigh around 2.7–3 kg; females about 2–2.5 kg.

- **Use**: Primarily raised for egg production in commercial and backyard systems.
- **Eggs**: Lays 280–320 white eggs per year; starts laying early and maintains high productivity.
- **Meat**: Not preferred for meat due to low body weight and lean structure.
- **Hardiness**: Performs well in varied climates; sensitive to cold but thrives in warm environments.
- **Behavior**: Energetic, flighty, and independent; not very broody and prefers open space.
- **Special Characters**: Globally recognized as the benchmark for commercial egg-laying breeds; foundation for many hybrid layers.

**3. New Hampshire**

- **Origin**: Developed in the early 1900s in New Hampshire, USA, through selective breeding of Rhode Island Reds.
- **Appearance**: Medium to large birds with rich chestnut red plumage, yellow legs, and a single comb; slightly lighter in color than Rhode Island Reds.
- **Traits**: Dual-purpose breed known for fast growth, early maturity, and good meat yield; feathers out quickly and is vigorous.
- **Weight**: Adult males weigh around 3.9 kg; females about 2.9 kg.
- **Use**: Primarily selected for meat production, but also lays a moderate number of eggs.
- **Eggs**: Produces 150–200 large brown eggs per year; reliable layer under backyard and semi-intensive systems.
- **Meat**: Excellent meat quality with good body weight; preferred for table consumption.
- **Hardiness**: Hardy in cold climates; tolerates moderate environmental stress.
- **Behavior**: Docile, friendly, and non-aggressive; easy to manage and suitable for beginners.
- **Special Characters**: Recognized as a standardized breed in 1935; used in breeding programs to develop other commercial lines like Delaware.

**4. Plymouth Rock**

- **Origin**: Developed in the United States in the mid-19th century, first exhibited in Boston in 1849.
- **Appearance**: Medium to large birds with a long, broad back, deep breast, and distinctive barred or white plumage; yellow legs and single comb.
- **Traits**: Dual-purpose breed known for excellent meat and egg production; hardy and easy to manage.
- **Weight**: Adult males weigh around 3.4–4.5 kg; females about 2.95–3.5 kg.
- **Use**: Popular for both backyard and small-scale commercial farming; valued for table meat and consistent egg laying.
- **Eggs**: Lays 4–5 large light brown eggs per week, totaling around 200–250 eggs annually depending on strain.
- **Meat**: High-quality, protein-rich meat; one of the foundation breeds for broiler development.
- **Hardiness**: Cold-hardy and resilient; tolerates varied climates and performs well in free-range systems.
- **Behavior**: Docile, friendly, and good with children; shows some broodiness and adapts well to new environments.
- **Special Characters**: One of the most iconic American breeds; used extensively in breeding programs and known for its longevity (6–8 years, sometimes up to 12).

**5. Sussex**

- **Origin**: The Sussex breed originated in England over 200 years ago, developed as a dual-purpose bird for both eggs and meat.
- **Appearance**: Medium to large birds with a broad body, white skin, and various plumage colors—most commonly white with black neck and tail feathers (Light Sussex); single comb and alert eyes.

- **Traits**: Dual-purpose breed known for high egg production and good meat yield; hardy and fast-growing.
- **Weight**: Adult males weigh around 4–4.5 kg; females about 3–3.5 kg.
- **Use**: Popular in backyard and small-scale farming for both eggs and table meat.
- **Eggs**: Lays approximately 200–220 large brown eggs per year, each weighing around 60 grams.
- **Meat**: Tender and flavorful; well-muscled body makes it ideal for meat production.
- **Hardiness**: Performs well in cold climates; resistant to common poultry diseases.
- **Behavior**: Calm, friendly, and easy to handle; suitable for families and beginners.
- **Special Characters**: Excellent foragers; often used in poultry exhibitions due to their attractive plumage and docile nature.

**6. Australorp**

- **Origin**: Developed in Australia in the early 20$^{th}$ century by refining the Black Orpington breed for better egg production.
- **Appearance**: Glossy black feathers with greenish sheen, upright stance, broad chest, and red comb, wattles, and earlobes.
- **Traits**: Dual-purpose breed known for exceptional egg-laying ability and decent meat yield; calm and hardy.
- **Weight**: Adult males weigh around 3.5–4 kg; females about 2.5–3 kg.
- **Use**: Ideal for backyard farming; raised for both eggs and meat.
- **Eggs**: Lays 280–300 large light brown eggs per year; one hen famously laid 364 eggs in 365 days—a world record.
- **Meat**: Tender and flavorful; suitable for home consumption though not primarily bred for meat.
- **Hardiness**: Cold-hardy and adaptable to various climates; resistant to common poultry diseases.
- **Behavior**: Friendly, docile, and easy to manage; great for beginners and mixed flocks.
- **Special Characters**: Recognized in black, white, and blue varieties; known for longevity and gentle temperament.

**7. Brahma**

- **Origin**: Though its name traces to India, the Brahma was developed in the United States in the mid-1800s using birds imported from China and possibly Bangladesh.
- **Appearance**: Massive body size with feathered legs and feet, pea comb, and dense plumage; available in Light, Dark, and Buff varieties.
- **Traits**: Dual-purpose breed known for its gentle temperament, cold hardiness, and majestic appearance; often called the "King of Chickens."
- **Weight**: Adult males weigh around 4.5–5.5 kg; females about 3.5–4.5 kg.
- **Use**: Raised for both meat and eggs; also popular in poultry exhibitions due to their impressive size and feathering.
- **Eggs**: Lays 150–200 medium to large brown eggs per year; known for consistent winter laying.
- **Meat**: High-quality, tender meat with excellent body mass; historically used as a primary meat bird.
- **Hardiness**: Extremely cold-hardy; feathered legs help in insulation but may require care in wet conditions.
- **Behavior**: Calm, friendly, and easy to handle; suitable for mixed flocks and backyard setups.
- **Special Characters**: Known as "gentle giants"; their size deters aerial predators and their docility makes them ideal for beginners.

**8. Cornish Cross**

- **Origin**: Developed in the mid-20$^{th}$ century through selective breeding of Cornish and White Plymouth Rock chickens.
- **Appearance**: White plumage, broad breast, short legs, and a stocky, muscular body. Grows rapidly and has a high feed conversion efficiency.

- **Traits**: Specifically bred for meat production. Not suitable for long-term backyard rearing due to health issues from rapid growth.
- **Weight**: Reaches market weight of 2–2.5 kg in just 6–8 weeks. Males may grow slightly larger than females.
- **Use**: Dominates the global broiler industry; raised almost exclusively for meat.
- **Eggs**: Not valued for egg production; hens may lay a few eggs but are not reliable layers.
- **Meat**: Tender, juicy, and high-yielding; preferred in commercial poultry processing due to uniform carcass size.
- **Hardiness**: Sensitive to heat and prone to leg problems, heart failure, and obesity if not managed carefully.
- **Behavior**: Docile but inactive; prefers sitting and eating over foraging. Requires controlled feeding and space to avoid health issues.
- **Special Characters**: Known as the "engine of the poultry meat industry" due to its unmatched growth rate and efficiency.

**Suggested Tasks/Workouts:**

1. Poultry Breeds Identification / Importance Exercise

| Breed Name | Origin | Type | Eggs/Year | Body Weight (kg) | Special Traits |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

2. Identify which breeds are best suited for backyard farming
3. Discuss the importance of indigenous breeds in sustainable agriculture
4. Discuss the adaptability of local vs. exotic breeds
5. Explain which breeds are most suitable for your region and why
6. Describe how breed selection impacts productivity and farm economics

## III. Types of Poultry Breeds

**Classification by Purpose**

**1. Layer Breeds**

**Purpose:** Egg production

**Traits:**

- Lightweight body structure
- High feed-to-egg conversion efficiency
- Early maturity and long laying cycles
- Typically lay white or brown eggs

**Examples:**

- **White Leghorn** – prolific white egg layer, very active
- **ISA Brown** – known for consistent brown egg production
- **Hy-Line** – commercial hybrid with high productivity

**Ideal for:** Commercial egg farms and backyard flocks focused on egg yield.

| Breed | Type | Eggs/Year |
|---|---|---|
| Gramapriya | Indigenous | 200–250 |
| Tellicherry | Indigenous | 150–180 |
| Nicobari | Indigenous | 160–180 |
| White Leghorn | Exotic | 280–320 |
| Minorca | Exotic | 220–250 |
| Ancona | Exotic | 180–220 |

**2. Broiler Breeds**

**Purpose:** Meat production

**Traits:**

- Fast growth rate (ready for market in 6–8 weeks)
- Broad breast and muscular body
- High feed conversion ratio
- Short lifespan due to rapid growth

**Examples:**

- **Cobb 500** – industry standard for broiler performance
- **Ross 308** – known for uniform growth and meat yield
- **Hubbard** – efficient feed utilization and carcass quality

**Ideal for:** Commercial meat production and intensive farming systems.

| Breed | Type | Avg. Body Weight (kg) |
|---|---|---|
| Aseel | Indigenous | 4.0–5.0 (male) |
| Kadaknath | Indigenous | 1.4–1.5 |
| Chittagong | Indigenous | 3.5–4.5 |
| Cornish Cross | Exotic | 2.0–2.5 (in 6–8 weeks) |
| Brahma | Exotic | 4.5–5.5 |
| Cochin | Exotic | 3.5–4.5 |

**3. Dual-purpose Breeds**

**Purpose:** Both eggs and meat

**Traits:**

- Moderate egg production
- Good body weight for meat
- Hardy and adaptable to varied climates
- Often used in backyard or small-scale farms

**Examples:**

- **Rhode Island Red** – robust, good layer and meat bird
- **Australorp** – excellent layer with decent meat yield
- **Sussex** – calm temperament, good dual-purpose utility

**Ideal for:** Rural households, integrated farms, and sustainable systems.

| Breed | Type | Origin | Eggs/Year | Avg. Body Weight (kg) |
|---|---|---|---|---|
| Vanaraja | Indigenous | India | 150–200 | 2.5–3.0 |
| Giriraja | Indigenous | Karnataka | 130–150 | 2.5–4.0 |
| Ghagus | Indigenous | Andhra Pradesh | 100–120 | 2.5–3.5 |
| Rhode Island Red | Exotic | USA | 250–300 | 2.9–4.0 |
| Australorp | Exotic | Australia | 280–300 | 2.5–4.0 |
| Sussex | Exotic | England | 200–220 | 3.0–4.5 |

**Suggested Tasks/Workouts:**

1. Breed Identification & Classification

| S. No | Breed Name | Type | Origin | Physical Traits | Purpose |
|---|---|---|---|---|---|
| | | | | | |

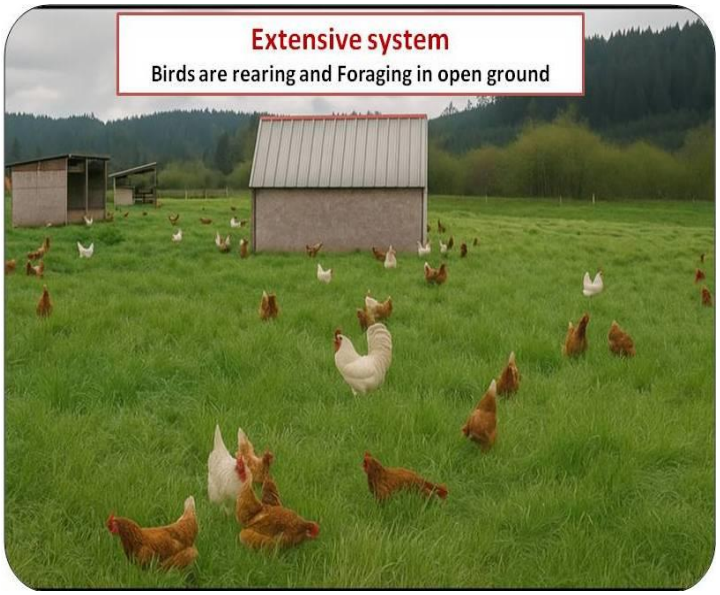
## IV. Poultry Housing Systems

**Poultry Housing System:**

Poultry housing refers to the type of shelter provided to birds to ensure proper growth, production, and protection from environmental stress and predators. The housing system may vary depending on the availability of land, climatic conditions, and investment capacity. Poultry housing systems are broadly categorized into Extensive/Open Yard System/Free-range, Semi-Intensive and Intensive systems, each with its own advantages and disadvantages.

**A. Extensive System:**

- In Extensive system, rearing and foraging of birds outside the poultry house.
- Extensive system is also called as the 'Free range' or 'Open yard system'.
- Birds foraging or scavenging in open ground during day.
- Birds needed shelter shade during night and in extreme weather conditions.
- No specific housing and equipment required in this method.
- Regular monitoring and effective disease control methods are needed.
- Birds of different size and species are reared together.




- Stocking density is 250 birds/hector or100 birds per acre.

**Advantage of Extensive System**:

i. No need of a separate house for the birds.
ii. Less supplemented feed is needed as birds graze on insects, seeds and herbs from environment.
iii. Birds exposed to fresh air and sunshine; hence they produce their own Vitamin D and improve general health.
iv. Open-ground rearing and natural feeding make the meat and eggs superior and nutritionally richer.

**Disadvantage of Extensive System**:

i. Birds are exposed directly to the predators (dogs, cats, wild animals, birds of prey).
ii. Higher risk of diseases infection due openly reared and uncontrolled contact with wild birds and contaminated soil.
iii. There is a higher chance of internal and external infections.
iv. They may not get proper food, leads to loss of body weight and produce fewer eggs.
v. Birds may lay eggs in hidden spots, leading to wastage of eggs.

**B. Semi-Intensive System:**


- The semi-intensive system of poultry farming is a combination of the extensive and intensive systems.
- In this method, birds are kept partly in shelters and partly in open space.
- Allow the birds to expose the natural conditions (Half-way shelter/housing and open runs or grazing areas).
- Therefore, this system is referred as Pen and Run system.
- It provides shelter to birds from predators and extreme environment.
- Stocking density is 750 birds/hectare (1sq.ft/birds in pen type and 16-24 $m^2$/ birds).
- Semi-intensive system is suitable for small and medium-scale farmers.

**Advantage of Semi-Intensive System**:

i. In this system, there is a balance between natural feeding and controlled management
ii. The chances of theft are minimized because birds are provided with care during the night.
iii. Predator attacks and diseases are in controlled condition due to fencing.
iv. Birds are remains healthier due to fresh air and sun light.
v. Less capital investment, housing can be constructed with locally available materials.
vi. Better quality of meat and eggs are produced as compared to the Intensive system of farming.

**Disadvantage of Semi-Intensive System**:

i. This method required more land.
ii. Risk of infection to the birds due to living with wild birds or other living organism.
iii. Birds are reared outdoor, so there is chance of theft and predators attack.
iv. It requires more monitoring and labor compared to intensive housing.
v. Difficulty in maintaining the uniform nutrition due to partly feeding on natural food and partly on provided feed.
vi. Eggs can be lost in the fields.

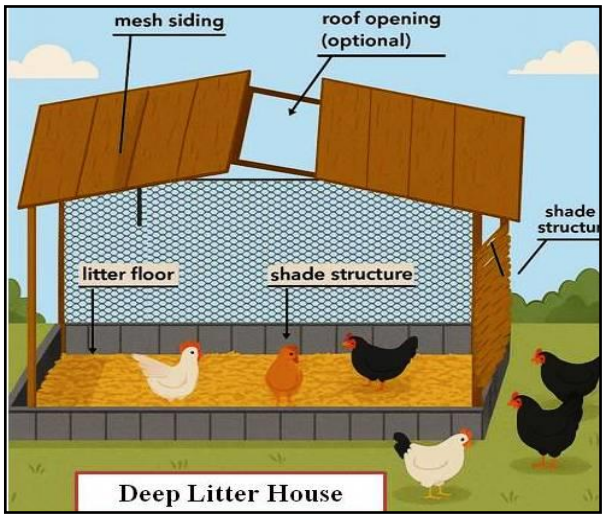
## C. Intensive System:

In the intensive system, poultry birds are reared under complete confinement, usually in cages or deep-litter houses. Therefore, it is also known as the 'in-house system'. This method relies on advanced technology for feeding, watering, temperature control, ventilation, and other requirements. Intensive poultry farming involves high-density rearing aimed at achieving maximum production. It is the most common commercial method of poultry farming. Intensive poultry farming is carried out in three ways,

1. Deep Litter System
2. Cage System
3. Slat system

### 1. Deep Litter System:

The deep litter system is a method of Intensive Poultry System, where poultry birds are kept on a thick layer (bedding) of organic material (Litter) on the floor, bedding materials such as paddy husk, sawdust, groundnut hulls, or straw to a depth of about 5–8 cm. This litter absorbs droppings moisture and manure and over time, it decomposes to form a valuable organic fertilizer. New layers of litter are added on top without removing the old ones, resulting in thicker and deeper bedding; this method is called the **'Deep Litter System'**. This method is commonly used for both broilers and layers poultry birds.



**Features of Litter Materials and its Importance:**

- Litter material like paddy straw, groundnut shells, wood shavings, maize cobs, maize straw etc. are used for bedding purpose.
- Litter material should be lightweight and able to dry quickly by releasing absorbed moisture into the air.
- It is soft and compressible and it is inexpensive, capable of forming part of the manure and easily available throughout the year.

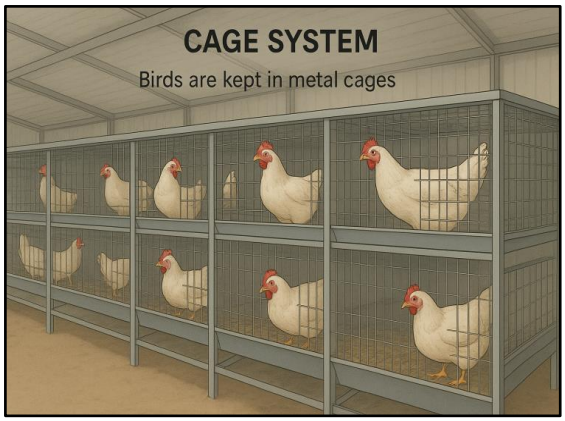
**Advantages of Deep Litter System:**

i. A deep-litter material keeps cool during summer and warm during winter, therefore the birds feel comfortable during all seasons.
ii. In the deep-litter system, birds get more space for movement, scratching, and exhibiting their natural behavior.
iii. Poultry droppings mix with litter materials and producing good quality organic manure.
iv. Dry litter reduces the risk of parasitic infections compared to wet floors.
v. Daily cleaning is not required; litter is replaced periodically.
vi. Deep Litter System is cost effective than the cage system.

**Disadvantages of Deep Litter System:**

i. It spreads diseases like coccidiosis and fungal infections due to wet and poorly managed litter.
ii. Egg quality is reduced because eggs laid on litter may get dirty and contaminated.
iii. It provides less floor space compared to the cage system.
iv. There is more feed wastage due to spilling through feeding trough.
v. In this system, pecking and cannibalistic habits is observed due to overcrowded.
vi. It require more labor than cage system.

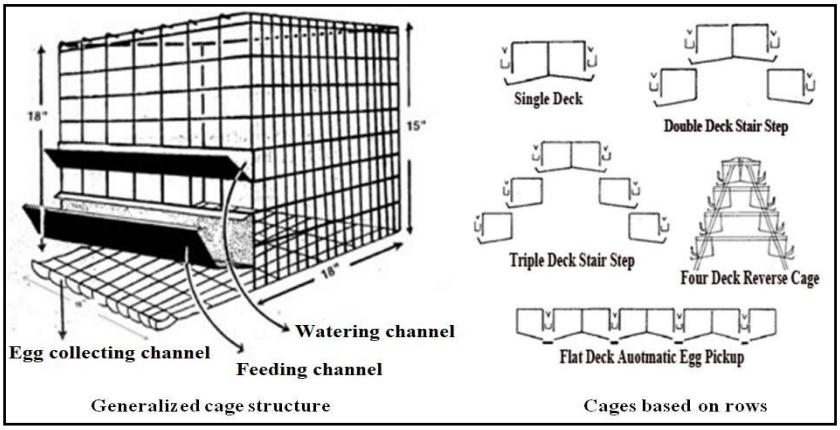
**2. Cage System:**



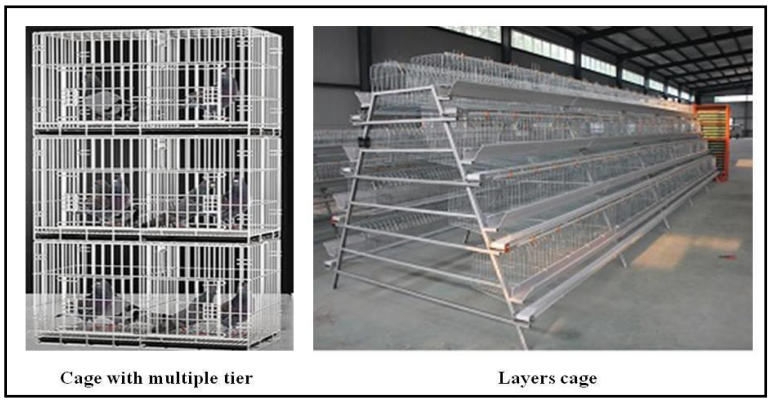

In the cage system of poultry farming, birds are kept in small cages made of wire mesh, inside a poultry house. Each cage holds about 3–5 birds and has space for feed and water in the front, with a sloping floor that allows eggs to roll out. This system is mainly used for layer birds and is the most popular method for commercial egg production because it saves space, easy to manage, and helps in better disease control.

Currently, about 75% of commercial layer hens in the world are kept in cages. In modern systems, automatic feeding trolleys and egg collection belts are often used to save time and labor. The droppings from the birds are managed in different ways depending on the cage design: they may fall into trays placed under the cages, or on moving belts or into a deep pit beneath the cages. Cage systems in poultry farming are broadly categorized on,

1. **Number of birds in cage:**
    a. **Individual or Single bird cage:** Only one bird is reared in a cage.
    b. **Multiple bird cage:** From 2 to 10 birds, usually 3 or 4 birds per cage.
    c. **Colony cage:** Raring more than 11 birds per cage. It is also called as community cage.
2. **Based on the number of rows:**
    a. **Single-deck:** Wire cage arranged in single row.
    b. **Double-deck:** Wire cage arranged in two tier row.
    c. **Triple-deck:** Wire cage arranged in three tier row.
    d. **Four-deck:** Wire cage arranged in four tier row.
    e. **Flat-deck:** Wire cage arranged in one level.



3. **Based on arrangement of cages:**
    a. **Stair-steps cages:** In this type, cages are arranged in a stepped or staggered pattern or multiple tiers. These are of M-type and L-type cages.
    b. **Battery cages (Vertical cages):** Rearing hens in small, wire-mesh cages stacked in rows and columns.
4. **Based on the type of bird reared:**
    a. **Brooder or chick Cages:** Rearing young chicks from day-old to several weeks old.
    b. **Layer Cages:** This system is designed for egg laying hens to maximize egg, where multiple hens are confined to individual compartments within a larger structure
    c. **Grower Cages: R**earing birds of a certain age (around 4-6 weeks) until they reach maturity.
    d. **Breeder cage:** it reared male and female birds separately in cages.



Cage with multiple tier  Layers cage

**Advantage of Cage system:**

i. This system uses land efficiently because more birds can be kept in a small space.
ii. Movement of birds is restricted in a small space; hence, there is less wastage of feed and feed consumption is also minimized.
iii. Feeding, watering, vaccination, and egg collection are easy to manage.
iv. Diseases spread more slowly in cages compared to other systems.
v. Droppings fall below the cage, preventing direct contact and reducing disease risk.
vi. Birds produce more eggs, and the eggs are cleaner and heavier.
vii. Less labor is required for management.

**Disadvantages of Cage System:**

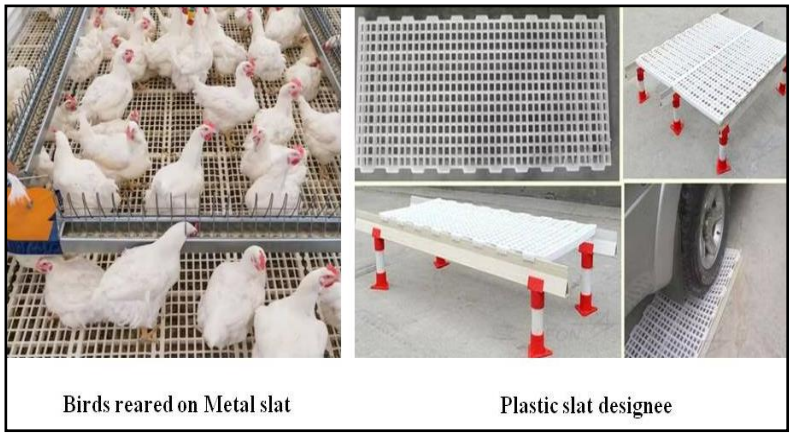
i. This system requires costly cages and housing setup.

ii. Droppings collect under the cages and must be cleaned often to prevent ammonia buildup.

iii. Due to less space, there is restriction in natural behavior, restriction in movement, feather pecking, and leg weakness.

**3. Slat system:**

In this system, the floor of the poultry house is made of wooden or plastic or metal slats (long or narrow strips with small gaps) placed 2-3 feet above the ground level. The droppings fall through the gaps into the ground or a pit below. Wooden or metal rod of 2-inch diameter can be fixed lengthwise with interspaces of 1-inch between rods. The slats must be strong enough to hold the birds without bending. This slat system keeps the birds clean and dry, reduces their contact with droppings, and lowers the chances of disease spread.



Birds reared on Metal slat  Plastic slat designee

**Advantages of Slat System:**

i. This method is more hygienic than the deep litter system because droppings fall directly through the slats, reducing contact between the birds and waste.

ii. The slat fences help in ventilation and temperature regulation.

iii. Due to dropping through slats, reduces the chances of coccidiosis and worm infestation.

iv. In this type, manure is easily collected.

**Advantages of Slat system:**

i. This system requires more investment.

ii. Birds may develop leg and foot problems due to hard slat surfaces.

iii. Droppings under slats may produce ammonia gas if not cleaned regularly.

iv. This system requires regular maintenance and repair.

**Suggested Tasks/Workouts:**

1. Name the three major systems of poultry housing.
2. List the features of the backyard (extensive) system of poultry housing.
3. Write any two characteristics of good litter material.
4. Give two examples of commonly used litter materials.
5. Classify the cage system.
6. What are community or colony cages?
7. What is the slat system in poultry farming
8. Provide images or sketches of different poultry housing system (Deep litter, cage, slat etc.) and ask students to identify them?
9. Provide images or sketches of poultry housing system and ask the students to comments on their advantages and disadvantage.
10. Fill the table with appropriate answers on types of poultry housing

| Sr. No. | Poultry Housing | Use | Two Advantages | Two disadvantages | Egg Quality (Good, Moderate, Bad) | Egg Production (Good, Moderate, Bad) | Expensive or Not (Yes/No) | Prevent diseases (Yes/No) | Reduces labour cost (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Extensive system | | | | | | | | |
| 2 | Semi-Intensive system | | | | | | | | |
| 3 | Deep Litter System | | | | | | | | |
| 4 | Cage System | | | | | | | | |
| 5 | Slat system | | | | | | | | |

## V. Feeding and Nutrition

### 1. Nutritional Requirements

Feeding poultry in a scientific and balanced way is very important for getting good and steady production. Since feed is the biggest expense in poultry farming, it must be managed carefully. Farmers need to provide the most efficient diet at the lowest cost. Poultry mainly need water, protein, carbohydrates, fat, minerals, and vitamins. A balanced diet means giving these nutrients in the right amounts for growth, maintenance, and production. These nutrients should come from affordable ingredients that are easily available. The composition and availability of feeds will vary, depending on the season, locality and production system. The need for feed will change, depending on the age and status {chicks, growers (pullets), egg layer, broody hen} of the bird. Feeding growing and productive birds is a daily task, usually done at fixed times by trained staff.

### 2. Feeding Ingredients for Poultry Birds

The ingredients used in poultry feed usually depend on what is easily available. Common ingredients include cereals like maize, rice, wheat, oats, and barley; by-products such as wheat bran and rice polish; and protein sources like fish meal, soybean meal, and groundnut cake. The feed is also enriched with the right amount of minerals and vitamins. Below are some of the feed materials commonly used in poultry diets.

**Energy Sources:** Generally, 75% of a quality poultry diet comprises energy feeds. These are the most critical feeds for maintenance requirements (e.g. body temperature, vital functions, exercise). Eg. Maize, Barley, oat, Wheat, Wheat bran, Bajara, Rice, Rice polish, rice bran, sorghum, dried poultry waste, fats (animal fat or vegetable oil), etc.

**Protein Sources:** Protein is needed for growth and optimal health status. Usually, up to 20% of a poultry diet comprises protein-rich feeds, mainly cost. Protein sources are of two types—animal-based and plant-based. Their value depends on how well birds can digest them and how much essential amino acids they provide for growth and production. In general, using two or three protein sources together gives a better mix of amino acids and nutrients than relying on just one.

**Vegetable Protein Sources:** Groundnut cake, Mustard cake, Sesame meal, Sunflower meal, Cottonseed cake, Linseed meal, Maize gluten meal, etc.

**Animal Protein Sources:** Fish meal, Blood meal, Meat meal, Liver residue meal, Hatchery by-product meal, Feather meal, Poultry by-product meal, Bone meal, etc.

**Minerals:** Minerals are vital for bone health, eggshell formation, and overall wellbeing. Calcium and phosphorus are the most important; they must be balanced, as excess of one can

cause deficiency of the other. Laying hens need extra calcium (like limestone or crushed shells) for strong eggshells. Common mineral sources include bone meal, limestone, and burned eggshells.

**Vitamins:** Sunlight and green grass usually provide Vitamins A and D, while Vitamin B can come from fresh cow dung or multivitamin supplements. However, birds kept indoors or in intensive systems always need extra vitamins mixed into their feed.

**Water:** Water is a key nutrient, making up about 65–78% of a bird's body. Its intake depends on factors like age, temperature, humidity, diet, and body weight. Clean water is essential for good broiler growth, and birds should drink more as they grow. A drop in water intake signals possible health or management problems.

Note:

i. *Instructor should display poultry feed samples / Photographs for all age groups of birds.*
ii. *Instructor can assign visit to poultry farm to collect data regarding feeding plan and feed composition as given in table.*

**Suggested Tasks/Workouts:**

1. Describe the energy sources used in poultry feed.
2. Prepare a table of age group wise feed requirement in poultry birds.
3. Prepare a table of age group wise water requirement in poultry birds.
4. Prepare a table of composition of feed for Broiler of 1-6 weeks age group.
5. Prepare a table of composition of feed for grower of 7-20 weeks age group.
6. Prepare a table of composition of feed for Layer birds.
7. Feed requirement for poultry (Calculate it with poultry bird number of 1200/per unit)

| **Age** | **Feed (gm) per bird** | **Total Feed Required for Poultry Unit** |
|---|---|---|
| 1st week | 10 to 15 | |
| 2-3rd week | 30 to 50 | |
| 4-8th week | 60 to 70 | |
| 8-20th week | 70 to 90 | |
| 20 weeks onwards | 110 | |

8. Water requirement for poultry (Calculate it with poultry bird number of 1200/per unit)

| **Age** | **Water Requirement per 100 birds/ day (Liters)** | **Total Water Required for Poultry Unit** |
|---|---|---|
| 1-3 week | 2 to 6 | |
| 3-6 week | 7 to 14 | |
| 6-10 week | 15 to 20 | |
| 10-17 week | 20 to 25 | |
| 18-20 week onwards | 25 to 30 | |
| Laying hen | 30 to 35 | |

9. Feed Composition Table (in % by weight)

| **Ingredient** | **Broiler Feed (1–6 weeks)** | **Grower Feed (7–20 weeks)** | **Layer Feed** |
|---|---|---|---|
| Yellow Maize | 25% | 28% | 30% |
| Rice Polish | 26% | 26% | 20% |
| Barley/Oat | 7% | 7% | 10% |
| Wheat Bran | 7% | 7% | 8% |
| Groundnut Cake | 18% | 16% | 15% |
| Maize Gluten Powder | 5% | 5% | 5% |
| Fish Meal | 6% | 5% | 4% |
| Meat Meal | 3% | 3% | 4% |
| Bone Meal | 1% | 1% | 1% |
| Calcium (Limestone) | 1.5% | 1.5% | 2.5% |
| Salt | 0.5% | 0.5% | 0.5% |
| **Total** | **100%** | **100%** | **100%** |

**Task**: Prepare a 50 kg feed for Broiler, Grower and Layer birds (tabular form)

**Instructions**:

- Multiply each % by 0.5 to get the weight in kg.
- Example: Yellow Maize = 30% × 0.5 = 15 kg

## VI. Poultry Breed Management

### 1. Management of Hatchery and Chicks: Chick Care and Management

**Ideal management practice of poultry chicks brooding**

- Plan in advance: confirm delivery date and time with the hatchery. Receive chicks at the farm entrance (do not allow delivery vans inside).
- Keep boiled and cooled drinking water ready. For the first day, mix per lit. of water: 8 g glucose, 0.5–1 g mild antibiotic/antibacterial, electrolytes, and vitamins. Continue antibiotics and vitamins for 3–5 days.
- Place medicated water in the brooder before releasing chicks. Keep feeders open and spread some feed on newspaper for easy access.
- Check chicks for health and uniform weight (40–48 g). Count them, dip their beaks in water, and gently place them in the brooder. Return weak, sick, or dead chicks for replacement.
- Observe chicks: they should move actively, eat, and drink.
- For heat, use kerosene/coal stoves with sand vessels, heater coils, or bulbs (kept out of reach).
- Chicks need 35°C in the first week, with temperature reduced by 5°C each week. Use a thermometer at chick level and observe their behavior: crowding under heat means too cold, moving to edges means too hot, and spreading evenly with normal activity shows the temperature is right.
- Keep hover lights on for about 22 hours daily during the first week, with a 30-minute off period at night. Later, provide heat mainly at night until 2nd–3rd week, depending on the season.

**Care of Growing Chicks:**

Artificial heat and the brooder can be removed once chicks are about 6 weeks old. Weak or sick chicks should be culled. Provide 0.095–0.19 m² floor space per bird. From 8 weeks onwards, birds should be shifted to grower feed, using the suggested formula.

Viz. Yellow maize – 43%; groundnut cake – 8%; gingelly oil cake -5%; fish meal – 6%; rice polish – 16%; Wheat bran – 20%; salt – 0.35%; mineral mixture – 1.75%

As chicks grow, you need to add more feeders and raise them higher from the ground. Each bird needs about 10 cm of space at the feeder (counting both sides). If you use tube feeders, one feeder that holds 25 kg is enough for 50 birds. The top of the feeder should be at the bird's back level or a little higher. Clean water must always be available, and each bird needs about 2–2.5 cm of drinking space.

**Debeaking:**

Debeaking helps reduce cannibalism and feed waste. It is done using an electric debeaker, usually by removing one-third of the upper beak and slightly trimming the lower beak. The best time is between 1 day and 6 weeks of age, and sometimes it is repeated around 16 weeks before shifting pullets to the layer house. Broiler chicks may be debeaked in the first week if needed, but birds raised in backyards should not be debeaked. This procedure should always be done by a trained person.

**Disease Control:**

The birds should be vaccinated as detailed in the schedule for vaccination.

## 2. Management of Layer Birds -Housing, Feeding and Care

**Housing -**

- Each laying cage houses 3 birds (45 × 37.5 × 40 cm) with a sloped floor so eggs roll to the front.
- Each bird gets 562.5 $cm^2$ space, more than the recommended 255 $cm^2$/kg body weight.
- Layers weigh about 1.8 kg at 90 weeks.
- Feeding line gives 15 cm feeder space per bird (more than the 10 cm recommended).
- Each cage has 1 nipple drinker, enough for 3 birds.
- 40–60 W bulbs are used, fixed at 2.1–2.4 m height to avoid obstruction.
- Recommended photoperiod: 15½–16 hours (including sunlight).
- Most cages are High-Rise or Platform type with 2 m space below for easy waste removal.
- No litter is used; only droppings collect under cages.
- After cleaning, cages should be checked and repaired before disinfection.
- House cleaning includes removing old litter, sweeping, repairing, disinfecting from top to bottom, and clearing waste.

**Feeding:**

Feeding in cages uses a linear feeder, but only one side is accessible. Feed is filled to ⅓–½ depth, provided twice daily at fixed times, and offered as necessary with no restrictions for layers.

**Care:**

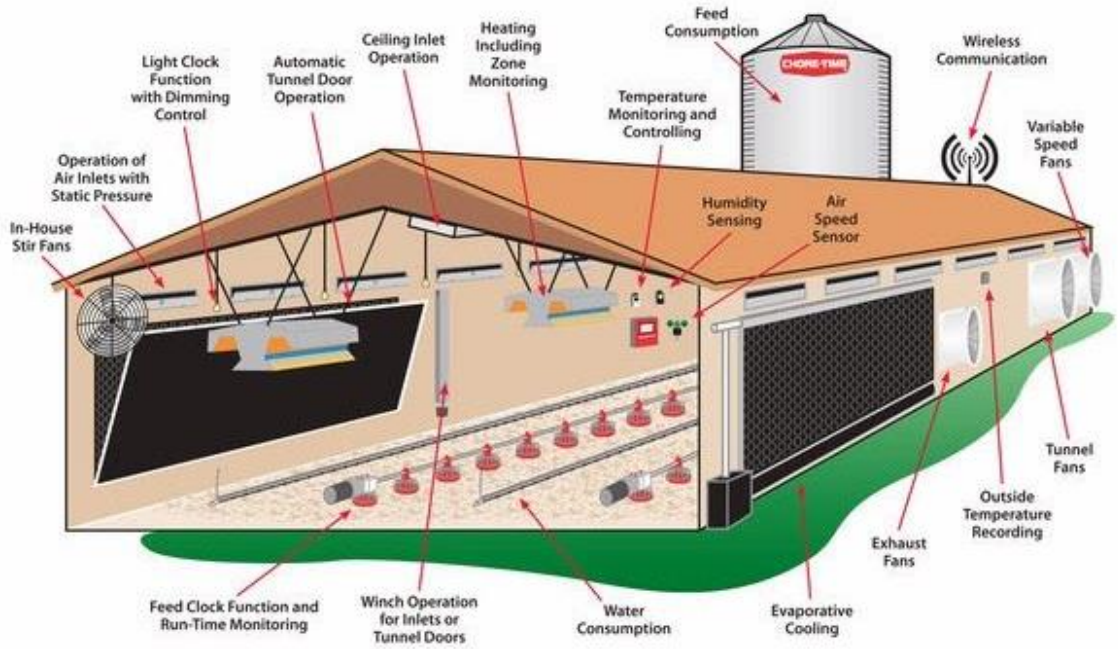
- Regularly observe birds for physical and behavioural signs of sickness.
- Remove sick birds from the flock to stop disease spread.
- Deworming and vaccination help keep birds healthy and disease-free.
- Medicines, drugs, or vaccines can be given orally, nasally, through the eyes, or by injection.
- Biosecurity Measures - Movement restriction at poultry shed level, Restriction to visitors.

**3. Management of Broiler Birds - Housing, feeding and Care**

**Housing:**

- **Location:** Elevated, well-drained site; at least 500 m away from other farms; easy access to water, electricity, and roads.

- **Orientation:** East–west to reduce direct sunlight and heat.
- **Structure:** Width 9–12 m for ventilation; length as per management needs; roof of heat-reflective/insulated material (galvanized sheets or thatch).
- **Walls:** Open-sided/curtained for natural ventilation in tropics; insulated walls for cold regions.
- **Flooring:** Concrete floor (easy cleaning, pest control) covered with 5–10 cm absorbent litter (sawdust, rice husks).
- **Ventilation:** Ensures oxygen supply, removes harmful gases, heat, and moisture; keeps birds healthy and litter dry. Poor ventilation leads to health problems (ascites, respiratory issues, blindness, blisters, poor growth). Over-ventilation may chill chicks, so balance with temperature control is crucial.
- **Lighting:** 23 hours light + 1 hour darkness; dark period prevents piling and deaths during blackouts.
- **Litter Quality:** Should have good moisture absorption, biodegradability, comfort for birds, low dust, freedom from contaminants, and consistent, bio-secure availability.
- **Temperature Management:** Chicks need constant supplemental heat after hatching. Heating Sources: Gas pancake, coal powder, charcoal burner, infrared bulb (small-scale).



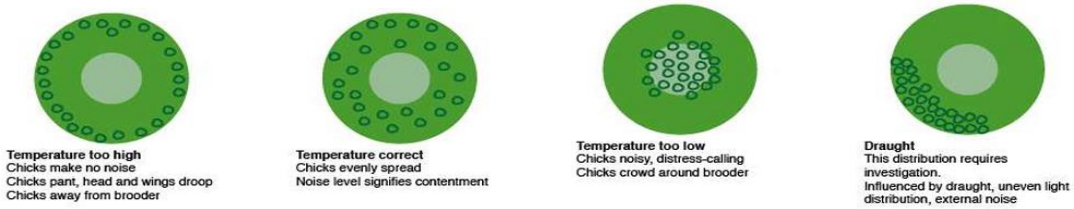

**Water:**

Birds generally consuming 2–3 kg of water per kg of feed

**Care:**

Broiler care should be taken by following measures, fencing the site to keep out other animals, maintaining good housekeeping and preventing pollution, installing vehicle wheel dips at entry points, and providing foot baths at each house entrance with regular chemical changes to avoid resistance. Staff and visitors should wear protective clothing, while rodent and pest control should be ensured by clearing vegetation around poultry houses. Routine vaccination is also essential.

**Effect of Temertature on Chick Behaviour**




**Note:**

i. *Instructor should display poultry standard housing systems for hatchery chicks, grower, Broiler and layer birds; models / Photographs.*

ii. *Instructor can assign visit to poultry farm to collect data regarding feeding plan and feed composition as given in table.*

**Suggested Tasks/Workouts:**

1. Describe the standard requirements of housing for hatchery chicks.
2. Describe the standard requirements of housing for broiler birds.
3. Describe the standard requirements of housing for layer birds.
4. Prepare a table of Age group wise feeding ratio for growing chicks.
5. Prepare a table of Temperature requirement for growing chicks.
6. Prepare a table of Feeding recommendation in 03 phase feeding.
7. Prepare a table of stocking density of growing chicks in broiler birds.

**Age group wise feeding ratio for growing chicks**

| Age group (weeks) | 10 | 11 | 12 to 14 | 15 to 16 | 17 | 18 | 19 to 20 |
|---|---|---|---|---|---|---|---|
| Feeding ratio (g/bird/day) | 53 | 58 | 60 | 62 | 65 | 70 | 75 |

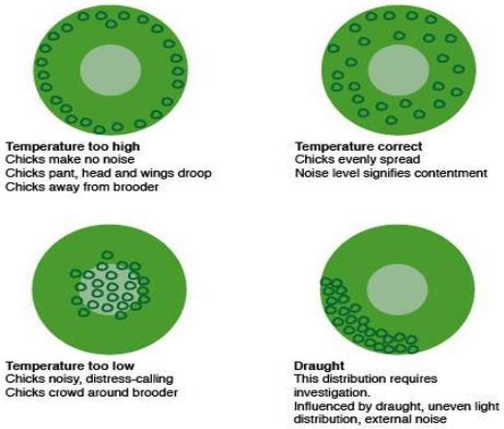
From above table some tasks are as follows:

8. How much feed is needed for 100 chicks aged 12–14 weeks over 1 day?

9. How much feed is needed for 150 chicks aged 17 weeks over 7 days?
10. How much feed is needed for 1200 chicks aged 19-20 weeks over 7 days?

**Calculate temperature range by age with reference data given in table**

| Age of chicks in Days | Temperature reuirement |
|---|---|
| 0 to 3 days | 32 - 33°C |
| 4 to 7 days | 30 - 32°C |
| 8 to 14 days | 28 - 30°C |
| 15 to 21 days | 25 - 28°C |




11. What temperature range resulted in optimal chick distribution?
12. How did behavior change when temperature deviated from the target?
13. What are the risks of prolonged exposure to incorrect temperatures?

**Calculate stocking density by age with reference data given in table**

| Age of Chicks (Days) | Recommended Stocking Density (birds/m²) |
|---|---|
| 0–3 | 30 |
| 4–7 | 20 |
| 8–14 | 15 |
| 15 to Slaughter | 10 |

14. Calculate stocking density by age with reference data given in table (Give data for any one column to calculate)

| Age of Chicks (Days) | Floor Area Used (m²) | Total Birds | Observation Notes |
|---|---|---|---|
| | | | |
| | | | |

15. Calculate the normal, overcrowded or low-crowded condition (Give data for any two column to calculate)

| Age of Chicks (Days) | Floor Area Used (m²) | Total Birds | Observation Notes |
|---|---|---|---|
| | | | |
| | | | |

**Feeding Recommendation:**

| Type | Age of Chicks in Days | Feed Requirement (kg/bird) |
|---|---|---|
| Broiler Starter | 0 – 14 | 0.45 kg per bird |
| Broiler Grower | 15 – 25 | 1.10 kg per bird |
| Broiler Finisher | 26 – 35 | 1.7 kg per bird |

16. Calculate feed requirement of 50/75/100 birds in each group age for 3/5/7 days with reference data given in table

| Age Group | No. of Chicks | No. of Days | Total Feed Requirement (kg) |
|---|---|---|---|
| Broiler Starter | | | |
| Broiler Grower | | | |
| Broiler Finisher | | | |

## VII. Poultry Farming Equipment

Poultry farming requires a variety of equipment to ensure the proper rearing, health, and productivity of birds. The right equipment helps in maintaining hygiene, providing adequate feed and water, controlling the environment, and reducing labor costs. Poultry equipment is broadly categorized into feeders and waterers, along with essential items such as incubators, manure removal systems, and ventilation systems, as well as modern automated systems used in large-scale farms. Proper use of equipment not only increases efficiency but also minimizes disease risks and improves the overall welfare of the birds.

### 1. Types of Poultry Feeder and Waterer:

The equipment in poultry farming includes different types of feeders and waterers. Feeders are equipment used to provide feed to the birds by placing feed in them. They may be conventional or semi-automatic, available in various designs and shapes, and are usually made of either metal or plastic. Poultry waterer is essential for providing clean and readily available water to the birds. They come in various types, including nipple drinkers, cups, and bell waterers, each with its own advantages. These tools are essential for maintaining the health, growth, and productivity of the flock. Proper use also minimizes wastage and keeps the poultry house hygienic.

### A. Types of Poultry Feeder:

i. **Trough Feeder:** Trough feeders are long, open containers made of metal or plastic, used to provide feed to poultry birds. Trough feeder is simple and inexpensive, but requires frequent refilling and may cause feed wastage (Fig. a)**.**

ii. **Pan Feeder:** These are shallow round or rectangular pans, usually made of plastic, that hold feed. They can be used for both chicks and adult birds, but sometimes cause feed scattering and wastage (Fig. b)**.**

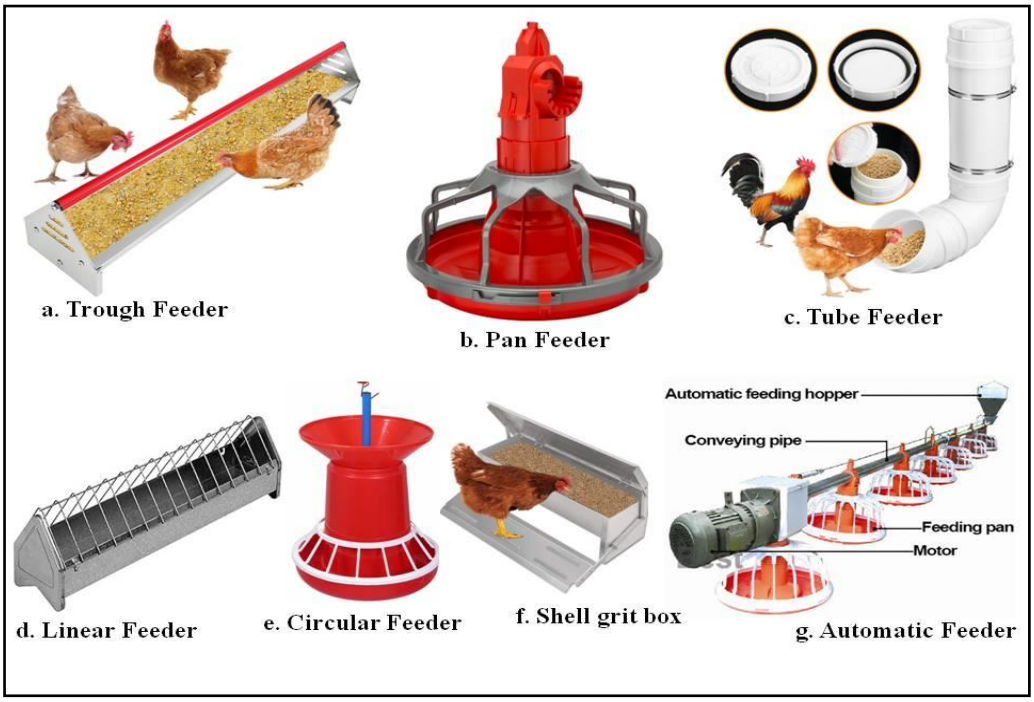
iii. **Tube Feeder:** These feeders have a tube with openings at the bottom where birds can eat the feed. They are made of plastic or metal and are usually hung from above (Fig. c).

iv. **Linear Feeder:** A linear feeder is a long, narrow feeder made of metal or plastic. It allows many birds to eat at the same time on either side of the linear feeder, but may cause feed wastage if not managed properly (Fig. d).

v. **Circular Feeder:** A circular feeder is a round-shaped feeder commonly made of plastic or metal. It allows birds to gather and feed from all sides, making it suitable for both chicks and adult birds. However, if not adjusted properly, it may lead to feed scattering and wastage (Fig. e).

vi. **Shell grit box:** A shell grit box gives extra calcium to layer birds, calcium is important for making strong eggshells. The box is usually filled with shell grit, like crushed oyster shells, that birds eat whenever they need (Fig. f)**.**

vii. **Automatic Feeder:** It is automatic feeder device that provides feed to birds without much manual work. It stores a large amount of feed and releases it slowly as birds eat. This saves time, reduces labor, and helps in steady supply of feed to the flock (Fig. g).




**Types of Poultry Feeder**

**B. Types of Poultry Waterer:** Wateres or drinkers equipment used to provide the water to the poultry birds. They come in different types based on size, design, and shape. The following are the common types of waterers used in poultry farming,

i. **Pan and Jar waterer:** It consists of an inverted jar placed over a pan. As birds drink the water from the pan, more water flows down from the jar to keep it filled. It is mainly used for chicks and small flocks (Fig. a).

ii. **Linear waterer / Channel type waterers:** This type of waterer is long, narrow troughs made of metal or plastic, usually attached to cages to provide a continuous water supply. One end of the channel-type waterer is funnel-shaped to receive water from a tap, while the other end has an outlet to drain excess water. This can serves water to many birds at once but need frequent cleaning and may lead to water spillage and contamination (Fig. b).

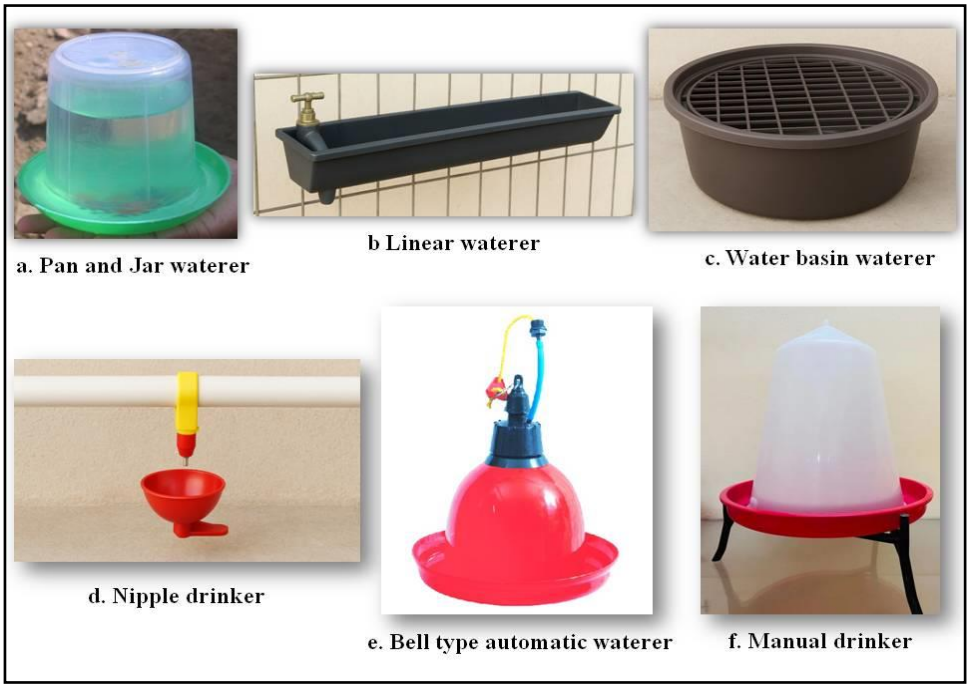
iii. **Water basin waterer:** These are basins made of plastic, wood, or galvanized iron fitted with a separate grill on top. The grill prevents birds from entering inside the

water or contaminating the water, keeping it cleaner for longer. Basins of different diameters and size are used (Fig. c).

iv. **Nipple drinker:** In this system, water comes out drop by drop when birds peck at the nipple. It provides clean and fresh water, prevents wastage, and is widely used in modern poultry farms i.e. both in deep-litter and in cage system (Fig. d).

v. **Bell type automatic waterer:** A round, bell-shaped drinker that hangs from above and is connected to a water pipeline. Drinker is automatically refills as birds drinks water, as needed a constant supply for the birds throughout the day (Fig. e).

vi. **Manual drinker:** A simple container, usually made of plastic or metal, filled with water by hand. It is also referred as "fountain drinkers" because water comes out of the holes like that in case of a fountain. Manual drinkers are popularly used for chicks during first week of brooding. It is easy to use and inexpensive, but requires frequent refilling and cleaning (Fig. e).




**Types of Poultry Waterer:**

**2. Other Essential Poultry Equipment:**

Apart from feeders and waterers, poultry farming requires several other essential tools for proper management. This equipment includes brooders heater, lighting and ventilation equipment, cleaning tools, feed storage bins, vaccination equipment etc. are essential to maintain the health of bird and hygienic environment in farm. The following are the additional essential equipments widely used in poultry farming.

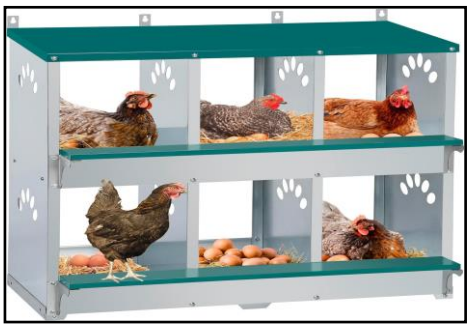
i. **Heating Equipment:** Heating equipment is used to keep chicks warm (maintain temperature around 35°C) during their early growth stage. A heat lamp, heat plate, or brooder heater can be used to generate heat in poultry houses. Infrared lamps are also widely used as an effective and safe source of heat.

ii. **Lighting equipment:** Lighting equipment is used to provide proper light inside the poultry house. Electric bulbs or LED lights help in regulating the growth of birds. They also play an important role in improving egg production in layer birds.

iii. **Incubator:** An incubator is used for the artificial hatching of eggs under controlled temperature and humidity. It provides the ideal environment for embryo development and healthy chick hatching.

iv. **Ventilation equipment:** Ventilation equipment is used to maintain fresh air and suitable temperature in the poultry house. Fans, curtains, and cooling pads help regulate airflow and remove excess ammonia, noxious gases and heat or humidity from the poultry house. Ventilated farm provides healthy environment to birds and comfortable site for better growth and production.

v. **Nesting Boxes:** Nesting boxes give hens a clean, safe, and comfortable place to lay eggs. They help in reducing egg breakage and contamination. Proper nesting boxes also encourage natural laying behavior in hens.



vi. **Perches/Roost:** Perches or Roost are wooden or metal rods placed inside the poultry house for birds to rest and sleep at night. They provide comfort and help birds follow their natural roosting behavior.

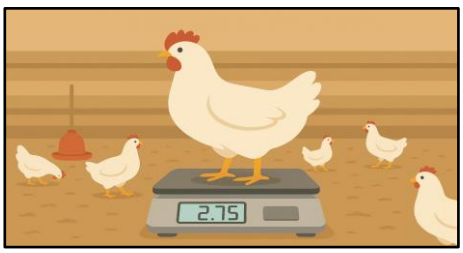

vii. **Rake:** A rake is made of iron rods fitted with a wooden handle. It is mainly used in the deep-litter system of poultry farming. The rake helps in loosening and turning the litter material to keep it dry and clean.

viii. **Egg Handling Equipment:** Egg handling equipment is used for the safe collection and storage of eggs. Egg trays and crates help in transporting eggs without damage. Candling devices are used to check egg quality and for grading purposes.


ix. **Cleaning and Sanitation Equipment:** Cleaning and sanitation equipment helps in maintaining the hygienic condition in the poultry house. Sprayers, foggers, and pressure washers are used to disinfect and clean the surroundings. This reduces the risk of diseases and keeps the birds healthy.

x. **Sprinkler:** Sprinklers are important in hot weather areas to cool poultry farms. They are used to spray water on the surroundings and the roof of farm buildings. In hot-humid conditions, sprinklers are used mainly to cool the roof during afternoon hours.

xi. **Weighing Machines:** Weighing machines are used to check the body weight and growth of poultry birds. Regular weighing ensures proper feeding management and better production.



**Suggested Tasks/Workouts:**

1. Identify the given picture of feeders and comment on its usage.
2. Identify the given picture of waterer and comment on its usage.
3. Identify the given picture of other equipment? and comment on its usage
4. Name any two essential poultry equipment other than feeders and waterers.
5. Fill the table with appropriate answers on types of feeder of poultry farm.

| Sr. No. | Types Feeder ⇨ / Criteria ⇩ | Trough Feeder | Pan Feeder | Tube Feeder | Linear Feeder | Circular Feeder | Shell grit box | Automatic Feeder |
|---|---|---|---|---|---|---|---|---|
| 1 | Use / Purpose | | | | | | | |
| 2 | Advantages | | | | | | | |
| 3 | Disadvantages | | | | | | | |
| 4 | Suitable for (Chicks / Adults / Both) | | | | | | | |
| 5 | Capacity (Few birds / Large flock) | | | | | | | |
| 6 | Maintenance needed (Low / Medium / High) | | | | | | | |
| 7 | Egg Quality (Good, Moderate, Bad) | | | | | | | |
| 8 | Expensive or Not (Yes/No) | | | | | | | |
| | | | | | | | | |

6. Fill the table with appropriate answers on types of waterer of poultry farm.

| Sr. No. | Types Waterer ⇨ / Criteria ⇩ | Pan and Jar watrere | Linear or Channel waterer | Water basin watrere | Nipple drinker | Bell type automatic waterer | Manual drinker |
|---|---|---|---|---|---|---|---|
| 1 | Use / Purpose | | | | | | |
| 2 | Advantages | | | | | | |
| 3 | Disadvantages | | | | | | |
| 4 | Suitable for (Chicks / Adults / Both) | | | | | | |
| 5 | Capacity (Few birds / Large flock) | | | | | | |
| 6 | Maintenance needed (Good / Moderate / Bad) | | | | | | |
| 7 | Expensive or Not (Yes/No) | | | | | | |
| | | | | | | | |

7. Fill the table with appropriate answers on other poultry equipments.

| Sr. No. | Criteria → / Other Equipments ↓ | Use / Purpose | Advantages | Suitable for (Chicks / Adults / Both) | Capacity (Few birds / Large flock) | Maintenance needed (Low / Medium / High) | Egg Quality (Good, Moderate, Bad) | Expensive or Not (Yes/No) |
|---|---|---|---|---|---|---|---|---|
| 1 | Heating Equipment | | | | | | | |
| 2 | Lighting equipment | | | | | | | |
| 3 | Incubator | | | | | | | |
| 4 | Ventilation equipment | | | | | | | |
| 5 | Nesting Boxes | | | | | | | |
| 6 | Perches/Roost | | | | | | | |
| 7 | Rake | | | | | | | |
| 8 | Egg Handling Equipment | | | | | | | |
| 9 | Cleaning and Sanitation Equipment | | | | | | | |
| 10 | Sprinkler | | | | | | | |
| 11 | Weighing Machines | | | | | | | |

## VIII. Health Care in Poultry

Keeping poultry healthy is very important for good egg and meat production, saving money, and taking care of the birds. Poultry health care includes steps to stop diseases, build strong immunity, and keep the area clean. This section looks at three key parts: spotting and managing common diseases, giving proper vaccines, and cleaning and disinfecting regularly. These actions help protect the birds from getting sick and support safe and successful poultry farming.

**Common Diseases:**

**1. Viral Diseases:**

**i. Newcastle Disease (ND)**

- Causative Agent: Avian paramyxovirus type 1
- Key Symptoms: Respiratory distress, coughing, nervous signs (twisting neck), drop in egg production
- Diagnosis: RT-PCR, virus isolation, ELISA, post-mortem lesions in trachea and brain
- Control Measures: Vaccination (live/inactivated), isolation of infected birds
- Prevention: Strict biosecurity, disinfect equipment, limit farm access

**ii. Avian Influenza (AI)**

- Causative Agent: Influenza A virus
- Key Symptoms: Sudden death, diarrhea, respiratory signs, facial swelling
- Diagnosis: RT-PCR, antigen detection, virus isolation
- Control Measures: Culling infected flocks, vaccination (inactivated)
- Prevention: Surveillance, movement control, wild bird monitoring

**iii. Infectious Bursal Disease (IBD)**

- Causative Agent: Birnavirus
- Key Symptoms: Swollen bursa, depression, immunosuppression
- Diagnosis: Bursa examination, ELISA, histopathology
- Control Measures: Vaccination at 2–3 weeks
- Prevention: Clean brooding area, reduce stress, proper litter management

**iv. Marek's Disease**

- Causative Agent: Herpesvirus
- Key Symptoms: Paralysis, tumors, weight loss
- Diagnosis: Histopathology, PCR, clinical signs
- Control Measures: Vaccination at hatch
- Prevention: Genetic resistance, dust control, sanitation

**v. Fowl Pox**

- Causative Agent: Avipoxvirus
- Key Symptoms: Wart-like skin lesions, diphtheritic plaques in mouth
- Diagnosis: Clinical signs, histology
- Control Measures: Wing-web vaccination
- Prevention: Mosquito control, coop hygiene

**2. Bacterial Diseases:**

**i. Fowl Cholera**

- Causative Agent: *Pasteurella multocida*
- Key Symptoms: Swollen wattles, septicemia, sudden death
- Diagnosis: Bacterial culture, PCR
- Control Measures: Antibiotics, vaccination
- Prevention: Rodent control, sanitation, clean water/feed

**ii. Salmonellosis**

- Causative Agent: *Salmonella pullorum, S. gallinarum*
- Key Symptoms: Diarrhea, poor growth, chick mortality
- Diagnosis: Culture, ELISA, serotyping
- Control Measures: Breeder vaccination, antibiotic treatment
- Prevention: Hatchery hygiene, feed testing, clean housing

**iii. Colibacillosis**

- Causative Agent: *Escherichia coli*
- Key Symptoms: Respiratory distress, peritonitis
- Diagnosis: Culture, antibiogram, necropsy
- Control Measures: Antibiotics based on sensitivity
- Prevention: Clean water/feed, ventilation, reduce overcrowding

**3. Parasitic Diseases:**

**i. Coccidiosis**

- Causative Agent: *Eimeria spp.*
- Key Symptoms: Bloody diarrhea, poor weight gain
- Diagnosis: Fecal exam, lesion scoring
- Control Measures: Anticoccidials in feed/water
- Prevention: Dry litter, proper drainage, hygiene

**ii. Worm Infestation**

- Causative Agent: Roundworms, tapeworms
- Key Symptoms: Poor growth, anemia, digestive issues
- Diagnosis: Fecal flotation, worm count
- Control Measures: Deworming medications
- Prevention: Pasture rotation, clean feeding areas

**4. Fungal Diseases:**

**i. Aspergillosis**

- Causative Agent: *Aspergillus fumigatus*
- Key Symptoms: Respiratory signs, lung nodules
- Diagnosis: Culture, histopathology
- Control Measures: Remove moldy feed, improve ventilation
- Prevention: Store feed properly, clean environment

**ii. Candidiasis**

- Causative Agent: *Candida albicans*
- Key Symptoms: White plaques in mouth/crop
- Diagnosis: Microscopy, culture
- Control Measures: Antifungal treatment
- Prevention: Hygiene, avoid antibiotic overuse

**Vaccination:**

Vaccination is a key part of keeping poultry healthy and productive. It helps protect birds from dangerous diseases like Newcastle Disease, Avian Influenza, and Marek's Disease, which can spread quickly and cause major losses.

Vaccination means giving birds a small, safe dose of a disease-causing germ (or a part of it) to help their bodies build protection. This way, if they face the real disease later, their immune system can fight it off.

**Types of Poultry Vaccines**

- **Live Attenuated Vaccines**: Weakened germs that trigger strong immunity (e.g., Newcastle Disease)
- **Inactivated Vaccines**: Killed germs, safe but may need booster shots (e.g., Avian Influenza)

- **Recombinant Vaccines**: Made using genetic engineering, often used for Marek's Disease

**Method of Application:**

- Through drinking water
- By spray
- As eye drops
- Or by injection, depending on the vaccine type

**Importance:**

- Prevents deadly outbreaks
- Reduces the need for antibiotics
- Keeps birds growing well and laying more eggs
- Supports safer, more sustainable farming

**Vaccination Schedule**

A vaccination schedule is vital for protecting poultry from deadly diseases and ensuring healthy growth. It outlines the right time and method to give vaccines, helping build strong immunity in broilers and layers. Following a proper schedule reduces disease risk, improves productivity and supports safe, sustainable poultry farming practices.

**1. Broiler Vaccination Schedule**

Broilers are raised for meat and have a short lifespan (about 6–8 weeks), so their vaccination schedule is brief but essential.

i. **Day 1** – *Marek's Disease Vaccine*
   - Given under the skin (subcutaneous)
   - Protects against paralysis and tumors

ii. **Day 5–7** – *Newcastle Disease + Infectious Bronchitis*
   - Given through eye drops or drinking water
   - Prevents respiratory infections

iii. **Day 10–14** – *Infectious Bursal Disease (IBD)*
   - Given through drinking water
   - Strengthens the immune system

iv. **Day 18–21** – *Newcastle Disease Booster*
   - Given again to reinforce immunity
   - Method: eye drops or water

**2. Layer Vaccination Schedule**

Layers are raised for eggs and live much longer (up to 72 weeks), so they need more vaccines over time.

**Brooding Stage (0–4 weeks)**

i. **Day 1** – *Marek's Disease Vaccine*
   - Subcutaneous injection
   - Early protection against tumors

ii. **Day 5–7** – *Newcastle + Infectious Bronchitis*
   - Eye drops or water
   - Protects lungs and airways

iii. **Day 10–14** – *IBD (Gumboro)*
   - Drinking water
   - Boosts immunity

**Rearing Stage (4–16 weeks)**

iv. **Week 6–8** – *Fowl Pox Vaccine*
   - Given by wing stab
   - Prevents skin and respiratory issues

v. **Week 8–10** – *Avian Encephalomyelitis*
   - Drinking water
   - Protects the nervous system

vi. **Week 12–16** – *Newcastle Booster*
   - Injection or water
   - Ensures long-term protection

**3. Cleaning and Disinfection**

Cleaning and disinfection are vital steps in poultry farming to keep birds healthy and prevent the spread of diseases. These practices remove dirt, waste, and harmful germs from the poultry house, equipment, and surroundings. Regular cleaning, followed by proper use of disinfectants, helps create a safe and hygienic environment for the flock.

**Maintaining Hygiene in Poultry Farms**

i. **Daily Cleaning**
   - Remove waste like litter, droppings, leftover feed, and spilled water.
   - Keeps the environment clean and reduces disease risk.

**ii. Disinfection**

- Apply disinfectants such as lime, formalin, iodine, phenol, or quaternary ammonium compounds.
- Target floors, walls, equipment, and water lines to kill harmful germs.

**iii. All-in All-out System**

- Raise birds of the same age group together.
- After one batch is removed, clean and disinfect the house before introducing new birds.

**iv. Biosecurity Measures**

- Limit visitor access and disinfect footwear and vehicles.
- Prevent entry of wild birds, rodents, and other animals that may carry diseases.

**v. Litter Management**

- Keep bedding dry and clean.
- Replace litter regularly to avoid moisture buildup and ammonia release.

**Suggested Tasks/Workouts:**

1. Give typer, causative agent, key symptoms and control measyes of following diseases

| **Disease** | **Type** | **Causative Agent** | **Key Symptoms** | **Control Measures** |
|---|---|---|---|---|
| Newcastle Disease (ND) | | | | |
| Avian Influenza (AI) | | | | |
| Infectious Bursal Disease (IBD) | | | | |
| Marek's Disease | | | | |
| Fowl Pox | | | | |
| Fowl Cholera | | | | |
| Salmonellosis | | | | |
| Colibacillosis | | | | |
| Coccidiosis | | | | |
| Worm Infestation | | | | |
| Aspergillosis | | | | |
| Candidiasis | | | | |

2. Enlist the diseases and their vaccine schedule

| Disease | Age | Vaccine Type | Mode of Application |
|---|---|---|---|
| Marek's Disease | Day 1 | | |
| Newcastle Disease (ND) | Day 7 | | |
| Infectious Bursal Disease | 14–21d | | |
| Fowl Pox | 4–6 wk | | |
| ND booster | 6–8 wk | | |
| Salmonella (breeders) | 10–12 wk | | |

3. Broiler Vaccination Schedule (Short lifespan: ~6–8 weeks)

| Age (Days) | Vaccine | Method | Purpose |
|---|---|---|---|
| Day 1 | Marek's Disease | | |
| Day 5–7 | Newcastle + Infectious Bronchitis | | |
| Day 10–14 | Infectious Bursal Disease (IBD) | | |
| Day 18–21 | Newcastle (Booster) | | |

4. Layer Vaccination Schedule (Long lifespan: ~72 weeks)

4.1 Brooding Stage (0–4 weeks)

| Age (Days) | Vaccine | Method | Purpose |
|---|---|---|---|
| Day 1 | Marek's Disease | | |
| Day 5–7 | Newcastle + Infectious Bronchitis | | |
| Day 10–14 | IBD (Gumboro) | | |

4.2 Rearing Stage (4–16 weeks)

| Age (Weeks) | Vaccine | Method | Purpose |
|---|---|---|---|
| Week 6–8 | Fowl Pox | | |
| Week 8–10 | Avian Encephalomyelitis | | |
| Week 12–16 | Newcastle (Booster) | | |

## IX. Study of the followings

### 1. Nutritional Value of Poultry Meat and Eggs

Poultry meat and eggs are both nutrient-dense animal products. Poultry meat is particularly valuable for its high protein content and low-fat profile, making it suitable for muscle maintenance and weight management. Eggs, on the other hand, offer a broader spectrum of micronutrients, including fat-soluble vitamins and choline, making them ideal for cognitive and developmental health.

**Nutritional Value of Poultry Meat**

i. **High-Quality Protein**
   - Rich in complete proteins (contains all essential amino acids)
   - Supports muscle growth, repair, and immune function

ii. **Low Fat (Especially Skinless)**
   - Skinless poultry is lower in saturated fat compared to red meat
   - Good option for lean protein in healthy diets

iii. **B Vitamins**
   - Especially B3 (Niacin) and B6: important for energy metabolism and brain health
   - Contains B12: essential for nerve function and red blood cell formation

iv. **Minerals**
   - Phosphorus: bone health and energy production
   - Selenium: antioxidant defense system
   - Zinc: immune function, wound healing, and taste perception

v. **Low in Carbohydrates**
   - Poultry meat is naturally carbohydrate-free

**Nutritional Value of Eggs**

i. **High-Quality Protein**
   - One large egg contains ~6g of complete protein
   - Egg protein is considered a biological standard (PER = 100%)

ii. **Rich in Healthy Fats**
   - Contains about 5g fat (mostly unsaturated)
   - Includes omega-3s (especially in omega-3-enriched eggs)

iii. **Excellent Source of Choline**
   - Vital for brain development and liver function

- One of the best dietary sources

**iv. Vitamins**

- Vitamin A: vision and immunity
- Vitamin D: bone health and immune function
- Vitamin B2 (Riboflavin) and B12: energy and red blood cells
- Vitamin E: antioxidant

**v. Minerals**

- Iron: especially in the yolk
- Phosphorus, Selenium, and Zinc

**vi. Antioxidants**

- Lutein and Zeaxanthin in yolk support eye health

**vii. Low Calorie**

- One large egg has about 70–80 calories

**Nutritional Comparison Chart (per 100g)**

| **Nutrient** | **Meat** | **Egg** |
|---|---|---|
| **Calories** | ~165 kcal | ~155 kcal |
| **Protein** | ~31g | ~13g |
| **Total Fat** | ~3.6g | ~11g |
| **Saturated Fat** | ~1g | ~3.3g |
| **Cholesterol** | ~85mg | ~373mg |
| **Carbohydrates** | 0g | ~1.1g |
| **Vitamin B12** | ~0.3µg | ~1.1µg |
| **Vitamin D** | ~0.1µg | ~2.0µg |
| **Iron** | ~0.9mg | ~1.2mg |
| **Selenium** | ~27µg | ~30µg |
| **Choline** | ~65mg | ~294mg |

**2. By products of Poultry Farming**

Poultry farming generates a wide range of by-products that go far beyond just meat and eggs. These materials once considered waste; are now valuable resources across agriculture, industry, and even biotechnology.

Below is the list of poultry by-products and their uses:

| By-product | Uses |
|---|---|
| **Feathers** | Processed into feather meal (high in nitrogen), used in fertilizers and animal feed |
| **Blood** | Converted into blood meal, rich in protein and amino acids; used in feed and fertilizer |
| **Manure** | Rich in nitrogen, phosphorus, and potassium; used as organic fertilizer or compost |
| **Eggshells** | Source of calcium; used in compost, seedling pots, crafts, and even chalk making |
| **Offal & Organ Meats** | Used in poultry by-product meal for pet food and livestock feed |
| **Hatchery Waste** | Includes undeveloped embryos and shells; processed into feed or fertilizer |
| **Poultry Litter** | Bedding mixed with droppings; composted for soil enrichment |
| **Fat & Skin Trimmings** | Rendered into oils or used in animal feed formulations |

**Sustainability & Economic Impact**

- These by-products help reduce environmental waste and support circular agriculture.
- They create additional revenue streams for farmers and processors.
- Advanced technologies like rendering and composting turn waste into high-value products.

**3. Economic Importance of Poultry Farming**

Poultry farming is far more than just raising chickens—it's a dynamic engine of economic growth, especially in developing countries like India. Below is a detailed overview of its economic significance:

**i. Source of Income**

- Provides regular income to farmers, especially small and marginal farmers.
- Low initial investment compared to other livestock businesses.

**ii. Employment Generation**

- Creates direct and indirect employment in rural and urban areas.
- Opportunities in breeding, feed production, hatcheries, transport, processing, and marketing.

**iii. Contribution to GDP**

- Poultry farming contributes significantly to the agriculture sector of a nation's Gross Domestic Product (GDP).
- In countries like India, poultry is one of the fastest-growing segments in animal husbandry.

**iv. Foreign Exchange Earnings**

- Export of poultry products (meat, eggs, processed items) helps earn foreign currency.
- Supports the economy through trade.

**v. Supply of Affordable Animal Protein**

- Provides high-quality protein at low cost, helping in nutritional security of the population.
- Supports public health and reduces malnutrition.

**vi. By-product Utilization**

- Poultry farming produces manure, which is a valuable organic fertilizer.
- Feathers and offal are used in various industries (e.g., pet food, fertilizers, craft items).

**vii. Women Empowerment**

- Backyard poultry is often managed by women, promoting their economic independence and empowerment in rural areas.

**viii. Market Linkages**

- Stimulates growth in related industries: feed, veterinary medicine, equipment, transport, and retail.
- Boosts the agribusiness ecosystem.

**ix. Scalability and Flexibility**

- Suitable for small-scale farms to large commercial operations.
- Can be adapted to urban, peri-urban, and rural settings.

**x. Short Generation Interval**

- Poultry has quick reproductive cycles, allowing rapid income turnover.
- Helps farmers recover investment and reinvest quickly.

## Field visit and submission of report

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# Practical Handbook of Poultry Farming (B. Sc. II SEC)

AS PER NEP-2020 (2.0) SYLLABUS OF SHIVAJI UNIVERSITY, KOLHAPUR (IMPLEMENTED FROM JUNE 2025)

ISBN: 978-81-991070-6-9

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Mob. No. 99223 95254

Bhumi Publishing

ISBN 978-81-991070-6-9
9 788199 107069