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# Smallholder Chicken Production Manual

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A FARMERS' TRAINING AND REFERENCE MANUAL TO INFORM  
DAY-TO-DAY PRODUCTION DECISIONS

TPGS/ILRI  
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## LIST OF ABBREVIATIONS AND ACRONYMS

<b>AsCGG</b>	Asian Chicken Genetic Gains project
<b>AMR</b>	Antimicrobial Resistance
<b>CBA</b>	Cost Benefit Analysis
<b>CP</b>	Crude Protein
<b>DOC</b>	Day Old Chicks
<b>ECI-Africa</b>	Emerge Centre for Innovations – Africa
<b>FAO</b>	Food and Agricultural Organization of the United Nations
<b>GHG</b>	Green House Gases
<b>IP</b>	Innovation Platforms
<b>IR</b>	Infra-Red bulbs
<b>Kcal</b>	Kilo calories
<b>Kg</b>	Kilo grams
<b>ME</b>	Metabolizable Energy
<b>MJ</b>	Mega Joules
<b>NGO</b>	Non-Government Organization
<b>NIAS</b>	National Institute of Animal Science-Vietnam
<b>SFRB</b>	Scavenging Feed Resource Base
<b>ToT</b>	Training of Trainers
<b>VC</b>	Value Chain

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## PREFACE

Chicken farming has become a rapidly growing sector in livestock and agriculture worldwide, with small, medium, and large-scale operations emerging. Many people rely on it as a primary or secondary source of income; Others lack the capacity and access to reliable information and guidelines for managing chickens effectively.

Improving the productivity of village chicken flocks can significantly benefit farmers with limited resources, boosting their income and improving their diet. There is a shift towards market-oriented and knowledge-based production methods, which are essential for those planning to engage in commercial layer and broiler production.

This manual resulted from the Asian Chicken Genetic Gains (AsCGG) project, implemented from 2020 to 2024 in Cambodia, Vietnam, and Myanmar. The project aims to enhance smallholder chicken systems by providing high-producing, farmer-preferred genotypes, and associated technologies to increase productivity and lift farmers out of poverty. The AsCGG project focuses on four pillars: adapting high-producing chicken genetics to low-input systems, utilizing farmer-preferred breeds, empowering women, and fostering innovation through the Innovation Platforms (IP) across the value chain.

Through the IP stakeholder engagement process, the chicken value chain stakeholders identified areas where capacity-building was needed. To address these gaps, the project team collaborated with Emerge Centre for Innovations - Africa (ECI-Africa), the implementing partner overseeing the IP process. Together, they designed and developed this training and reference manual covering the identified capacity gaps.

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## **MODULE 1**

### **OVERVIEW OF THE MANUAL**

**Manual Description:** This manual aims to improve the skills and knowledge of chicken farmers and value chain actors to contribute to the growth of the chicken sub-sector. It is intended to serve as a training and reference resource for practical chicken production and a guide for day-to-day management decisions. Extension workers, development practitioners, NGOs, and new farmers interested in chicken production can also benefit from this manual.

**Manual Contents:** The manual covers issues, including chicken housing, management, health care, feeding, marketing, record keeping, and production challenges commonly faced by chicken farmers. The recommended actions provided in the manual are intended to guide rather than prescribe "must-do" actions.

**Key objectives of the manual:** The manual aims to provide chicken production knowledge and skills to extension/ development practitioners and chicken farmers to:

- Improve the quality of training for chicken production and productivity
- Motivate value chain actors to transition from low-level to higher-performing market-oriented chicken farming
- Provide knowledge for new farmers entering the chicken production business
- Train trainers who can further cascade the training to smallholder farmers
- Highlight the importance of upscaling and market orientation of production

**Key Outcomes:** Using the manual, users/training participants are expected to:

- Develop technical skills to provide technical support and training to farmers in productive chicken production
- Enhance farmers' capacity to run efficient and profitable chicken production
- Contribute to reorienting chicken production to meet market requirements

#### ***TOPIC 1.1: Target audience (for whom is the manual intended?)***

This manual is a reference and training resource material that the following target audience can primarily use:

*Farmers:* These may be men and women already raising poultry or have shown interest in poultry production but require further knowledge.

- Farmers already engaged in chicken production can use the manual as a reference to help them make day-to-day/timely decisions to run their farms;
- Farmers already producing chicken who want to upgrade the performance /market orient their chicken enterprise by applying the technical knowledge in the manual to uplift their farms to a higher level;
- New farmers going into the chicken business can get information on what they need to know to run a successful chicken production business.
- *Types of farms:* This manual provides fundamental guidance for emerging market-oriented chicken farmers focusing on semi-intensive farms rearing 500-2000 chickens. It is not aimed at subsistence-based backyard production that is expected to be upgraded shortly, although many principles in the manual may apply.

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*Development practitioners:* The technical content is also a helpful guide to help development practitioners, including government extension agents, development partners/NGOs, and others interested in helping develop chicken production and, thereby, the livelihoods of communities. These actors can use the manual as a:

- *Training resource:* The technical content can be covered at the Training of Trainers (ToT) training level and down the ladder to chicken farmers. Trainers trained at the TOT level can use it to train chicken farmers who will use the knowledge and skills gained to modernize and market-orient their chicken production businesses;
- *coaching guide:* to provide continuous technical support and monitoring of progress

### ***TOPIC 1.2: Principles, structure, and relevance of the reference/ training manual***

The manual covers various subjects that can be customized based on the producer's needs. It serves as a reference and training for farmers in different chicken production segments. It aims to balance brevity and simplicity while addressing diverse chicken farming issues. It is organized into ten modules, each describing contents and expected outcomes. Technical content is presented in topics within each module to guide farmers in assessing their practices and creating development /improvement plans.

**Module 1:** Overview: Describes objectives, outcomes, target audience, structure, and recommendations for using the manual.

**Module 2:** Chicken Production Business: Focuses on smallholder chicken farmers' livelihoods, market orientation, and considerations in starting a small-scale chicken production business.

**Module 3:** Housing and Equipment: Covers the basic requirements of a chicken house, types of housing systems, site selection, construction, cleaning, and disinfection. It also includes descriptions of different equipment used in chicken houses.

**Module 4:** Chicken Breeds: Describes different chicken breeds for various production objectives/systems and the importance of using appropriate breeds.

**Module 5:** Chicken Feeds and Nutrition: Focuses on types of chicken feed categories, characteristics of a good chicken diet, buying feeds, home mixing, feed storage, and feeding management for optimum efficiency.

**Module 6:** Chicken Health and Disease Prevention: Covers disease prevention measures such as biosecurity, vaccination, and dealing with disease occurrence.

**Module 7:** Management of Different Classes of Chicken: Describes the management of chicks, pullets, layers, and other classes of chicken.

**Module 8:** Marketing Chicken and Chicken Products: Focuses on the marketing of chicken and chicken products such as eggs, chicks, pullets, and spent hens.

**Module 9:** Handling and Transportation of Chicken and Eggs: Covers appropriate handling and transportation of different classes of chicken, as well as handling, storage, and transport of eggs.

**Module 10:** Records and Record-Keeping: Describes the importance of records and record-keeping as a management tool in chicken farming for monitoring, evaluating, and improving the business.

**Appendices:** Provides additional technical details and information as checklists for routine activities, problem identification, and remedial action.

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### **TOPIC 1.3: How to use the manual as a training and reference resource**

The manual is intended to serve as a training and reference manual for different actors associated with chicken production.

○ ***The manual as a training resource:***

- *Master Trainer Training:* Master trainers can use the technical content of the manual to train ToT trainers, along with facilitation skills.
- *ToT Trainer Training:* Master trainers can train ToT trainers, who will then train farmers.
- *Farmer Training:* Trainers who have completed ToT training can use the contents to train chicken farmers.

The contents can be tailored to the needs of each beneficiary based on the problem to be addressed/need. It can also be packaged by selecting technical content for a target group. For example, farmers focusing on chick-rearing may not need training on pullet or layer management, egg handling, etc. Topics directly relevant to chick-rearing can, thus, be packaged and delivered to this group.

○ ***Use as a Reference Manual***

This manual can also serve as a practical reference tool for different categories of beneficiaries. Target users and the support they can obtain from the manual include:

- *Chicken farmers and value chain stakeholders:* Informed day-to-day management decisions and planning for farm improvements/upgrades.
- *Extension workers and development practitioners:* Backstopping, technical support, and coaching for chicken farmers.

○ ***Manual as a guide for short- and long-term farm improvements/upgrades:***

- *Short-term Improvement Plan:*
  - ✓ Technical contents help farmers identify challenges and develop improvement plans.
  - ✓ The appendix includes a list of common mistakes, a troubleshooting guide for early problem identification, and recommended remedial actions.
  - ✓ Farmers can create individualized development/improvement plans and prioritize actions to upgrade their operations using improvement/development plan templates presented at the end of each module.
- *Long-term Development Plan:*
  - ✓ Farmers can use the manual to plan upgrades/shifts in farm operations, from extensive backyard to semi-intensive scavenging, small-scale intensive, and large-scale commercial. At the end of each module, personalized improvement/development plan templates are provided for farmers/trainees. These plans are designed to assist them in tackling farm-related challenges discussed in the module. Farmers are encouraged to utilize these templates for planning and implementing farm improvements. The plans should be consistently used, allowing farmers to address priority challenges first and prepare for additional categories of challenges.

○ ***Presentation of the manual:***

The manual can be condensed into smaller versions in local languages. These abridged versions can be printed pocket-size for easy reference, decision-making, and prompt action. Additionally, using durable materials for the paper and cover can ensure the manual lasts longer.



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## **MODULE 2**

### **CHICKEN FARMING AS A BUSINESS**

**Description/introduction:** Establishing a successful chicken production farm business requires careful planning, efficient management, and a solid understanding of the industry. This module provides valuable guidance on setting up and managing a farm, emphasizing the importance of business principles and market demand. Its objective is to raise awareness among current and potential chicken farmers about the profitability of the business. The module covers essential considerations, including farm planning, required skills, and choosing the right starting point (eggs, chicks, or pullets).

**Key module learning outcomes:** Upon completing this module, training participants and chicken farmers will be equipped to make informed decisions based on business knowledge and technical skills. Ultimately, they can start a chicken farming business at an appropriate location and size based on market demand rather than subsistence operations.

#### ***TOPIC 2.1: Chicken farming in household livelihoods and as a business venture***

##### ***○ Chicken products in household nutrition***

Protein deficiency is a major problem affecting weight, height, and cognitive learning, particularly in children. Inadequate protein and other nutrient intake in children can cause physical and mental retardation, stunting, and increased susceptibility to diseases. Chicken products, such as meat and eggs, offer high-quality protein sources that can improve human nutrition and food security. Eggs, for example, contain all vitamins except vitamin C, and incorporating an egg and some chicken meat into the daily diet can address the protein requirement of growing children. Nutrients in chicken products are also highly bio-available and small, consumable units of high nutritional value that can effectively supplement plant-based diets and improve overall family nutrition.

##### ***○ Chicken production in household wealth and job creation***

- Chicken production generates self-employment opportunities for household members and contributes to diversifying household economic enterprises.
- Chicken development offers unique opportunities for women, as promoting chicken production can be particularly beneficial and empowering for women at both the family and societal levels. Income from poultry often serves as one of the few significant sources of income for women.
- The chicken production business has the potential for high profitability when given the right inputs and attention.

##### ***○ Market orientation/commercialization of chicken farming for wealth and job creation***

Village/backyard chicken farming is a subsistence production system with low inputs and outputs. However, there are economic opportunities in commercializing chicken production and transitioning farmers to higher-value production under more intensive modes. This can be achieved through upgrading to semi-intensive/improved free range (level 1), small-scale specialized chicken production (layer, broiler) under intensive management with a focus on market production (level 2), and higher vertically integrated production (level 3). See Table 1 for a summary of the three levels of the market-oriented output.

- *Level 1:* Improved free range/Semi-Scavenging/Semi-intensive system: Farmers fence their birds in an enclosed area, where they can access forage plants and insects, supplemented with forages like alfalfa. This reduces chicken mortality and improves performance, increasing income for smallholder farmers.
- *Level 2:* Intensive system level: Specialized hybrid chickens are managed in a confined system with a complete diet supply and standard management.
- *Level 3:* Vertically Integrated level: Farms integrate with other value chain actors, running their entire production process from production to marketing and selling products directly to vertically integrating firms. This creates conditions for higher production and cost minimization for farmers.

**Table 1. Levels of market orientation of chicken farming**

Criteria	Level 1. Improved free range/Semi-intensive	Level 2. Small scale Intensive	Level 3. Vertically integrated intensive system
<b>Flock size</b>	50-100 birds or above	500-2000 birds	More than 2000
<b>Inputs</b>	Medium	High	High
<b>Purpose</b>	Home consumption/income generation	Income generation	Income generation
<b>Genotypes</b>	Improved dual-purpose	Specialized hybrids	Specialized hybrids
<b>Feed Source</b>	Scavenging+ Supplementation	Commercial feeds	
<b>Disease control</b>	Moderate biosecurity and vaccination coverage	Various vaccination schemes	High level of biosecurity and vaccinations
<b>Housing</b>	Simple housing made of local material with a run	Housing made of conventional material	High-standard intensive housing
<b>Annual egg production</b>	150-180	250-300	>300
<b>Market orientation</b>	Moderate (Based on need)	High (Must have readily available market)	High (Must have readily available market)

**TOPIC 2.2: Chicken production as a business venture**

○ ***The attractiveness of smallholder chicken production as a business venture***

Chicken production provides significant business opportunities and can be conducted at large and small scales, accessible to different types of producers, including jobless youth, women, and interested investors. It is suitable for market orientation/commercialization/job creation because:

- Initial start-up costs are relatively low, making it reasonably accessible to most small-scale producers.
- The chicken business can be lucrative with the right inputs, attention, and appropriate market development and linkages.
- Chickens require minimal space and labor for production, and adjustments can be made for different climatic conditions (e.g., the type of housing).
- It can be a year-round income source and generate revenue faster than other livestock enterprises.
- Chicken meat and eggs are in high demand and will continue to be so due to fast population growth, urbanization, and a shift towards white meat due to its lower impact on climate change.
- Housing and other structures can be built using locally available materials.
- Chicken production complements other farm enterprises, contributing to improved overall farm efficiency.



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- Experience: commercial chicken production requires knowledge, experience, and skills. It is advisable to start small and expand with increasing expertise.
  - Land available: Determine the size of the envisaged farm. Large farms can be established on a small area of land using high-tech systems, e.g., the Cage management system.
  - Useful to know the competition to be faced, e.g., the numbers of chicken farmers and types of products targeting the same market, the volume of products available, etc.
  - Before you start, it is helpful to get a chicken/egg production business/feasibility plan based on the previous assessments and the following:
    - ✓ *Technical feasibility*: Suitability of climate of the area, availability of inputs such as chicks, feed, medicines, etc., technical norms, infrastructure available for veterinary support, marketing, training, and experience of the beneficiary
    - ✓ *Financial viability*: cost and loan requirement; input costs for chicks, feed, veterinary services, and other overheads; output costs, i.e., the sale of eggs, culled birds, for meat, manure, empty gunny bags, etc., income-expenditure statement and annual gross surplus, cash flow analysis, repayment schedule, i.e., repayment of principal loan amount and interest
  - **Site selection**: Choose a suitable location for your farm. The location of a chicken farm is crucial for the business's success. The following are the primary considerations:
    - *Infrastructure*: Transport for input supply and product marketing; Power and water supply; Market availability; sufficient space for the housing of the chickens and subsidiary structures.
    - *Labor availability*: numbers and skill level are important considerations depending on the operation size and level of technology use.
    - *Climatic conditions*: temperatures >30°C can negatively impact productivity and/or require additional investment for climatic control.
    - *Presence of other farms*: advisable to locate your farm as far away from other chicken farms as possible for biosecurity.
  - **Identifying and selecting the value chain segment to engage in**  
Choosing the optimal chicken value chain segment for your farm to maximize benefits from your effort/investment. Options include focusing on input supply (such as DOC, feed, pullet), egg production, or service provision (such as vaccination or veterinary services). Considerations for selection include:
    - Skill and previous experience in the value chain segment like input supply, production, marketing, processing, etc.
    - Locational and related advantages you may have;
    - Access to resources: land, capital, etc.
    - Feasibility of the enterprise to your situation/objective realities;
    - Interest
  - **Deciding from what to start (eggs, chicks, pullets, start-of-lay pullets)**  
After selecting the type of chicken enterprise, you can choose what to start from. This depends on the choice of enterprise. If you, for example, want to engage in layer/egg production, you will have different

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options to start your farm. The strengths and weaknesses of each option to help you make a knowledge-based decision are described.

- *Start from hatching eggs:*
  - ✓ It is an option if you have the possibility of hatching on the farm;
  - ✓ Source of fertile eggs (own or other) needed
- *Start from day-old chicks:* this is an option for the supply of day-old chicks. It is probably the most economical and practical way to start for the following reasons:
  - ✓ Chicks are less likely to carry disease and parasites than older birds, especially if you buy them from a reliable hatchery.
  - ✓ Chicks from local or external sources can be transported to the farm within 24 to 48 hours of age.
  - ✓ You don't have to guess how old the birds are.
  - ✓ There may be a possibility to order sexed chicks. Under such circumstances, it is possible to purchase female chicks only- This is what is desirable for an enterprise targeting egg production.

For many chicken farmers, chicks may not be the best way to start due to the following limitations:

- ✓ Require special brooding care and facilities: They must be kept warm and protected, especially during the early production period.
  - ✓ Need time to mature: If you want chickens for eggs, it will be at least five months before chicks grow and begin to lay eggs – You will need to be patient and have the resources to spend before getting income.
  - *Start from 21-day-old chicks/young pullets:* Some chicken farmers raise chicks and sell at about 21-day-old chicks or young pullets of three months of age - You may choose to start from such birds.
    - ✓ Difficult to know how old they are. Many chick rearers misinform about the age of the growers.
    - ✓ They may have been exposed to many diseases and are more likely to have parasites than chicks.
    - ✓ They may have been poorly managed. In most cases, poor management will manifest after the start of lay (proper management at an early age has implications on lifelong productivity).
    - ✓ You may still have to wait for some time before you get revenue from your enterprise.
  - *Start from start-of-lay pullets:*
    - ✓ You may worry that baby chicks will be too difficult to raise, or you may want egg production immediately. In these cases, your best bet is to start with adult birds (start of lay pullets).
    - ✓ If you are getting your birds from a seller, check the health status (at least physically). Look for active, alert birds in clean surroundings. Sick birds may look fluffed up and listless. Nasal discharge or runny eyes are other signs of illness. The birds shouldn't be breathing fast with open beaks.
- ***Deciding on the system of production to follow***

Determine the production system based on chosen enterprise, with various production systems and management outlined elsewhere in the manual.
  - ***Choosing the appropriate breed***

Select the appropriate breed based on chosen enterprise. Some are breed options outlined in the manual's breed section.

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### ***TOPIC 2.3: Cost-benefit analyses of chicken businesses***

Profitability is a crucial factor in choosing a business enterprise. People typically start a business to support their families and cover expenses such as education and healthcare. Therefore, profitability should be a primary consideration when selecting an enterprise. The following steps are necessary to ensure profitability:

- *Identify cost components or expenditures:* Record all expenses related to the business, including:
  - Startup costs and capitalization, such as land, housing, equipment, permits, and licenses required to start up the business;
  - Operating expenses like input purchases, rent, transportation, salaries, and other day-to-day costs associated with running the business.
- *Estimate revenue and profit projections:* Based on market demand and production capacity, project the expected revenue and profit of the business.
  - *Identify sources of income (sales revenue):* Determine the income generated from various farm products, such as eggs, composted litter, spent hens, and extra males.
  - *Conduct a cost-benefit analysis:* Calculate the enterprise's profitability by subtracting the production cost from the sales revenue.

$$\text{Profit} = \text{Sales (Income/revenue from the chicken business)} - \text{Cost of production (Expenses incurred in the production process)}$$

Regularly performing this analysis requires keeping records. It helps assess the viability of the business, make informed investment decisions, and take timely corrective measures when needed.

#### ***Tips for increasing profits (cost-saving and income enhancement strategies)***

Profits = Revenue – Expenditure. To increase profits, a business must, thus, decrease costs and increase sales. Farmers need entrepreneurship skills to plan, select enterprises, budget, and analyze costs and benefits. Accurate record-keeping is essential. Seek help from development agents for professional assistance.

- *Cost saving measures: include reduction or avoiding some costs*
  - Avoid wastages, e.g., Feed,
  - Use the right breed for the type of management you are using. E.g., It is better to use specialized layer breeds for intensively managed production and use the appropriate inputs and management for optimum efficiency. Using dual-purpose chicken for this type of management (or vice versa) will not be as efficient.
  - Apply appropriate biosecurity and disease prevention measures to reduce mortality losses and reduced production due to diseases
- *Income enhancement strategies:* Income-enhancing measures will also improve profit margins. Such measures include:
  - Producing good quality products, you can sell at better prices;
  - Promote your products for selling at better-paying markets;
  - Reduce your marketing costs, e.g., transport;
  - Reduce product loss, e.g., egg breakage and similar losses.

- *Manage your finances:* Efficient financial management practices are crucial for the economic sustainability of your chicken production farm. Consider the following guidelines:
  - ***Keep an accurate daily record of your finances:*** This record will track where the money comes from and where it goes. In addition, this record (called a cash book) will help you to know how your business is doing. Without records, you can never know whether you are making a profit or a loss and make informed financial decisions.
  - ***Cost Analysis:*** Regularly analyze production costs to identify areas where you can reduce expenses and improve efficiency. Monitor costs such as feed costs, labor costs, veterinary services, and energy expenses. Explore opportunities to optimize resource allocation and negotiate better prices with suppliers.
  - ***Put money in savings regularly:*** You should not wait till the end of the month to start saving. Instead, try to set aside a small amount each day. This becomes very useful during emergencies.
  - ***Minimize selling your products /services on credit and allowing too many long-standing debts:*** Some farmers fear losing the sale if they do not give credit. But it is not a sale until it is paid for. When you give so much credit to your customers that you do not have enough cash to restock, the customers will go to other enterprises, and your business will fail.

Money owed to you by people is yours, and you need it to support your business. You need to set your terms up front and plan to collect the payment if you have to sell some of your products on credit.

### Development action plan to apply knowledge/skills

List your priority challenges for upgrading your chicken farming business to a higher level. Indicate the action(s) required to address them and the date you commit to completing the action/activity.

Challenges related to upgrading your chicken business to a higher level (Examples)	Action (s) to address the challenge	Action completion date	Remarks
Challenge 1: Shortage of finance	Action 1: Identify/quantify your financial needs	July 25, 2023	
	Action 2: Identify possible sources of finance	July 30, 2023	
	Action 3: Fulfill requirements for securing the finance (e.g., credit from a micro-finance institution)	August 30, 2023	
	Action 4: Secure finance	October 30, 2023	
Challenge 2: ??*	Action 1		
	Action 2		
	Action 3:		

\* Identify and prioritize other challenges and plan for appropriate action as shown in the example for challenge 1. These could, for example, be space, genotype supply, feed supply, etc.



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## MODULE 3

### HOUSING AND EQUIPMENT

**Description/Introduction:** Providing appropriate housing, equipment, and a conducive environment is crucial for the well-being, comfort, and productivity of your chickens. Affordable housing options can fulfill the basic requirements, but farmers should also learn how to manage the chicken house effectively. This module will guide you through the various aspects of chicken housing, including ventilation, lighting, bedding, selecting the necessary equipment, and environmental management practices.

**Key learning outcomes:** After completing this module, participants/farmers will be able to:

- Understand the essential needs of chicken housing.
- Choose the appropriate type of chicken housing based on their requirements.
- Select a suitable location and site for constructing a chicken house.
- Manage chickens comfortably by maintaining optimal environmental conditions such as temperature, humidity, light, ventilation/airflow, and controlling ammonia and dust levels.
- Determine the minimum floor space, feeder, drinker, and laying nest requirements based on the type and age of chickens.
- Familiarize themselves with various types and options of chicken equipment.
- Understand the proper steps for disinfecting a chicken house.
- Maximize production, productivity, and profitability in their chicken business.
- Develop and implement an actionable plan to address housing and disinfection challenges.

#### **TOPIC 3.1. Chicken houses and housing**

- Basic requirements for a good chicken house:
  - Economical and durable construction
  - Maximizes the genetic potential of chickens and reduces production costs
  - Provides sufficient space for movement
  - Suitable for local agro-climatic conditions and ensures proper micro-climate for the birds
  - Includes adequate lighting, ventilation, temperature control, and protection from drafts and rain
  - Ensures good health, biosecurity, and welfare of the chickens
    - ✓ Allows for easy cleaning and efficient operations
    - ✓ Prevents entry of rodents and wild birds
    - ✓ Maintains an appropriate distance from other buildings
    - ✓ Protects against predators
- Site selection considerations for chicken house construction:
  - Land requirements:
    - ✓ Elevated and well-drained with sandy soil preferred
    - ✓ Sufficient space for all planned structures and potential expansion
    - ✓ Consider prevailing wind direction to avoid flow towards residences or chicken entry points
    - ✓ Ensure availability of the necessary infrastructure like water, power, telephone, and road access
- Farm layout considerations:
  - Small farms only require one house and don't need specific layouts
  - Medium and large farms need careful planning for building placement
  - Key principles for layout:



- ✓ Prevent visitors and outside vehicles from approaching the birds
  - ✓ Arrange houses so fresh air flows through the brooder shed first, followed by the grower and layer sheds, to prevent diseases from spreading.
  - ✓ Place the egg store, office, and feed store near the farm entrance to minimize movement around the chicken sheds.
  - ✓ Construct the disposal pit at the far end of the site.
- Considerations for constructing a chicken house:
- Use locally available, durable, easy-to-clean, and cost-effective materials, avoiding sharp-edged objects to prevent injury to chickens and humans.
  - *Orientation:* Orient the house with the narrow ends East-west and the long side extending North-South for reduced direct sunlight, solar heat, and increased bird densities.
  - *Length:* Rectangular shape provides better natural ventilation, with the length determined by the number and age of chickens and available land.
  - *Width:* should not exceed 9 meters for adequate natural ventilation, especially in hot weather.
  - *Roof height:* should be 2.5-3.5 meters above ground, higher in warmer climates, and split in very hot temperatures (25° and 40° angles).
  - *Foundation* with solid concrete blocks or bricks, 30-45cm below and above ground level.
  - *Floor:* Cement concrete floor is preferred for disease control, easy cleaning, and prevention of insect, rodent, worm, and seepage issues. Extend the floor base 45cm outside the wall to deter rodents.
  - *Sidewalls:* At least two sides should be open, with the lower portion solid and the upper part fitted with small-gauge (½") wire netting to prevent the entry of birds, cats, and rodents. Providing openings or low-built walls, about 1-meter height (max of 1.5 meters), will provide sufficient ventilation without exposing the chicken to draft at bird level. Open sides can be closed with suitable material during colder periods.
  - *Roof and overhang:* should be rainproof, thatched for small farms, or made of iron sheets and wood. Eaves should extend 1-1.25 meters, longer in areas with heavy rainfall (Thumb rule: half the window height).
  - *Lighting:* Hung from the ceiling at 220-250cm above ground level. Incandescent bulbs should have a distance of 300cm, while fluorescent lights (tube lights) should have a gap of 450cm between them.

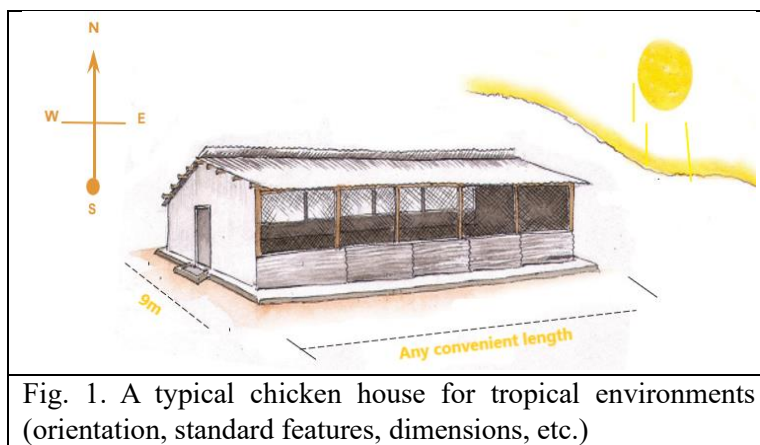


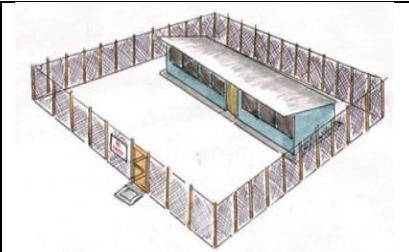
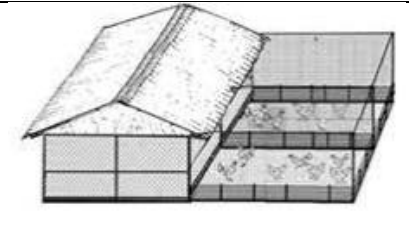
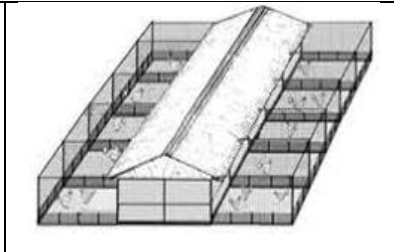
Fig. 1. A typical chicken house for tropical environments (orientation, standard features, dimensions, etc.)

- Accessory structures for the chicken house:
  - ✓ Entrance/change room for attendants to change clothing, disinfect shoes, and wash hands before entering the stable.
  - ✓ Feed store with enough space for one week of feed for the chickens.
  - ✓ Washbasin for cleaning equipment like drinkers with proper closed drainage.

### Types of chicken houses

The housing and equipment required depend on the production objectives, the number of chickens housed, and the production system used.

- *Extensive chicken houses*: A system where chickens can access outdoor areas to forage and exercise. These houses provide shelter and nesting spaces for the chickens but allow them to roam freely and scavenge for feed in a larger designated area. The outdoor area may be enclosed with fences to protect the chickens from predators. This system promotes natural behaviors and is often used for organic or free-range production.
- *Semi-intensive chicken houses*: Combines free-range and confinement housing.
  - ✓ *Run system*: Enclosed area with fences (1.5-2m high) for scavenging and exercise, with egg nests, feed, and water provided in the shed/house. The top can be covered with mesh wire or local materials for protection.
  - ✓ *Moveable house*: Low-cost sheds that accommodate free-range chickens and provide night shelter. It is equipped with nests and perches. Birds can access surrounding fields during the day for scavenging. Suitable for peri-urban areas and integrated into cropping by moving chickens around within blocks of open land.

		
House with exercise area/run	Partitioned exercise area on the front side of the house/Shelter	Partitioned exercise area on both sides of the house/Shelter
Fig. 2. Semi-intensive chicken housing		



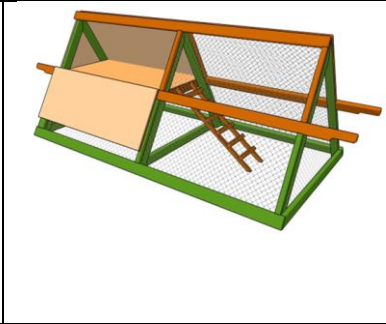
		
Fig. 3. House with exercise area/run- Vietnam- Photo: NIAS	Fig. 4. Raised shelter	Fig. 5. Moveable shelter



Fig. 6. Different locally made cage housing for chicken- Vietnam; Photo: NIAS-Vietnam

- *Intensive chicken houses:* housing where chickens are confined indoors for their entire lives. Require more investment in housing and facilities. The type and degree of technology use depend on the climate and available capital.
  - ✓ *Open houses:* have two open sides and a roof overhang to protect chicks from rain and sun. They use wire mesh for the sides in warm/hot areas.
  - ✓ *Open front houses:* similar to open houses but have only one side open, suitable for temperatures ranging from 15-30°C.
  - ✓ *Curtain houses:* have adjustable curtains on both sides, allowing climate control. The maximum opening of the curtain depends on the local climate, ideally 1.5m in warm areas and 0.3-0.6m in cold temperatures.



Fig. 7. Open houses



Fig. 8. Curtain house: Without curtain covered (left); covered with curtain (right)



## Housing/Rearing Systems

An intensive rearing system is commonly practiced for hybrid chickens, requiring careful attention for optimum production. Two types of intensive housing/rearing systems are available: deep litter/floor rearing and slatted floor system.

- *Deep litter/Floor rearing system:*
  - ✓ Chickens are reared on a floor covered with 5-10cm of clean litter material.
  - ✓ Linear or round feeders with 10cm of space per 12-15 birds should be provided.
  - ✓ Drinker space can be half the feeder space, with a long basin for 35-40 birds and water guards to prevent spills.
  - ✓ Nests with clean materials should be placed in the darker part of the house, with one nest for 5-6 birds.
  - ✓ The type of litter depends on availability and should absorb water while being kept dry.
  
- *Slatted floor system:*
  - ✓ Similar to a deep litter system, but with a raised, cleaner, and more hygienic floor.
  - ✓ The floor is made of wire or wooden slats/platforms, approximately 60cm above the ground.
  - ✓ Chicken droppings are collected below the slats, and the floor can be removed for cleaning.
  - ✓ Slatted floors are more expensive but minimize issues with wet bedding and coccidiosis.
  - ✓ Slats can be full (covering the entire house) or partial.



## Environmental management in chicken houses

Environmental conditions impact the well-being and health of humans and birds. Respiratory, digestive, and behavioral disorders are more likely in substandard climatic conditions.

- *Measuring and assessing temperature:* Birds are reliable temperature indicators; observe them at rest for accurate assessment. Measuring temperature is a common and inexpensive method to evaluate the house climate. Place thermometers close to the birds for accurate readings. Optimal temperatures for layers are between 20-24°C; higher temperatures affect eggshell quality and weight. Birds require an additional 1.5g of feed daily for every 1°C below 20°C.
- *Relative Humidity:* Maintain house humidity below 70%. Chicks require humidity between 75-80% to prevent drying out. Measure relative humidity to identify respiratory disorders caused by high or low humidity.

- 
- *Ventilation/air movement:* Ventilation improves air quality, removes heat, excess moisture, harmful gases, and reduces dust. Ventilation in open-sided houses can be managed by adjusting curtains based on temperature. Construct houses to utilize prevailing winds for natural ventilation. Houses with a width of 9 meters or less and high-pitched roofs provide good natural air movement.
  - *Lighting:* Lighting intensity and duration influence chick growth and egg production. Layers benefit from approximately 14 hours of light per day. Artificial lighting can be used to extend the day.
  - *Litter management:* Litter condition affects chick intestinal health and profitability.
    - ✓ Spread litter (e.g., wood shavings, rice husks) to a 5cm depth on the floor.
    - ✓ Ensure litter remains dry; rake it thoroughly at least twice a week.
    - ✓ Monitor wet litter conditions, especially during cold and rainy seasons, and near watering utensils. Wet litter releases toxic gases like ammonia, impacting bird health and promoting disease. Remove dirty, wet, or caked litter and replace it with fresh litter.

### ***TOPIC 3.2: Cleaning and disinfection of chicken houses***

Clean the house immediately after evacuating the birds to prevent the accumulation and spread of disease-causing agents. Follow these steps for effective cleaning and disinfection of the chicken house:

#### **Step 1: Remove organic matter**

- Take out all the litter from the entrance of the chicken house.
- Dispose of the litter as far away from the houses as possible.
- If the litter is used in the fields, work it into the soil to prevent recontamination.
- Remove all feeders, drinkers, and equipment. Wash and disinfect them. Soak the feeders and drinkers in disinfectant for a few hours, then rinse them with water and expose them to sunlight.

#### **Step 2: Perform dry cleaning**

- Make necessary repairs to the house and equipment.
- Start by dusting down the roof, walls, and floor in that order. Then sweep the chicken house.
- Carefully wipe off any dust after the light bulbs have cooled down.

#### **Step 3: Wash with a detergent**

- Use a detergent to wash all surfaces of the house thoroughly.
- Ensure that the water drains out of the chicken house and entrance.

#### **Step 4: Disinfect**

- Clean the entire house using a suitable sprayer and a registered disinfectant proven to kill chicken pathogens.
- Seek professional advice on selecting appropriate disinfectants.
- Prioritize *safety* when using disinfectants.
  - ✓ Follow the recommendations of professionals.
  - ✓ Wear safety materials such as coveralls, goggles, rubber gloves, rubber boots, a waterproof hat, and a respirator/mask to protect your whole body. If these items are unavailable, use local alternatives like plastic bags.
  - ✓ Begin with weaker chemicals and gradually increase strength according to the disinfectant producers' recommendations. Read the label and instructions before application.

- Allow the house to dry and remain closed for as long as possible (two weeks or more) before introducing new chickens.
- After one day, apply lime to the floor and short walls of the house.
- Place foot baths/boot dips containing disinfectant at the entrance of each chicken house. All individuals entering must dip their footwear every time.



### Improvement action plan to apply knowledge/skills

**Housing-related improvement plan:** List at least two of your priority challenges related to housing. Indicate the action(s) required to address them and the date you commit to completing the action/activity.

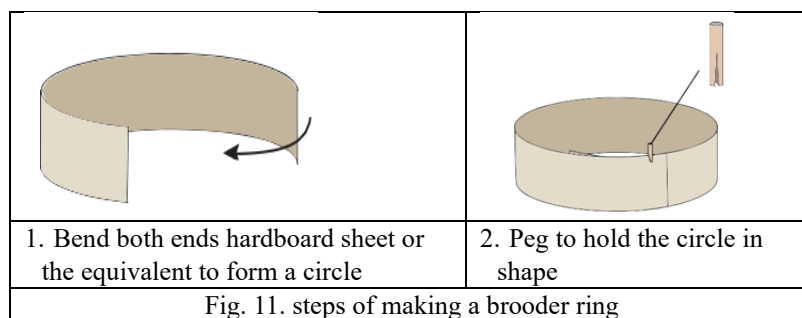
Challenge (Examples)	Action (s) to address the challenge	Action completion date	Remarks
<b>Challenge 1:</b> Poor ventilation	Action1: Identify the cause of poor ventilation (seek professional support if necessary)	July 15, 2023	
	Action 2: Devise a course of action, e.g., modifying the air inlets	July 20, 2023	
	Action3: Implement the action	July 30, 2023	
<b>Challenge 2:</b> Feather pecking, aggression, cannibalism	Action1: Identify the cause, e.g., inadequate space, lighting, etc. (seek professional support if necessary)	July 15, 2023	
	Action 2: Devise a course of action, e.g., modifying the air inlets, adjusting lighting	July 20, 2023	
	Action3: Implement the action	July 30, 2023	
<b>Challenge 3*</b>	Action1:		
	Action 2:		
	Action3:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement. Use the troubleshooting guide in appendix 2 to identify your actions/activities.

### TOPIC 3.3. Equipment for different age groups of chicken and systems of management

- **Brooding equipment:** Brooders are essential for providing warmth and light to baby chicks during their initial weeks. Various types of brooding equipment are used, including:
  - **Brooder guards:** These are thin sheets, around 35 to 45cm in height and varying length/diameter, made of iron, rigid cardboard, bamboo mat, or similar materials. Brooder guards play a crucial role in

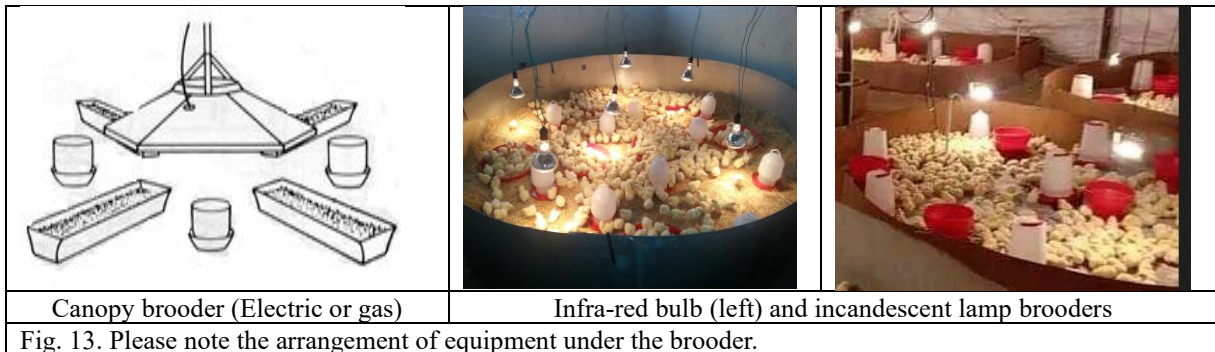
ensuring the safety of chicks. They restrict the chicks' movement, keeping them close to the brooders and preventing them from venturing too far from the heat source, which could lead to chilling.



- *Heat sources:* Different types of heat sources can be used depending on availability and size of operation.
    - ✓ **Bulbs/lamps:**
      - *Infra-Red (IR) bulbs / self-reflecting bulbs:* These bulbs are efficient heat sources for brooding chicks. They emit no visible light and can achieve the desired temperature with lower wattage. No reflector is needed. Choose between 150-watt or 250-watt bulbs based on the number of chicks.
      - *Incandescent bulbs:* Economical and effective. These bulbs provide both heat and light. They emit visible light and may require higher wattage. Select bulb wattage (60-250 watts) based on brooding area size and chick quantity. A 100-watt bulb suits small areas with up to 10 chicks, while a 250-watt bulb is suitable for larger areas with up to 50 chicks.
- The bulbs should be suspended 45-60cm above the chicks using chains or similar means. Adjust the bulb height to regulate brooder temperature based on chick comfort. Always use multiple bulbs to ensure chicks have heat, even if one burns out.
- ✓ **Gas brooder:** Connected to a natural gas supply. This type of brooder is hung 8-12cm above the chicks and equipped with canopy-type reflectors to direct heat toward them.

- ✓ Electrical heaters (heating rods or coils): These brooders have heating elements, pilot lamps, and sometimes a built-in thermometer to monitor the temperature.

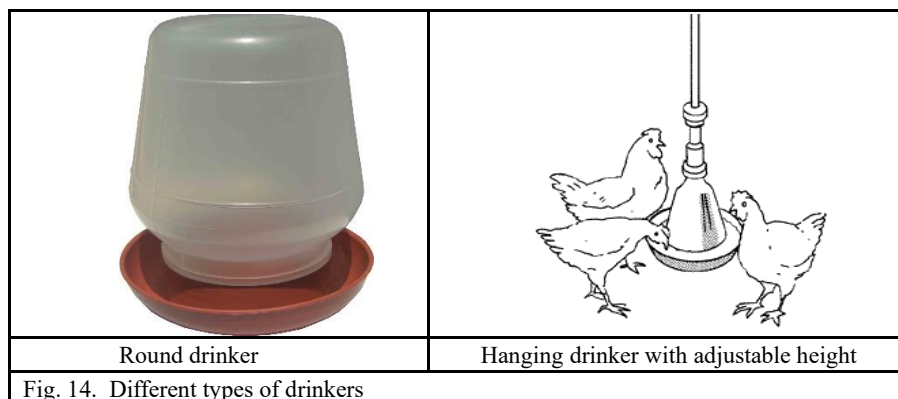
The temperature in all heat sources can be adjusted by varying the height of the heater as needed.



- **Drinkers:** Ensure water containers are always clean. Use narrow rims to discourage chickens from sitting on them. Avoid placing drinkers under roosts to prevent contamination from droppings. Ensure an adequate number of drinkers based on the size of your flock. The drinkers should be easily accessible and reliable, without leaks or stoppages. The proper installation considers the normal drinking position of chickens, back level or higher.

*Types of drinkers:*

- ✓ *Plastic container drinkers:* consist of 3-4-liter plastic containers placed upside down over a plastic saucer. A small hole in the water container allows water to flow into the dish. Larger sizes (12-30 liters) are available for older chickens.



- ✓ *Drinkers made from local materials:* Fig. 15 shows examples of drinkers farmers can construct from local materials. Unlike feeders, drinkers should not be made of metal that corrodes.





Fig. 15. Locally made drinker-Vietnam-Note the lower aluminum plate;Photo-NIAS Vietnam



Fig. 16. Locally made Chick feeders-Vietnam-Note the lower aluminum plate; Photo-NIAS Vietnam.

- **Feeders:** Choose feeders of different sizes, designs, and shapes. They should be constructed and positioned to prevent feed spillage or wastage into the litter. Install them at the appropriate height (or adjustable) based on the average height of the back of the birds in each chicken class, and provide sufficient space for feeding. Ensure all chickens, including the timid ones, have ample opportunity to feed.

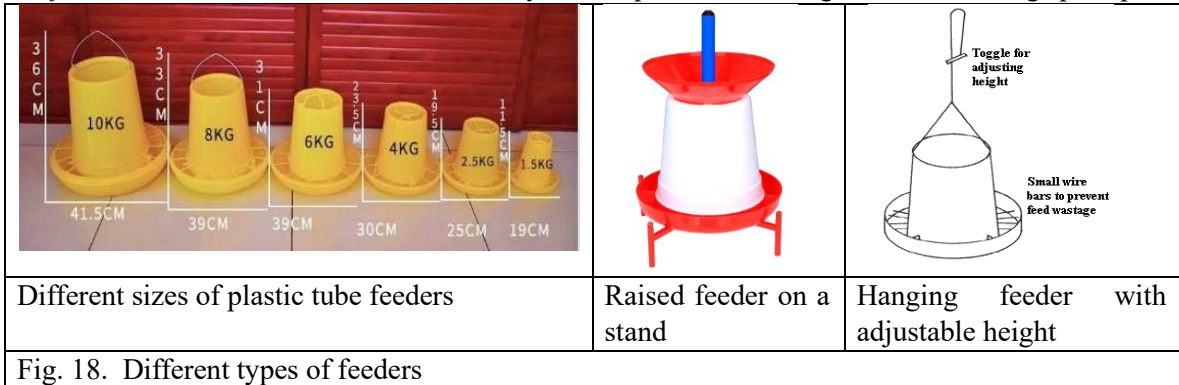
*Types of feeders:*

- ✓ **Chick feeders:** Tray-shaped feeders designed for feeding chicks during the early brooding period(Fig.17). They are easy to use but not very hygienic, as chicks can walk and defecate in them. Long/linear plastic chick feeders with a top cover help minimize feed wastage caused by kicking. The red color of chick feeders appeals to the chickens' natural instinct to peck, encouraging immediate feeding.

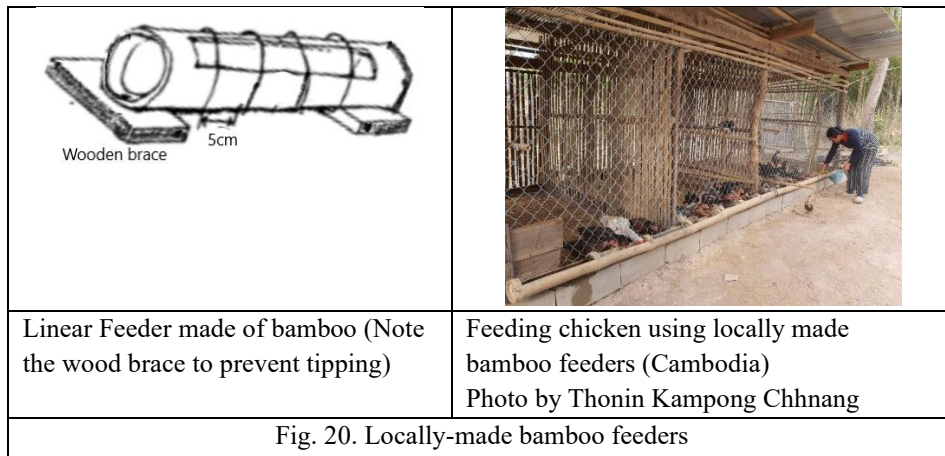
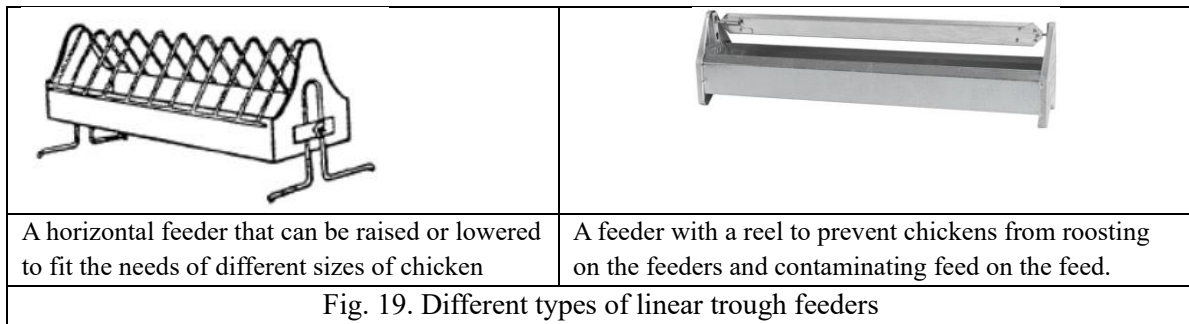


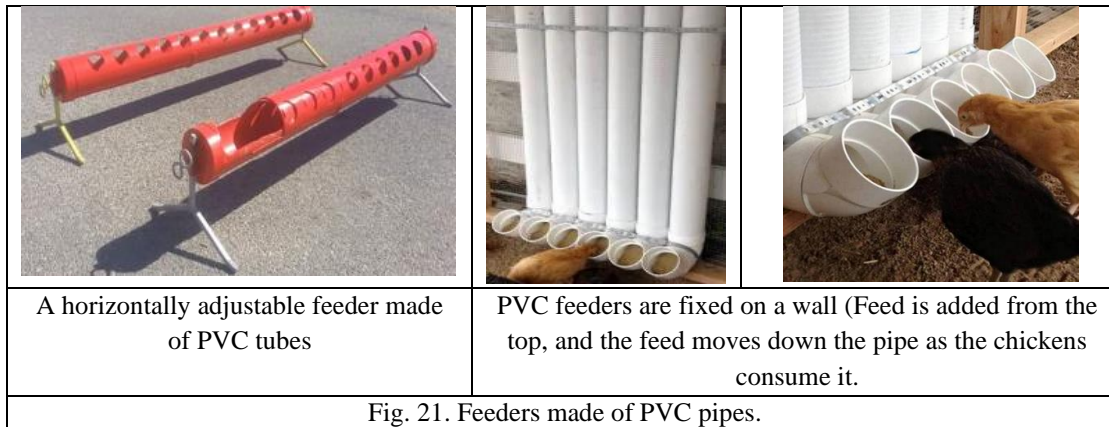
- ✓ **Tube feeders:** These cylindrical tubes with a pan (see Fig. 18) are the commonly used and efficient feeders for adult chickens. However, the tube feeders should be raised as the chickens grow older.

- ✓ *Linear feeders:* Similar to linear drinkers, this system requires calculating 10 cm of feeding space per



- ✓ chicken. An example of a linear feeder is shown in Fig. 19. Different sizes of linear feeders with guards are available, and the height of the feeder can be adjusted.



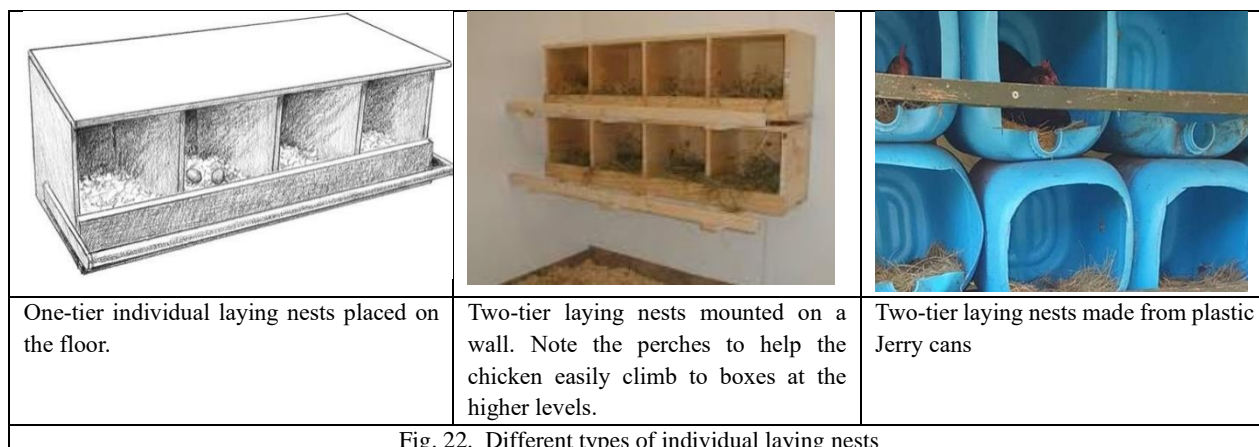


**Additional Note on drinkers and feeders:** Using red-colored drinkers and feeders is recommended as it has been observed that chickens are particularly attracted to the color red or shades close to it, which encourages them to drink and feed. That is why commercially available chick drinkers and feeders often come in this color. On the other hand, it's important to avoid using slippery metal trays for chick feeders as they can lead to leg problems. Use rough-surfaced plastic trays instead.

- **Laying nests:** Layers in a floor management system require laying nests for egg-laying. Laying nests help minimize floor eggs, maintain cleanliness, and reduce breakage. A sufficient number of nests, at least one nest for every five layers, should be provided to minimize waiting time and reduce fighting among the hens and/or to laying eggs outside the nest. Nests should be appropriately sized, measuring about 35 cm on all sides, with a nest floor area of approximately 0.1m<sup>2</sup>. Nest boxes may have one, two, or three tiers/levels. Nests above the floor level should have a perch in front to assist layers in safely climbing and entering the nest.

*Types of laying nests:*

- ✓ **Individual laying nests:** Designed for one hen to lay at a time (Fig. 22).
- ✓ **Communal nest boxes:** Allow two or more hens to sit simultaneously (Fig.23). However, communal nests carry a higher risk of egg breakage and a higher proportion of dirty eggs.



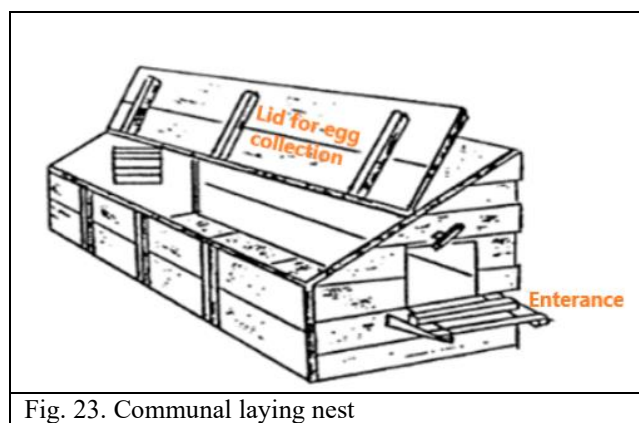


Fig. 23. Communal laying nest

✓ *Management of nest boxes:*

- Location: Place nest boxes in the chicken house's dimly lit and quiet areas. Cover the nest boxes and consider positioning them under windows rather than opposite them. Using dark-colored paint or materials for the nest boxes can also create a suitable environment. Nest boxes can be placed on the floor, raised with supports, or attached to the walls.
- Close nest boxes at night to prevent birds from defecating in them.
- Line the nest boxes with fresh bedding materials (such as hay, straw, or wood shavings). Fill the nest box about one-third with litter material for hen comfort and to prevent egg breakage.
- To avoid hens all preferring the same nest, ensure that all the nests are the same size and color and provide them with a similar level of darkness.
- Collect eggs frequently to prevent excessive breakage.

- **Perches/roosts:** Chickens naturally prefer perches over lying on the floor. Perches are used by chickens to rest at night, reducing pests, diseases, pecking, and fighting. Bamboo or rounded wood that matches the size of the chickens' feet can be used as perches (Fig.24). The perch should be about 1 meter high. The perch space recommended is one meter for five birds, and perches should be placed at a distance of 35-40 cm apart. Treating the perches with used engine oil or kerosene helps deter parasites.

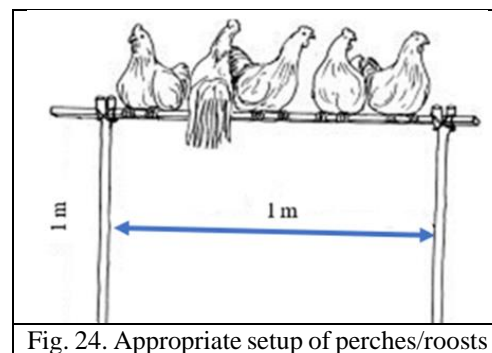


Fig. 24. Appropriate setup of perches/roosts

**Desirable setup and equipment arrangement in a chicken house:**

Good planning and strategic equipment arrangement are necessary to create an optimal environment in a chicken house. Consider the chickens' needs, ease of cleaning and maintenance, and a comfortable environment. Arrange the equipment for convenient access for each bird to feeders, drinkers, nests, and other essentials while minimizing travel distance. Also, ensure convenient movement for attendants. Here's a suggested arrangement for an ideal chicken house:

- **Housing Structure:** Ensure a durable, weatherproof, predator-proof chicken house with enough space for your chickens.



- 
- *Nesting Boxes:* Place nesting boxes in a quiet, dark corner to provide comfort and privacy for egg-laying. Have one box for every five hens, easily accessible for egg collection.
  - *Roosting Bars/Perches:* Install roosting bars off the ground to satisfy chickens' instincts. Allow enough space for birds to roost comfortably.
  - *Feeding and watering equipment:* Ensure sufficient feeders and waterers are accessible throughout the chicken house, making refilling and cleaning convenient while preventing contamination. Scatter drinkers evenly, alternating them with feeders throughout the house. Adjust the heights gradually as the birds grow, aligning the top lip of the feeder with their backs to minimize spillage and promote efficient feeding.
  - *Lighting:* Install appropriate lighting to simulate natural daylight, supporting healthy growth and egg production.
  - *Ventilation:* Ensure proper ventilation through windows or vents, promoting good air quality and preventing harmful gas buildup. Position them high to allow fresh air exchange without causing drafts at ground/bird level.
  - *Heat Source:* If needed, provide a secure heat source, such as lamps or radiant heaters, for young chicks. Ensure safety and prevent fire hazards.
  - *Litter/Bedding:* Cover the floor with ample bedding (e.g., straw or wood shavings) to absorb droppings and maintain cleanliness. Regularly monitor the litter to keep it dry and free of excessive moisture.
  - *Access:* If your chicken house has a run, ensure the access point is easy for chickens and secure against predators. Fence the run and provide a cover for shade and protection. Include perches and enrichments for bird activity.
  - *Dust Bath Area:* Designate a corner in the house or run for chickens' dust baths. Use a box filled with sand, soil, and diatomaceous earth.
  - *Egg Collection Area:* Set up a specific area for collecting eggs to keep them clean and prevent breakage. Place egg trays or baskets conveniently within the chicken house.
  - *Storage:* Allocate a separate area for storing feed, bedding, cleaning tools, and supplies. Consider a small cupboard or secure bin inside or near the house.
  - *Security Measures:* Install appropriate security measures like sturdy fencing, secure doors, and locks to protect against predators and unauthorized access.

Remember to tailor your chicken house to your needs, considering factors like the number of chickens, climate, and available space. Observe your chickens' behavior for any signs that may indicate necessary changes.

***Common mistakes related to housing and equipment:***

- *Wrong location and/or orientation of the chicken house:*
  - ✓ *Inadequate distance from other facilities:* Being too close to other farms, chicken houses on the same farm, or residences.
  - ✓ *Improper orientation:* Prone to drafts, which can cause significant stress to the birds.

- ✓ Poor ventilation and inadequate lighting in the houses.
- *Overcrowding birds:* Overcrowding can lead to stress, feather pecking, and cannibalism (Fig.25).
- *Inadequate and/or inappropriate feeding and drinking equipment:*
  - ✓ Insufficient number of feeders and drinkers for the number of chickens.
  - ✓ Use of feeders/drinkers that are not appropriate for the age/size of the chickens (Fig.20).
  - ✓ Leaky feeders/drinkers resulting in feed wastage and wet litter.



Fig. 25. An example of chicken too crowded. Note the number of chickens waiting to access the laying nests, feeders, and drinkers.



Fig.26. An example of a wrong type and size of feeder for the age and size of the chicken

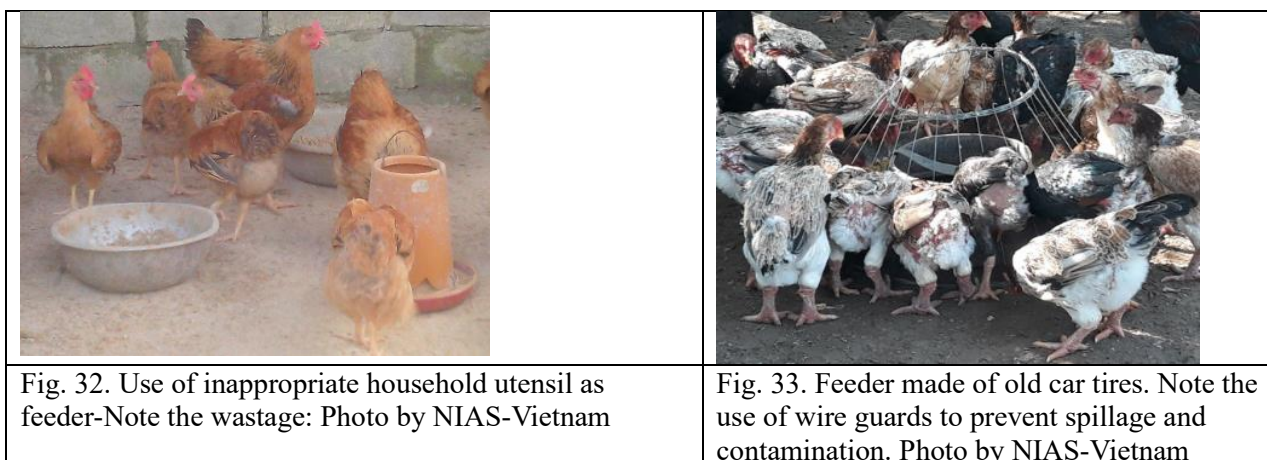
- *Heating:* Failure to prepare for heating alternatives during power outages, such as standby generators or charcoal, leading to inadequate warmth for the chickens.
- *Inappropriate drinker and feeder height:* Failure to raise the drinkers/feeders to an appropriate height above the floor results in contamination, clogged water flow, feed wastage, and the spread of diseases (Figs. 25 and 26). Lack of access to water reduces feed intake and growth.
  - ✓ Drinkers/feeders should be gradually raised from the floor as the chicks grow (Figs. 28 and 29).
  - ✓ The base of the drinker/feeder should align with the bird's chest in the early stage, and the bird's back in the later stage.
  - ✓ Platforms or ropes can be used to elevate the drinker/feeder if needed.



Fig. 27. Drinker contaminated with litter (left) and turned upside down (right), resulting in wet litter



- *Inappropriate feeders for the age/size of chickens:*
  - ✓ Using small feeders for large-sized chickens leads to significant feed wastage as the birds scratch the feed onto the floor.
  - ✓ Contamination of feed with droppings can occur, increasing the risk of disease.
  - ✓ Not replacing smaller feeders with larger ones as chicks grow to accommodate their increased size. For example, the flat feeder trays shown in Fig. 26 should have been changed to larger feeders as the chicks grew.



### Improvement action plan to apply knowledge/skills

**Chicken house equipment-related improvement plan:** List at least two of your priority challenges related to house-equipment. Indicate the action(s) required to address them and the date you commit to completing the actions.

Challenge	Action (s) to address the challenge	Action completion date	Remarks
<b>Challenge 1:</b> Feed spillage	Action 1: Identify the cause, e.g., size/type of feeder not appropriate to the size of the chicken, damaged feeders, etc.	August 15, 2023	
	Action 2: Devise an appropriate action, e.g., increasing feeder space, etc.	August 17, 2023	
	Action3: Implement the action	August 17, 2023	
<b>Challenge 2:</b> Reduced feed intake	Action1: Identify the cause, e.g., poor feed quality, inadequate feeder space, etc. (seek professional support if necessary)	July15, 2023	
	Action 2: Devise an appropriate action, e.g., increasing feeder space, etc.	July 20, 2023	
	Action3: Implement the action	July 30, 2023	
<b>Challenge 3: *</b>	Action1:		
	Action 2:		
	Action3:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement. Use the troubleshooting guide in appendix 2 to identify your actions/activities.



## MODULE 4

### CHICKEN BREEDS SUITABLE FOR DIFFERENT PRODUCTION SYSTEMS/OBJECTIVES

**Description/Introduction:** Selecting the right chicken breed for your specific production systems and objectives is crucial. This module provides an overview of various chicken breeds and their suitability for your production goals, market demand, and environmental factors.

**Key learning outcomes:** By completing this module, chicken farmers/training participants will be able to:

- Distinguish between purebred and commercial hybrid chicken breeds and their characteristics and requirements.
- Select the most suitable chicken breed for their specific management system and production objectives.




#### TOPIC 4.1. Importance of using appropriate breeds

##### ○ Characteristics of different chicken breeds

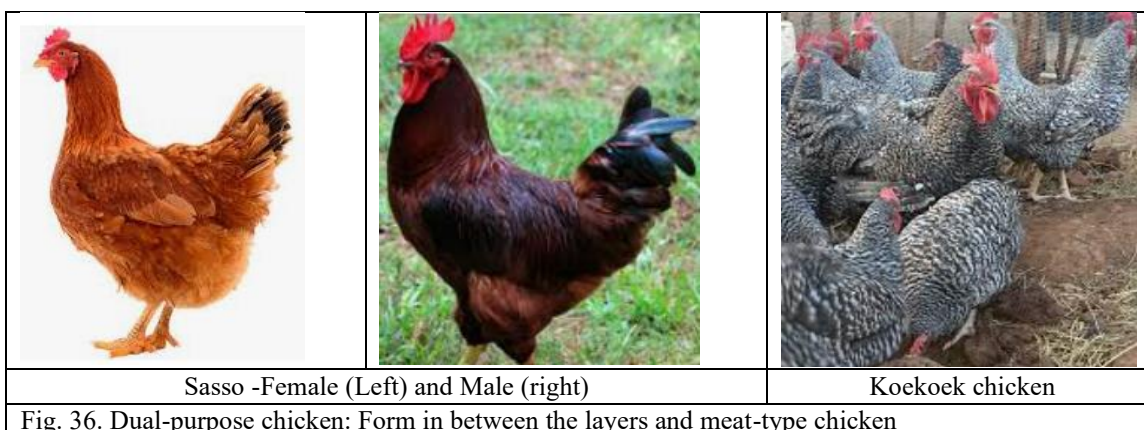
The suitability of various categories of chicken breeds for different production systems, production goals, market demand, and environmental factors is described as follows to help you make the right breed choices:

- **Indigenous chicken breeds:** Indigenous chicken breeds are highly valued in Vietnam and Cambodia for their unique characteristics and nutritional value. They contribute significantly to smallholder extensive free-range chicken production. Despite their slow growth rates, these breeds hold cultural significance and are prized for their flavorful, high-quality meat.
- **Modern specialized chicken:** Hybrid chickens bred for commercial production exhibit specific traits based on their intended purpose. They can be categorized as layer-type, meat-type, and dual-purpose chickens, with the following features:
  - ✓ **Layer-type chicken:** If your primary focus is egg production, select chicken breeds known for their high egg-laying capacity (Fig 34). These breeds have been selectively bred for their egg production traits, such as the number of eggs laid per year, egg size, and shell quality. These breeds start laying at 5-5 ½ months of age and produce over 300 eggs annually under good management. Commercial layers are capable of year-round egg production.
  - ✓ **Broiler-type chicken:** If your primary focus is meat production, select chicken specifically bred for meat production (Fig 35). They have rapid growth rates reaching a body weight of 2 to 2.5 kg within six to eight weeks, consuming approximately 4 kg of feed.

**Table ??.** Body conformation of meat and layer-type chicken

		
Fig.34 Typical layer-type chicken: “boat-shaped” with a solid straight back		Fig. 35. Typical broiler-type chicken: Have strong legs and developed breast muscles

- ✓ *Dual-purpose chicken*: Consider dual-purpose chicken breeds to produce meat and eggs. Dual-purpose chickens have moderate growth rates and respectable egg-laying capabilities (Fig 36). They are cost-effective, disease-resistant, and efficient in meat and egg production. They also possess desirable traits in indigenous chickens, including colorful plumage, adaptability to various environments, and less intensive management. Popular improved dual-purpose breeds like Koekoek and Sasso can reach weights of 1.5 to 2.0 kg within three months and produce approximately 120 to 180 eggs per year under smallholder conditions.



○ **Examples of commercial hybrid chicken:**

▪ ***Layer-type chicken:***

- ✓ *Lohman Brown*: Produces up to 360 eggs annually in commercial conditions (around 300 in backyard conditions) with low daily feed consumption of 110 grams.
- ✓ *ISA Brown*: Exhibits exceptional feed conversion and lifelong production of 500 high-quality eggs. Adapts well to different climates and management systems, with optimal egg size, strong shells, and consistent laying.
- ✓ *Bovans Brown*: Highly adaptable and vigorous breed known for high peak production, top-quality dark brown eggs, and excellent persistency. Thrives in various climates and management programs.

▪ ***Broiler/Meat type breeds of chicken:***

- ✓ Arbor Acres, Ross 208, Ross 308, Ross 508, Avian, Lohman, Cobb 707, and Hubbard: Commonly used broiler breeds in Vietnam and Cambodia. These fast-growing breeds are suitable for intensive management and achieve optimal performance when following recommended practices.

▪ ***Dual-purpose chicken:***

- ✓ *Sasso*: Hardy, free-range, and scavenging chickens suitable for eggs and meat. Thrive in rural smallholder farming with endurance and adaptability to extreme climates. Requires less health care and can be kept in various systems.
- ✓ *Koekok*: Dual-purpose chicken with laying capabilities and a large structure for meat production. Maintains good egg production even with poor feeding conditions. Suitable for medium input or

semi-scavenging production systems, laying approximately 196 brown eggs per year with an average weight of 56g under intensive management.

**TOPIC 4.2. Suitability of breeds for different production systems/ objectives**

Based on the target products, chickens in commercial production are selected for eggs, meat, or both. Choosing the right breed for the specific production system, environment, and market is crucial.

Intensive management is necessary for specialized layer-type and broiler-type hybrids to meet the demands of egg production and growth. They are not suitable for extensive or semi-intensive systems.

Dual-purpose chickens perform well with less intensive management, scavenging feed efficiently and showing better meat and egg production than indigenous breeds. Rearing dual-purpose breeds under semi-scavenging management can significantly improve farmers' livelihoods.

- Focus areas for breed selection:
  - Select specialized hybrids developed for meat or egg production in intensive systems.
  - For egg production, choose specialized egg-type breeds.
  - Go for specialized meat type/broiler hybrids for meat production in intensive systems.
  - Dual-purpose chickens are suitable for semi-scavenging management systems.

**Common mistakes in breed selection and use**

- Using dual-purpose or pure-line chickens for intensive egg production, which may not yield as many eggs as expected.
- Providing sub-optimal management, failing to utilize the potential of high-yielding hybrid layers and broilers.

**Improvement action plan to apply knowledge/skills**

**Breed Selection and use related improvement plan:** List 2 challenges related to breed selection and use.

Indicate the action (s) required to address it and the time you commit to completing it.

Challenge	Action (s) to address the challenge	Action completion date	Remarks
<b>Challenge 1:</b> poor performance of specialized hybrids managed under a semi-intensive management system, etc.	Action1: Identify the cause, e.g., wrong management for the breed (seek professional support if necessary)	July??, 2023	
	Action 2: Devise an appropriate course of action, e.g., improve the management system, use the appropriate breed for the management system, etc.	July ??, 2023	
	Action3: Implement the action	July ??, 2023	
<b>Challenge 2*</b>	Action1:		
	Action 2:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement. Use the troubleshooting guide in appendix 2 to identify your actions/activities.

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## MODULE 5

### CHICKEN FEEDS AND NUTRITION

**Description/Introduction:** Proper feeding practices and access to affordable and safe chicken feed are essential for the profitability and growth of chicken production. Feed costs make up a significant portion of production expenses. Therefore, efficient feeding systems that meet chickens' nutritional needs promote productivity and profitability. This module focuses on understanding chicken nutrient requirements, feed sources, feed quality, and practical feeding methods for different management systems and production objectives.

**Key learning outcomes:**

- Recognize the importance of proper feeding for success in chicken production.
- Apply feeding management principles to optimize feed utilization efficiency.
- Conduct a basic assessment of feed quality.
- Calculate feed budgets and understand important considerations for purchasing, handling, and storing feed.
- Implement appropriate feeding practices for running an efficient chicken production business.
- Develop an actionable plan to address feed and feeding challenges.
- Improve chicken product supply, income, and nutritional status for farmers.

**TOPIC 5.1. Chicken feeds and feeding**

- Importance of proper chicken feeding:
  - Optimizes genetic potential and improves efficiency in chicken production.
  - Saves feed and reduces production costs, which account for about 70% of expenses.
  - Enhances disease resistance and reduces mortality/morbidity losses.
- Types of feeds suitable for chicken feeding:
  - Scavenging feed resources: In free-range/semi-scavenging systems, chickens find feed by scavenging insects, grains, leftovers, and vegetation.
  - Energy sources: Consist of 75% of a chicken diet
    - ✓ Grains: Corn, rice, and
    - ✓ Alternative sources such as cereal screenings (rice bran, grain screenings, etc.), roots and tubers (*Cassava (manioc) roots and their by-products, sweet potatoes, etc.*), molasses, and fats (e.g., coconut oil, animal fats).
  - Protein sources: About 20% of the diet include:
    - ✓ Animal protein sources: *Meat meal, fish meal, meat & bone meal, blood meal,*
    - ✓ Legumes: *Soybeans or soybean meal (cooked or heat-treated),*
    - ✓ Oilseed meals: *Canola, Peanut, Sunflower, safflower, sesame*
    - ✓ Peas, beans,
    - ✓ brewer's by-products,
    - ✓ maggots, and worms.
  - Minerals: about 3-4% of the diet
    - ✓ Macro-mineral sources: limestone, oyster shell, bone meal, and
    - ✓ micro-minerals from wood ashes.
  - Vitamins: Less than 1% of the diet

- Obtained from premix, yeast, green fodder, alfalfa meal, and dairy by-products. Confined chickens may require additional vitamins from purchased premixes, while supplementary vitamins are usually not required when chickens are left to scavenge.
- Feed additives:
  - ✓ Medications, pigments, and
  - ✓ non-conventional ingredients like seaweed, insects, duckweed, silkworm pupae, and earthworms.
- *Characteristics of a good chicken diet:* A balanced diet contains ingredients that meet the nutrient requirements of specific chicken breeds in different production systems and ages.

### **TOPIC 5.2. Calculation of feed budget and considerations in buying feeds**

- *Calculation of feed budget:* An adult layer hen consumes approximately 125 grams of feed and 250 ml of water daily. For example, if you have 1000 chickens, they will consume 125,000 grams or 125 kilograms of feed per day. This means you must purchase 1000 kilograms of feed every eight days (125 kilograms per day \* 8 days). Using this example, you can calculate the feed requirement for any number of days or chickens.

To ensure a continuous feed supply, placing another feed order immediately after receiving your current one is advisable, as delivery delays may occur.

- *Considerations in buying feed ingredients and compound feeds:*

**Physical evaluation of feed quality:** Physical evaluation provides a rough measure of feed quality. Requires experience and acquaintance with the typical characteristics of the feedstuff being evaluated to identify deviations. The following are physical indicators of feed quality:

  - *Color:* Color changes indicate storage conditions, toxins, or contamination. For example, a black-colored fish meal may indicate rancidity.
  - *Size:* Smaller grains have lower ME values due to a higher proportion of hulls.
  - *Homogeneity:* Check for contaminants like other grains, husks, broken grains, or weed seeds.
  - *Smell:* Different smells can indicate deviations. Musty odor suggests fungal contamination or insects, while petroleum odors indicate excessive pesticides or fungicides.
  - *Taste:* Changes in taste, such as bitterness in grains or oilseed cakes, may indicate the presence of mycotoxins. Salt levels can be detected by tasting the feed.

**Buying feed ingredients:** Consider the following factors for successful feed buying:

- *Animal type:* Certain feedstuff may have limitations for different classes or ages of chickens. For example, cottonseed meal should be avoided in layer rations due to its impact on egg quality.
- *Price fluctuations:* Feed ingredient prices are lowest during the harvest season. Therefore, buying during this time can be advantageous, provided proper storage facilities exist.
- *Associative effects:* Mixing different protein sources can improve chicken performance.
- *On-farm production:* If possible, consider producing feed ingredients on the farm.
- *Moisture-free basis:* When purchasing feeds, especially grains, buying based on a moisture-free basis is advisable. Price comparisons should account for differences in moisture content.
- *Transportation:* Compare prices based on the cost at your farm gate, considering variations in transportation costs from different suppliers.
- *Storage:* Maintain a sufficiently low moisture level in feed ingredients for safe storage. For example, grains should be below 14% moisture.

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**Buying compound/commercial feeds:** When purchasing compound feeds for hybrid chickens, consider the following desirable characteristics:

- Well-balanced to meet the nutrient requirements of the target animal
- Contain a variety of feeds in the ration
- Processed and prepared appropriately
- Influence the quality of animal products

For different classes/types of chicken, specific specifications should be considered when buying compound feeds. These specifications are explained below:

- **Layer-type rations:**
  - ✓ *Chick starter ration:* 20% protein for layer-type chicks fed up to 8 weeks of age.
  - ✓ *Grower ration:* 18% protein for growing pullets from 8 to 17 weeks.
  - ✓ *Layer ration:* 16 to 18% protein for hens after 22 weeks or when they start laying eggs. Higher calcium and mineral levels are required for laying hens.
- **Broiler-type rations:** Broilers require fast growth and efficient feed conversion. They should have *ad libitum*/free choice feeding. The typical feeding program includes two phases:
  - ✓ *Broiler starter ration:* day old to 3 to 4 weeks, 3000 Kcal (12.5 MJ)/kg of ME and 22% CP.
  - ✓ *Broiler finisher ration:* 5 weeks to market age, 3200 Kcal (13.5 MJ)/Kg ME, and 20% CP. On average, 2-2.5 kg of feed is required per kg of weight gain, with a total consumption of 3-5 kg per marketed broiler.

### **TOPIC 5.3. Measures to reduce feed cost**

- *Measures to reduce feed cost:* Small-scale farmers often face the challenge of expensive feed, limiting their ability to expand. The following actions can help decrease feed costs and improve the profitability of chicken production:
  - *Blending commercial "concentrates" with high-energy feed ingredients on the farm:* Mixing "concentrates" obtained from feed mills with energy-rich ingredients like grains can result in complete chicken feed. The proportion of "concentrates" and high-energy ingredients depends on the nutritional needs of the chicken breed, growth stage, and production objectives. Therefore, it is essential to follow the blending instructions provided by the feed mill.
  - *Home mixing of simple chicken diets:* involves selecting the right combination of feed ingredients to create a balanced ration and reduce reliance on expensive purchased feeds. This requires a basic understanding of animal nutrition.  
Home mixing requires knowledge of ration formulation or access to feed formulation software and/or consulting a poultry nutritionist to calculate the proportions of various ingredients needed to achieve the desired nutrient levels in the feed. Factors to consider include the age and type of birds, locally available feed ingredients, cost-effectiveness, and ingredient quality.

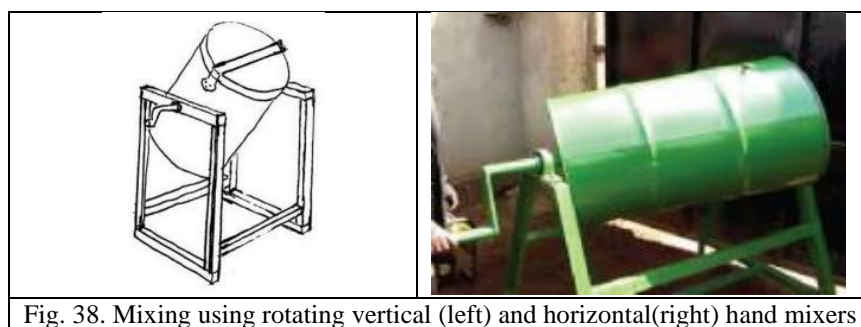
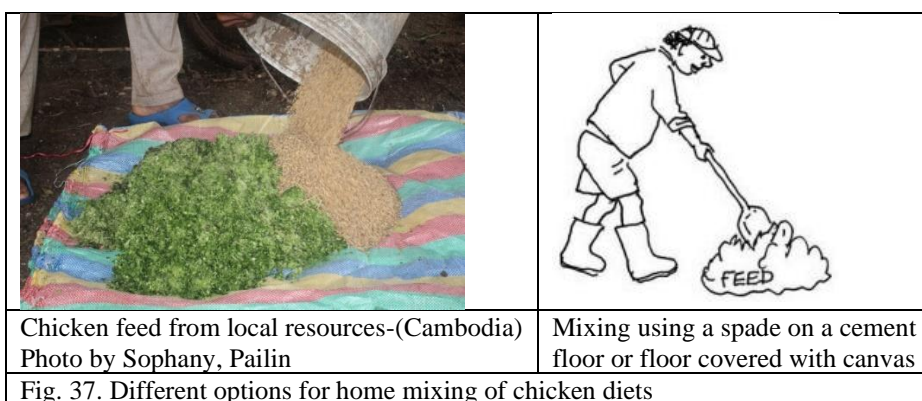
Table 2 below provides a guide on the proportion of different ingredient types for home-mixing chicken diets.



**Table 2. Typical Rations for Chickens**

Ingredient*	Starter	Grower	Layer
High energy (e.g., corn, etc.)	45+	50+	55+
Medium energy (e.g., Oats, barley, paddy rice, rice bran, broken rice)	<15	<15	<15
Vegetable protein (e.g., Soybean meal, other oilseed meals)	25-35	15-25	15-25
Meat by-products	<8.5	<7.5	<7.5
Fish by-products	0-5	<10	<10
Fats and oils	<7	<7	<7
Alfalfa meal	0-2.5	0-2.5	0-2.5
Ca and P source	0-3.25	0-2.5	<10

\*Other alternative feed ingredient categories are listed under the “Classes/ types of feed ingredients suitable for chicken feeding” part at the beginning of this module.






- *Reduce feed wastage by implementing measures such as:*
  - ✓ Using appropriate feeders for the type/size of the chicken to eliminate wastage.
  - ✓ Enhancing feed utilization efficiency by controlling parasite infestations, selecting the right breed for the management system and target product, etc.
- *Avoid sudden management changes that can decrease feed utilization efficiency:*
  - ✓ Gradually introduce changes like the type/size of feeders/drinkers to minimize stress in birds, especially young chicks.
  - ✓ Transition to a new feed type (e.g., from chick starter diet to grower diet and grower to layer diet) by gradually increasing the proportion of the new feed while mixing it with the previous feed until the transition is complete.

**TOPIC 5.4. Storage of feed ingredients and compound feeds**

Minimize loss of feed quality and quantity by doing the following:

- Avoid buying more feed than can be appropriately stored and used within a month.
- Store feed away from potential contaminants like gasoline, oil, and pesticides.
- Stack bags of feed on a pallet, elevated above the ground and away from walls. Place a protective layer at the bottom to prevent access by mice and rats.
- Stack different feedstuffs separately and prioritize "first in, first out" usage.
- Clearly label micro-ingredients to prevent mix up and toxicity.
- *Conditions of storage:* Maintain proper storage conditions to prevent deterioration:
  - ✓ Heat, humidity, and fat in the feed accelerate spoilage.
  - ✓ Dry feeds with over 14% moisture content before storage.
  - ✓ Ensure good ventilation to prevent mold, excessive heating, and fire hazards.
- *Length of storage:* Storage length depends on ingredient origin and perishability:
  - ✓ Ingredients available at any time require shorter storage periods.
  - ✓ Ingredients from long distances or uncertain supply can be stored for 2-4 weeks.
  - ✓ Perishable feeds should not be stored for extended periods.
- *Mixed feeds spoil faster:* Therefore, store feeds as individual ingredients and mix in quantities usable within one week, especially in warm and humid conditions.

		
On a dirty floor without a pallet, too close to the wall	Moldy corn with aflatoxin infestation	Moldy mixed feed (see how clogged it is)
Fig. 39. Improper feed storage	Fig.40. moldy feed due to poor storage is not suitable as feed	

		
Feed is stored on a pallet to protect it from direct contact with the floor- Also note the corridor between different types of feed.		Barrel with a lid can be used to store feed in a chicken house.
Fig. 41. Appropriate feed storage		



**TOPIC 5.5. Applied/practical chicken feeding**

▪ **Feeding under different systems of production/housing**

*Feeding in the semi-intensive/semi-scavenging management system:* Dual-purpose chickens like the Sasso are housed in an enclosed area where they scavenge with supplementation instead of a fully balanced diet.

- ✓ Chickens find most of their feeds by scavenging in the surroundings, which vary based on seasons, climate, geography, and farming systems.
- ✓ Supplemental feeding is necessary after confining the birds, providing access to forage plants such as cowpea, alfalfa, cabbages, and sesbania.
- ✓ Hydroponically-grown fodder, rich in vitamins and protein, can be produced from sprouted grains through hydroponic culture as an excellent alternative ingredient to increase dietary vitamin supply and digestibility (Fig.42).



Fig. 42. Hydroponic fodder grown in a few days to the size in the figure can be an excellent supplement.

- ✓ Regular watering, care, and optimal feeding ensure higher profits in this model.
- ✓ Chickens receive supplements like alfalfa, cabbage, sesbania, and hydroponic leaves, providing vitamins, proteins, etc. (Figs.43 and 44)



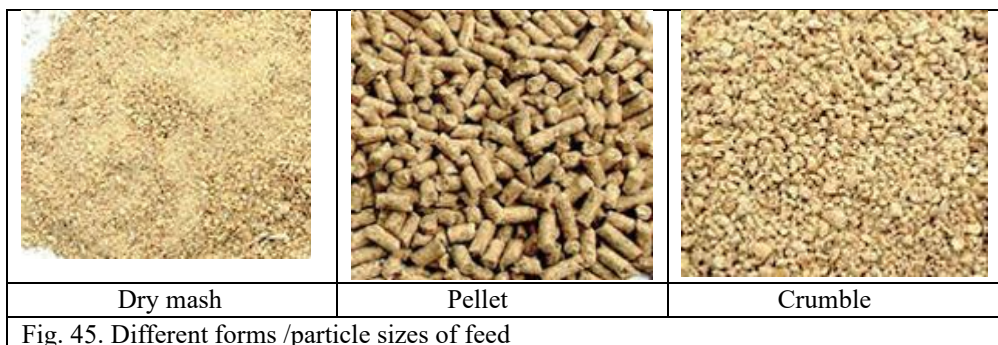
Fig. 43. Scavenging Sasso chicken

Fig.44. Hang greens as a supplement (neem -left and cabbage-right).  
Supplementation by hanging fodder like this also helps to keep chickens active (relief from boredom! And picking on each other)

- ✓ For concentrate supplements, provide half in the morning and the other half in the evening when birds return.

*Feeding in the intensive management system:* Confined chickens require a balanced diet for efficient production.

- ✓ *Feed form (mash, pellets, crumble) and particle size vary for different types of chicken:* Layers often receive mash, while broilers receive pellets (Fig.45).



- ✓ *Feed amount:* Depends on the chicken's age and breed. Table 3 shows layer-type chicken feed requirements at various stages.

**Table 3. Feed requirement per layer type chicken**

Age (weeks)	Type of ration/diet	Feed per chicken required
0-3 weeks	Chick starter	400g
4-8 weeks	Layer chick starter ration	1.5kg
9 weeks to 5% lay	Pullet ration/diet	4.5kg
5% lay to 45 weeks of lay	Layer (Phase 1 ration)	22kg
45 weeks to end of lay (80 weeks)	Layer (Phase 2 ration)	28kg

- ✓ *Feeding methods/systems:* The following are systems of feeding farmers can practice
  - *Free-choice feeding:* Unlimited access, ensuring constant feed availability.
  - *Restricted feeding:* Supplying specific amounts of feed at designated times for control of weight gain and better feed efficiency.

#### ▪ Reducing Feed Wastage

To increase feed efficiency and lower costs, it is crucial to minimize feed wastage. There are two types of feed wastage:

- ✓ *Direct feed wastage:* Direct feed wastage involves spillage, excessive feed in the trough, feed theft and contamination, mold development, etc. To address this, appropriate raised feeders should be used, designed to minimize animal access. Sufficient feeder space helps prevent competition, fighting, and spillage.
- ✓ *Indirect feed wastage:* occurs when feed utilization is reduced due to factors like illness or high ambient temperature. These issues are harder to detect.

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- **Appropriate particle Size of Chicken Feed**

*The particle size of feed:* Chickens prefer rounded, bright-colored particles. Recommended particle sizes for different chicken types are as follows:

- ✓ Chicks: 0.7-1.0mm
- ✓ Pullets: 1.0-1.5mm
- ✓ Layers: 1.5-2.0mm

- **Transitioning Between Rations and management**

Specific rations should be provided during different stages of a chicken's life. Chicks should be fed chick mash for the first eight weeks. This should be followed by growers' mash up to two weeks before they are expected to start laying. At that point, the flock should be switched to layers' mash until the end of the laying period. When transitioning between diets, it is recommended to mix the previous feed with the new one in increasing proportions until the transition is complete. Vitamins can be provided during this period to reduce stress.

Similarly, when making changes, such as introducing new feeders or drinker types, it is important to do so gradually. Abrupt changes can be stressful to the chickens and affect their performance.

- **Importance of appropriate water supply**

Water consumption is generally twice that of feed. Layers require 200-250ml/day, which increases in high temperatures. Provide water freely without restriction.

**Common Feeding related mistakes:**

- Underestimating the value of high-quality feed.
  - ✓ Feeding unbalanced rations:
    - Some farmers opt for cheap feeds, but long-term profitability lies in high-quality options.
    - Adulterating formulated feed reduces protein, vitamins, and minerals, resulting in poor chicken performance.
  - ✓ Feeding moldy feed risks organ damage and neurological issues.
  - ✓ Feeding the wrong feed, like giving young birds a layer ration, negatively impacts their growth and well-being.
- Poor Feeding Management:
  - ✓ Infrequent filling of feed troughs leads to chicks picking on litter, causing an "off-feed" condition.
  - ✓ Overfilling feeders leads to wastage through spillage.
  - ✓ Inadequate/inappropriate feeding and drinking equipment in terms of size and leakage.
- Improper Feed Storage:
  - ✓ Poor storage attracts rodents, causing feed loss and disease transmission.
  - ✓ Moisture exposure leads to mold development and mycotoxin formation, causing internal hemorrhages, stunted growth, and immunosuppression.
- Inadequate Water Supply: Infrequent filling of drinkers reduces water and feed intake.

**Improvement action plan to apply knowledge/skills**

***Feeding, water, and feed storage-related improvement plan:*** List at least three challenges you may have related to feeding, watering, and feed storage. Indicate the action(s) required to address it, the barriers to acting, and the time you commit to completing it.

<b>Challenge related to Feeding (Examples)</b>	<b>Action(s) to address the challenge</b>	<b>Action completion date</b>	<b>Remarks</b>
<b>Challenge 1:</b> Moldy feed	Action1: Identify the cause, e.g., inappropriate storage condition (seek professional support if necessary)	July ??, 2023	
	Action 2: Devise an appropriate course of action, e.g., store feed on pallets, etc.	July ??, 2023	
	Action3: Implement the action	July??, 2023	
<b>Challenge 2:</b> Low water intake	Action1: Identify the cause, e.g., water temperature too high, the height of drinkers, etc. (seek professional support if necessary)	July ??, 2023	
	Action 2: Devise an appropriate course of action, e.g., use cooler water, adjust drinker height, etc.	July ??, 2023	
	Action3: Implement the action	July ??, 2023	
<b>Challenge 3*:</b>	Action1:		
	Action 2:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement. Use the troubleshooting guide in appendix 2 to identify your actions.

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## MODULE 6

### CHICKEN HEALTH AND DISEASE PREVENTION

**Description/Introduction:** Maintaining optimal health and disease prevention is crucial for successful chicken farming as it significantly impacts productivity and profitability. This module focuses on key technical aspects and preventive measures to maintain chicken health and prevent disease entry and spread on the farm.

**Key Learning Outcomes:** By completing this module, participants/chicken farmers will be able to:

- Recognize disease sources, identify signs of ill health, and develop preventive strategies.
- Understand the significance of farm sanitation and biosecurity, creating a practical biosecurity plan for daily operations.
- Recognize the importance of timely vaccination and adherence to vaccination schedules, evaluate vaccine effectiveness, and implement a vaccination plan.
- Devise and implement an actionable plan to address chicken health challenges and enhance disease prevention measures.
- Significantly reduce disease-related losses, improving poultry production, productivity, and product safety.

#### **TOPIC 6.1: Sources of disease and recognizing ill health**

##### ○ **Where do diseases come from?**

Various disease sources pose health risks and should be considered for disease prevention. Fig. 46 shows these sources. Infectious diseases can spread through:

- Introduction to the farm of diseased birds or carriers that have recovered from diseases
- Transfer of pathogens through shoes and clothing of visitors or caretakers moving between flocks
- Contact with contaminated objects (feeders, drinkers, etc.)
- Improper disposal of dead bird carcasses
- Exposure to impure water, including surface drainage water
- Presence of rodents, wild animals, insects, and free-flying birds
- Contamination from feed, feed bags, and delivery trucks
- Transmission through contaminated premises via the soil or old litter
- Infection through hatching eggs

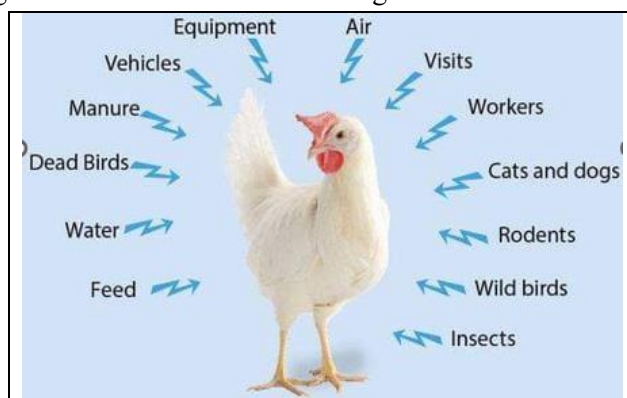


Fig. 46. Sources of diseases

##### ○ **Recognizing Ill Health in Chickens**

Regular inspection and early detection are crucial in minimizing the impact and spread of chicken diseases. Delayed recognition often leads to untreatable conditions.

- **Timing of Inspections:** Conduct inspections at least twice daily, assessing behavior, droppings, feed intake, mortality rates, etc. Additional observations should be made during routine activities like feeding, water supply, and egg collection.

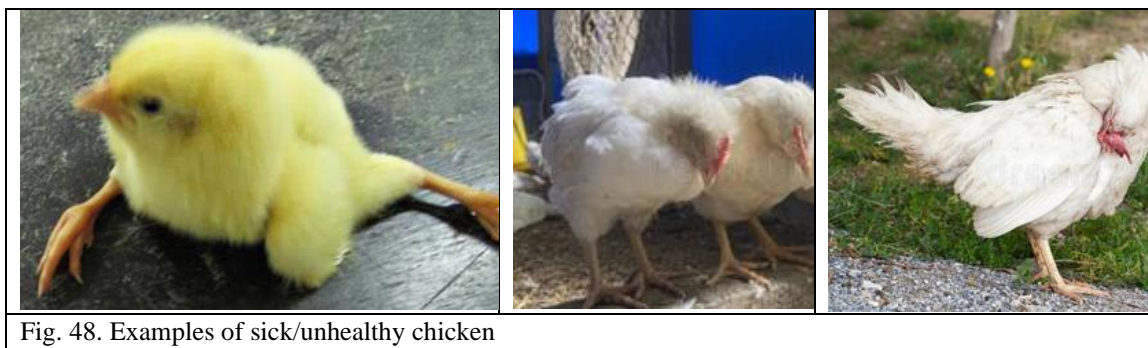
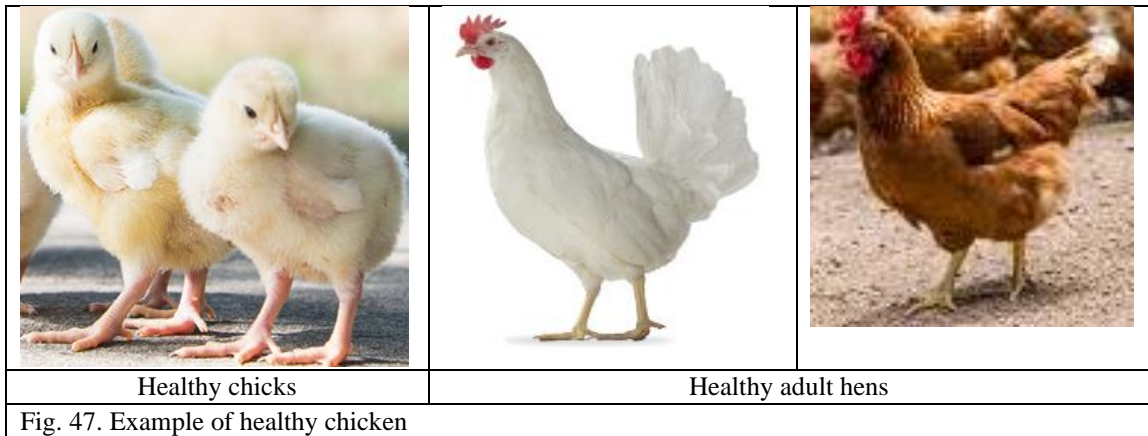


- *Characteristics of Healthy and Unhealthy Chickens*: Refer to Table 4 for signs indicating good and poor health during close inspections. Additionally, Fig. 47 provides visual examples of healthy chickens, and Fig. 48 those of unhealthy chickens. Compare the descriptions in the table with the corresponding images in the figures.

**Table 4. Signs of good and poor health in chicken**

Observation on inspection	Signs of good health	Signs of poor health
Activity	Chicken busy, Walk, run, stand, and scratch	Chickens stay on the roost and hide in a dark corner. Less active than usual, drowsy or weak appearance, inability to walk, reluctance to move around, sitting on the floor at night when the bird normally roosts
Sounds/ movements	Make normal sounds and movements;	Strange sounds and actions, Moving slowly/sluggish; Sitting or standing for long periods with feathers fluffed up, head stuck under the wing, or hanging down
Nostrils	No discharges, intact	Discharge from the nose, scaly or crusted nostrils
Breathing	Breathe quietly with a closed mouth except in very hot conditions	Labored breathing, sneezing, or coughing; breathing with beak open (panting/gasping), fluid running from the mouth
Skin	Normal skin texture	Sores, blackened or red areas on the skin
Eyes and eyelids	Clear and shiny eyes without discharge; No swellings around the eyes and eyelids	Dull/sleepy eyes and comb, Swollen eyes, discharge from eyes, cloudy eyes, cloudy spots on pupils of eyes
Comb and wattles	comb and wattles are waxy and full of color	pale or purple comb and wattles
Feathers	Glossy and in place; Smooth and neat feathers	Ruffled feathers with missing patches
Wings	Carry wings close to the body	Droopy wings or tail
Head and legs	No signs of swelling	Swellings on the head and/or feet;
Droppings	Soft and compact droppings	Diarrhea (white, yellow, green, red, colorless, or bloody) Pasted, clumped feathers around vent (anal area); vent area sore, swollen, or distended
Feeding and drinking	Feed and drink normally	Do not eat and/or drink much; may sometimes stop eating altogether; A drop in feed consumption weight loss
Egg production	Lay eggs normally	Reduced egg production or stop laying eggs A sudden drop in egg production A lot of poorly shaped or colored eggs in layers





**TOPIC 6.2: Prevention vs. Treatment in chicken health care**

The saying "prevention is better than cure" holds, especially in chicken health care. Preventive measures are more cost-effective and help avoid losses due to mortality, reduced production, and high treatment expenses. Moreover, diseases can result in mass culling or even the closure of an entire poultry farm, emphasizing the importance of preventing pathogen transmission.

**Disease Prevention measures:**

○ **Biosecurity**

A practice designed to prevent the entry and spread of diseases onto the farm. Poor biosecurity can undermine vaccination, medication, and overall management. Effective biosecurity plans should encompass the interrelated measures of isolation, sanitation, human traffic control, and flock management (Fig.49).

- *Isolation:* is the confinement of chickens within a controlled environment and keeping all other animals out. This is achieved through the following:
  - ✓ Use fences to confine chickens and keep other animals out.
  - ✓ Ideally, have one chicken house per farm. Alternatively, maintain a 15-30m distance between houses and keep one age group per farm.



Fig. 49. Major Components of Biosecurity

- ✓ Maintain a distance of 300m from roads and adjacent properties.
  - ✓ Practice all-in-all-out chicken management, filling and disposing of houses all at the same time.
  - ✓ Prevent access to rodents, wild birds, and stray chickens using wire nets and avoid feed spillage outside the chicken house.
  - ✓ Store bulk feeds away from production houses, preferably 30m or more, and hold short-term supplies per house to reduce disease transmission.
- *Sanitation and cleanliness:* disinfection of materials, people, and equipment entering the farm and the cleanliness of the personnel on the farm
    - ✓ Ensure cleanliness and hygiene at the farm and flock levels.
      - Disinfect materials, people, and equipment entering the farm.
      - Clean and disinfect chicken housing at the end of each production cycle.
      - Clean drinkers daily and refresh water supply regularly.
      - Provide and wash clothing, footwear, and cleaning facilities for staff and visitors.
      - Install footbaths with disinfectant at the entrance of each chicken house for footwear disinfection (Fig.50).



Fig. 50. Footbath (Note broom on the side of the first picture- to remove solid dirt from the boots and the metal stands.

- ✓ Prevention of Pest Problems:
    - Regularly inspect the house for signs of pests and take appropriate control measures
    - Store feed properly in insect- and mouse-proof containers.
    - Keep feeding areas clean and dry, removing spilled feed promptly.
    - Eliminate hiding places for rodents and clear vegetation around the house.
    - Prevent the nesting of wild birds inside chicken houses.
- *Traffic Control:*
    - ✓ Chicken workers should wear clean, disinfected footwear and clothing, ideally using different gear for each house.
    - ✓ When visiting chickens of different ages, start with the youngest flock and visit sick flocks last.
    - ✓ Limit farm visitors and avoid visiting other chicken farms.
    - ✓ Only essential staff should enter the house.

- **Flock Hygiene Management:** Hygiene management is a set of measures to reduce the number of pathogens (infection pressure) on the farm and prevent transmission between farms, houses, and chickens. Hygienic measures can be applied at three levels:

**Farm Level:** Prevent pathogen entry by considering the following:

- ✓ farm layout (Location, isolation (distance from other farms, wind direction),
- ✓ implementing fencing,
- ✓ changing footwear at the farm entrance,
- ✓ selling eggs/chickens outside the farm.
- ✓ Dispose of manure and carcasses properly to avoid infection transmission Fig. 51. Dead chicken burial pits should be at least 1 m deep and well away from water sources such as wells and rivers. Hands and clothes should be washed or boiled after dead birds are handled.
- ✓ Avoid bringing unsold live birds from the market back to the farm.



Fig.51. Dead chicken disposal by burying and/or burning

**Flock/House Level:** Measures to prevent transmission of pathogens from one chicken flock (house) to another. These include:

- ✓ Implementing an all-in/all-out system,
- ✓ maintain distance between houses,
- ✓ use separate footwear and equipment for each house,
- ✓ ensure wild bird-proof housing,
- ✓ maintain ventilation,
- ✓ practice proper cleaning and disinfection,
- ✓ control rodents, and
- ✓ consider feed storage per house.

**Animal Level:** Measures to prevent transmission of pathogens from one animal to another. These include:

- ✓ Avoiding overcrowding,
- ✓ maintain a good climate and dry litter,
- ✓ clean drinkers daily,
- ✓ provide high-quality feed and water,
- ✓ vaccinate birds,
- ✓ monitor and control ectoparasites, and
- ✓ take appropriate treatment or culling measures in case of disease.

- **Vaccines and Vaccination:** Vaccination is crucial for preventive health care in chickens, as it helps prevent or minimize the effects of specific diseases by enhancing the bird's immune system. Effective vaccination requires proper management, good chicken nutrition, and adherence to biosecurity measures.

- **Importance of Timely Vaccinations:** Timely vaccinations are vital for maximizing benefits. Ensure the availability of appropriate doses and types of vaccines when vaccination is due.
- **Buying, Care, and Storage of Vaccines:** When purchasing and storing vaccines, follow the instructions provided by the manufacturers. Consider the following general recommendations:

- ✓ **Buying Vaccines:**
  - Purchase vaccines from reliable suppliers who maintain the cold chain and offer professional advice.
  - Transport vaccines in well-insulated cool boxes with ice packs.
  - Check the vaccine type, dose, expiry date, and sealing of the packaging.
- ✓ **Storage:**
  - Store vaccines refrigerated between 2 and 8°C in a cool and dark place.
  - Avoid freezing, extreme heat, and intense light.
  - Regularly check the refrigerator's temperature and ice formation.
  - Minimize opening the refrigerator door and avoid placing hot or large quantities of warm products inside.
  - Position the vaccines deep within the fridge to reduce temperature fluctuations when opening the door.
  - Avoid unnecessary removal of vaccines, as temperature fluctuations can harm live vaccines.
- ✓ **Vaccination**
  - Follow professional advice and vaccine instructions when administering vaccines.
  - Vaccinate during cooler periods of the day, such as early morning or late evening.
  - Ensure sufficient doses are available for the flock, and check the birds' health before vaccination.
  - Administer vitamins before and after vaccination, avoiding mixing vaccines and vitamins.
  - Avoid vaccinating during stress, high heat, or ongoing antibiotic treatment.
  - Limit drinking time to three hours for vaccines administered through drinking water, followed by discarding the remaining water, cleaning the drinkers, and providing fresh water mixed with vitamins.
  - Record all vaccination information and procedures for future reference, including serial/batch numbers, expiry dates, and vaccination dates.
  - Properly dispose of any unused vaccines following professional advice.
- **Vaccination Methods:**  
 Vaccinating chickens involves various methods. Each vaccine requires a specific approach. The two main ones (Fig.42) are:
  - ✓ *Eye-drop vaccination:* Accurate dilution of the vaccine is crucial. Calibrate the eye droppers before use. Ensure the droplet disappears quickly before releasing the chicken.




		
Eye-drop vaccination	Vaccination via drinking water	Fowl pox vaccination via wing-web injection by a farmer in Cambodia Photo by Thonin Kampong Chhnang

Fig. 52. Vaccination methods

- 
- ✓ *Vaccination via drinking water:* a suitable method for mass vaccination when appropriate. Key concerns include:
    - Use plastic drinkers instead of metallic utensils to administer vaccines.
    - Avoid using disinfectants to clean the drinkers, as they can inactivate the vaccine.
    - Accurate mixing following vaccine administration instructions is crucial.
    - Properly distribute drinkers in the area.
    - Avoid using water with disinfectants or detergents; opt for clean, unchlorinated water or add skimmed powdered milk to tap water.
    - Use the reconstituted vaccine immediately (within 2 hours).

*Stimulating consumption:*

- Deprive birds of water (but not feed) for 1 to 3 hours to make them thirsty.
- Increase light and the number of drinkers to encourage drinking.
- Supply fresh feed to stimulate consumption.

*Regarding disposal of unused vaccines:*

- If vaccines remain unused, discard them by adding hot water and disinfectant and burying the mixture, including the vaccine containers.
- Never discard unused vaccines in the chicken house to avoid contamination.
- Dispose of drinking water, wash drinkers, and provide fresh water.
- Wash hands with soap and water afterward.

*Measures to promote an optimum immune response/effectiveness:*

- Administer vaccines as recommended.
- Implement the correct vaccination program.
- Avoid vaccinating sick chicks; they must be healthy.
- Minimize stressful conditions for chicks, such as disturbance and poor ventilation.
- Provide good nutrition.
- Check vaccine expiration dates.

***Proposal for vaccination schedules for Vietnam and Cambodia:*** For specific vaccination schedules in Vietnam and Cambodia, consult local veterinary/livestock staff for a well-balanced program targeting critical diseases in the area.

○ **Deworming for internal parasites and controlling external parasites are crucial:**

- ***Deworming:*** Worm infestations can reduce weight gain and egg production.
  - ✓ Symptoms of worm infestation include weakness, paralysis, diarrhea with blood, anemia, and a drop in egg production.
  - ✓ Layer-type chicken flocks are typically dewormed around eight weeks and again at 18-20 weeks before egg production starts. Deworming during peak production should be avoided unless there is a severe infestation.
- ***Control of external parasites:*** External parasites like red mites and fleas can affect performance. Symptoms include itching, restlessness, wounds, weight loss, weakness, anemia, and decreased production. Regularly inspect birds for external parasites, focusing on the back, vent area, under the wings, and areas with broken or rough feathers. Dust nest boxes and perches with approved chicken insecticide if evidence of external parasites is found.



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- **General management support for disease monitoring and prevention**

- **Stress Management:** Minimize stress factors that can compromise the immune system and make chickens more susceptible to diseases. Avoid overcrowding, sudden environmental changes, excessive noise, and improper handling. Provide adequate space, ventilation, and environmental enrichment to reduce stress.
- **Preventive treatment measures:** Preventive treatment measures are essential for reducing disease risk and promoting healthy growth and productivity. However, indiscriminate antibiotic use without proper dosages can lead to the development of Antimicrobial Resistance (AMR) and reduce the subsequent effectiveness of antibiotics. Chicken farmers should thus follow professional guidance when using antibiotics.
- **Records and Monitoring:** Maintain detailed records of flock health, including vaccinations, treatments administered, and abnormal observations. Regularly monitor individual bird health and behavior, body condition, weight, comb color, egg production, and overall flock performance. Analyze trends and seek professional advice if any abnormalities are noted.

- **Taking Action in Case of Disease Occurrence or Mortality**

For small-scale chicken farmers, it's important to know what steps to take when observing ill health in the flock, even without specific knowledge of individual diseases. Here's what farmers can do:

- **Emergency Preparedness/response plan:** Develop an emergency response plan, preferably in consultation with a veterinarian. This plan should outline procedures for disease outbreaks/ emergencies. In addition, it should include guides on how to:
  - Promptly remove dead chickens, ensuring proper disposal by burning or burying them deep away from the chicken house. Minimize contamination of the premises to prevent further disease spread.
  - Immediately isolate suspected chickens and then proceed with other measures.
  - Seek professional veterinary assistance at the first sign of ill health. Professionals can assess whether treating the affected flock is worthwhile and guide the best action. For example, it may sometimes be necessary to eradicate the entire flock, thoroughly clean the premises, and wait until it's safe to introduce new birds.

### **Common mistakes related to preventive health care of chicken**

Common mistakes contributing to disease spread and poor flock health include:

- *Sourcing day-old chicks:* Sourcing from unreliable sources that may carry diseases.
- *Inadequate biosecurity measures, such as lack of hygiene and sanitation:*
  - Failure to follow proper cleaning order.
  - Insufficient cleaning and sanitization of houses and equipment.
  - Wearing the same farm outfit inside and outside the farm.
  - Unrestricted access to people.
  - Delayed removal of wet, moldy litter.
  - Absence of footbaths or failure to replenish disinfectant.



Fig. 53. Poor biosecurity- poorly maintained dirty surroundings suitable breeding ground for rodents and wild birds; No footbath-Vietnam. Photo: NIAS

○ *Insufficient separation of birds in controlled environments:*

- Mixing different ages of chickens in the same farm or house.



Fig. 54. Mixing different age groups and poultry species-Vietnam  
Photo: NIAS-Vietnam

- Sharing equipment and supplies among houses or farms.
- Renting chicken transport crates without proper sanitation.
- Inconsistent adherence to an all-in, all-out rearing system.

○ *Poor control of rodents, birds, and insects:*

- Creating conducive breeding grounds for pests.
- Inadequate protection of chicken houses against wild birds.
- Uncontrolled access to pets

(cats, dogs, etc.)

○ *Insufficient downtime between flocks:* Failure to allow at least 14 days for proper cleaning and disinfection of the chicken facilities.

○ *Delayed disposal of sick and dead birds:*

- Neglecting regular inspections of the chicken house and birds.
- Inability to recognize signs of illness.
- Improper disposal of dead birds, increasing disease spread.

○ *Mistakes related to vaccine use and administration:*

- Failure to follow manufacturer's instructions for vaccine use.
- Improper vaccine formulation, storage, or handling.
- Use of expired vaccines or vaccinating infected birds.
- Incorrect administration route or timing of vaccination.

○ *Failure to promptly address health issues:* Lack of early detection and treatment leading to losses and decreased flock performance.



Fig.55. Free access given to pets (dogs) in Cambodia is an example of biosecurity failure. Photo by Bunnara, Kampong Chhnang

**Improvement action plan to apply knowledge/skills**

**Preventive healthcare-related improvement plan:** List one priority challenge you have related to biosecurity on your farm, one related to vaccines/vaccination, and another related to internal and external parasite prevention and control. Indicate the action (s) required to address it and the time you commit to completing the activities.

Challenges*	Action(s) to address the challenge	Action completion date	Remarks
Challenge you have related to Biosecurity.	Action1:		
	Action 2:		
Challenge you have related to vaccines/ vaccination.	Action1:		
	Action 2:		
Challenge you have related to parasite prevention and control.	Action1:		
	Action 2:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement using the examples at the end of the previous modules. Use the troubleshooting guide in appendix 2 to identify your activities.

## MODULE 7

### APPLIED CHICKEN MANAGEMENT

**Description/Introduction:** Proper husbandry and management practices are essential for the overall well-being, productivity, and profitability of your chicken farm. This module emphasizes the essential care required for chickens at every stage of rearing and production. It covers various aspects, including pre-arrival and arrival management of chicks. It addresses challenges during feeding, watering, and transport, establishing culling standards, identifying and managing poor-quality chicks, pullets, and unproductive layers, investigating causes of decreased egg production, and dealing with behavioral issues like cannibalism and egg eating. Additionally, it guides managing transitions such as feed and equipment changes.

#### **Key Learning outcomes:**

- Effectively raise chicks and replacement pullets by implementing appropriate feeding and lighting programs.
- Manage transition periods to prevent performance decline.
- Perform necessary management practices, including culling underperforming birds.
- Develop and execute actionable plans to overcome challenges in chicken management.
- Enhance overall performance in layer production through efficient and effective management techniques.

#### **TOPIC 7.1: Systems of management for different classes of chickens**

This unit covers the management of various age groups and types of chickens. A detailed checklist for daily management routines is provided in the appendix for farmers and development practitioners seeking more comprehensive information.

**What is Chicken Management?** Chicken management involves monitoring poultry health, maintaining suitable conditions in the poultry house for brooding, rearing, growing, and laying, administering recommended vaccinations, and implementing appropriate feeding programs. Fig. 56 shows chicken management factors that affect performance.

#### **Management of Chicks:**

- *Effective Brooding Management Practices:* Chick rearing requires careful attention even before the chicks arrive. The following are important activities:
  - Create a circular brooding area using brooder guards to prevent crowding and suffocating chicks in corners. Gradually expand the guarded area as chicks grow.
  - Install reliable heating equipment and distribute feeders and drinkers evenly as the brooding area expands.
  - Provide dry bedding material in the brooder area, such as wood shavings or straw. Avoid materials that can be ingested or cause respiratory issues, such as sawdust or sand.

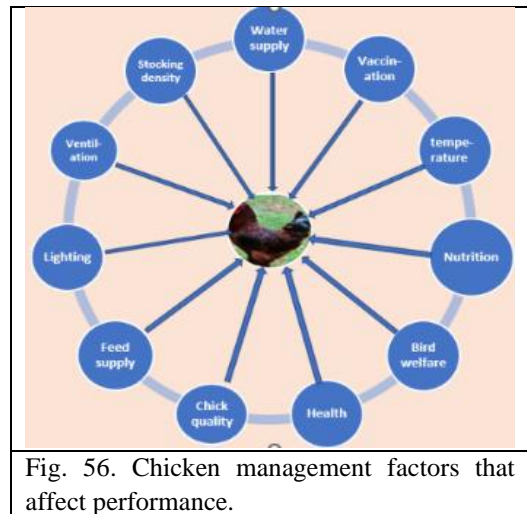


Fig. 56. Chicken management factors that affect performance.

- Cover the bedding with newspaper or similar material to prevent litter consumption by chicks during the first few days (Fig.57. Remove the newspaper after approximately five days to avoid leg problems).
- Do not use slippery metal trays as feeders. It can cause leg problems in chicks (Fig.58).



Fig. 57. Newspaper and porous polyethylene sheets are used to cover the bedding to prevent chicks from eating the litter.

Fig. 58. The metal trays used as feeders are too slippery and can cause leg problems in chicks - ***do not use them.***

- **Standards for brooders**
  - ✓ Maximum of 500 chicks in one brooding ring.
  - ✓ Approximately 75 chicks per drinker and feed plate.
  - ✓ Long feeders with at least 2.5 cm of eating space per chick.
  - ✓ The brooder guard height should be between 35-45 cm.
  - ✓ The bedding should have a thickness of about 5 cm.
  - ✓ Density: Day 1 - 50 chicks per m<sup>2</sup>; Day 7 - 25 chicks per m<sup>2</sup>.
- **Critical actions**
  - ✓ *Pre-arrival/pre-placement preparation:* Ensure heaters, temperature, relative humidity probes, ventilation, drinkers, feeders, etc., are prepared and checked before the chicks arrive.
  - ✓ Prepare the brooder area, including constructing a brooder guard at least 24 hours in advance.
  - ✓ Turn on the brooder heaters at least 6 hours before the chick arrival.
  - ✓ Check the house temperature and ensure the environment, water, and feed are at the appropriate temperature.
  - ✓ *The arrival of chicks/Chick placement/stocking density:*
    - Carefully transfer the chicks from transport vehicles to the brooder house.
    - Check the chicks for uniformity, alertness, activity, and signs of deformities or infection.
    - Place the chicks under the brooder hovers as soon as possible.
    - Provide lukewarm (about 18°C or slightly above) water with an 8% sugar solution (dissolve 80 grams of sugar per liter of drinking water) and multivitamins for the first two hours to reduce transport stress and mortality.
    - Fill feeders after 30 to 60 minutes to allow the chicks to consume water first and rehydrate before feeding.

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## Brooder Management:

- *Induction of Chicks to Feed and Water*
  - ✓ Place the chicks under the brooder and observe if they are actively drinking.
  - ✓ Assist weak chicks by gently dipping their beaks in the water. Hold each chick next to the water container and gently dip its beak in the water. *Just dip — don't hold the chicks' beaks in the water for too long!* Chicks are often dehydrated during shipping and need water more than feed. This taste of the water will encourage them to drink. Spending extra time checking chicks not drinking and dipping their beaks can get your chicks started right. If you still have a chick that looks weak and doesn't stand on its own, try to get just a drop or two of warm water into its beak and then place it under the heat source.
  - ✓ Chicks copy each other, so you can relax after a few are drinking and eating. The other healthy chicks will soon follow their lead.
  - ✓ Check on the chicks frequently, especially during the first few hours of placement, ensuring they can reach the feed and that the water temperature is not too warm (It should not feel too warm to the touch).
  - ✓ Dead chicks in the first few days are normal, but if there are ongoing deaths after a week, investigate possible causes.
  
- *Lighting and Heating Management of Chicks:*
  - ✓ Regularly monitor the temperature in the brooder area, installing thermometers at the chick level.
  - ✓ Maintain the desired temperature by reducing it by 2°C every week.
  - ✓ Follow the temperature guidelines provided in Table 5 for optimal chick comfort and development.

**Table 5. Weekly brooding temperature**

Age (weeks)	Temperature (°c) at chick level	Temperature (°c) in the house
1	33 - 35	30 - 32
2	30 - 32	27 - 29
3	27 - 29	24 -26
4	24 - 26	21 - 23

After two hours of placing the chicks, check their comfort level and make necessary adjustments to the temperature by:

- ✓ Increasing ventilation.
- ✓ Raising or lowering the heat source.
- ✓ Changing the size or wattage of the heat source.
- ✓ When using heat lamps, hanging two different-sized light bulbs in the brooder allows for quick adjustments to significant changes in day and night temperatures.
- ✓ Note that infrared lamps may not register accurately on a thermometer as they are designed to heat the chicks, not the air. Observe the behavior of the chicks to assess if they are warm enough.
- ✓ With experience, you can gauge the right temperature in the brooder without relying on a thermometer. Observe the chicks' actions and sounds to determine if the temperature is too hot or cold (Fig.59).



- *Temperature too high*: quiet chicks, panting, drooping heads and wings, and chicks moving away from the heat source.
- *Temperature too low*: chicks huddling under the heat source and making distressed sounds.
- *Chicks huddled in one corner of the brooder guard*: indicate a need for investigation. Possible factors include drought, uneven light distribution, or external noises. Chicks may be trying to avoid darker areas or drafts.
- *Temperature correct*: The desired condition is when chicks are evenly scattered throughout the brooder area, exhibiting contentment through their behavior and noise level.

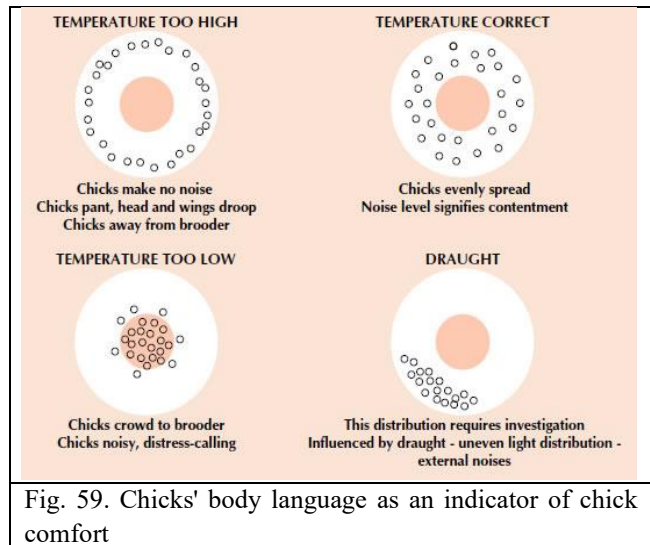


Fig. 59. Chicks' body language as an indicator of chick comfort

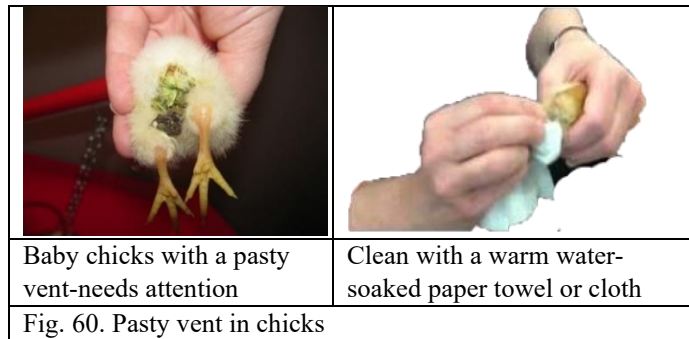
- *Ventilation*: it is essential to maintain proper ventilation during brooding. Ventilation is critical for removing ammonia and dust from the house. Smell the air at floor level. Breathing should be comfortable. Ammonia smell indicates wet litter, while dusty conditions indicate too dry litter. Take corrective measures based on the smell.
- *Light*: To give the chicks all the opportunity to feed and drink, you must provide 23 hours of light starting on the first day. The one-hour darkness is to accustom the chicks to darkness in case of power interruptions and resulting panic.

### Close Observation of Chicks:

Close observation of individual chicks is necessary in addition to group monitoring. Look out for changes in feed and water intake and abnormal appearance or symptoms. Signs of concern include coughing, sneezing, labored breathing, watery eyes, ruffled feathers, feather loss, or excessive picking. Inspect the vent, face, mouth, and nostrils for blood, scabs, or injuries.

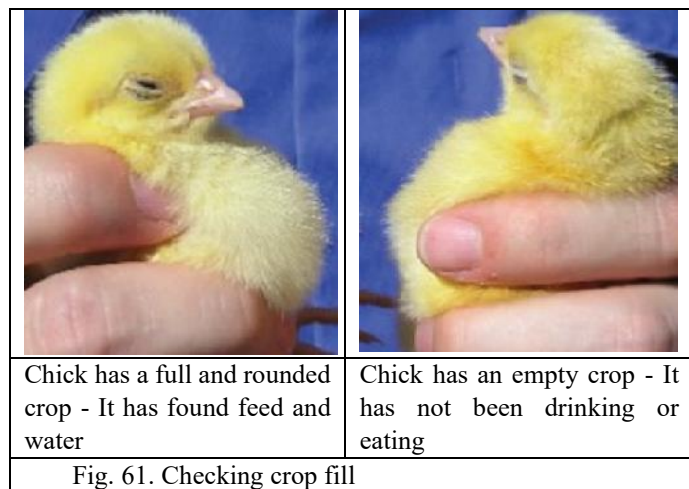
- *Identifying Good and Poor Chicks and Follow-Up Measures*: Screening and culling should begin upon the chicks' arrival. Pay attention to the following defects in one-day-old chicks:
  - ✓ Crooked legs (curly toes), one eye, or a crossed beak.
  - ✓ Unhealed navels.
  - ✓ Excessive fluid loss or dehydration.
  - ✓ Colors are not representative of the breed.
  - ✓ Lethargic chicks with dull/closed eyes, sunken heads, and drooping wings indicate poor health.
  - ✓ Chicks of variable sizes (small, medium, and large).

**Check for Vent Pasting:** Pasty vent occurs when dry droppings block the chicks' vent, causing constipation. Apply 3-4 drops of liquid paraffin or cooking oil to each drinker every 2 hours during the first days to prevent vent-pasting. Treat promptly if it still occurs. Continuously monitor for signs of pasting and gently remove pasted material using a warm, wet cloth or towel. Fig. 60 shows a chick with a pasty vent and how to clean it.



**Check for Crop Fill:** It is crucial to ensure that each chick is drinking and eating. Within 48 hours of placement, all chicks should have a full crop. Check crop fill by collecting 30-40 chicks from different areas of the brooder house and gently feeling each chick's crop (Fig. 61). The following observations indicate their intake:

- *Full, soft, and rounded crop:* Chicks have found feed and water (95% or more should have filled crops).
- *Full but hard crop:* Chicks have found feed but may have limited access to water, so check water availability.
- *Swollen and distended crop:* Chicks have found water but insufficient feed, so critically evaluate feed availability and consistency.
- *Empty crop:* Chicks have not been drinking or eating.



Covering the bedding with newspaper or similar material for the first day or two prevents chicks from overeating litter, which can lead to an "off-feed" condition with congested crops.

○ **Watering and Feeding Management:**

Place feeders and drinkers in a circle for easy access by chicks. Avoid placement directly under the heat source.

- *Watering management:*
  - ✓ Provide clean, fresh, and easily accessible water for chicks at all times.
  - ✓ Maintain 10-12 drinkers per 1,000 birds at the appropriate height.
  - ✓ Clean drinkers daily and prevent spillage and wet litter.
  - ✓ Ensure the water temperature is slightly below the environmental temperature.

Additional factors include water quality, mineral content, and drinker height.

Drinkers should be placed at a higher level to avoid contamination by bedding material and to prevent wetting of the bedding.

Upon arrival, ensure that chicks easily find clean, fresh water. If possible, refresh the water several times a day, at least once a day.

- **Feed and Feeding Management:**
  - ✓ Fill feeders only one-third full to minimize spillage and wastage.
  - ✓ Provide a constant supply of feed for the chickens.
  - ✓ Ideally, use 20-30 tube feeders per 1,000 birds positioned at a comfortable height.
  - ✓ Use high-quality and safe feed free from mycotoxins.
  - ✓ Some reasons for using lower-quality feed include underestimating the value of good-quality feed and its cheaper and more accessible availability.
  - ✓ Practices by some farmers reduce the quality of feed supplied to chickens by using unbalanced rations and adding ingredients to formulated feed with the wrong intention of lowering feed costs.

Improper feed management can lead to issues such as feed wastage, reduced feed intake and growth, and the development of mycotoxins. Common mistakes include:

- ✓ overfilling feeders,
- ✓ infrequent filling, and
- ✓ Improper storage which results in visible and invisible losses, impaired gut health, poor feed utilization, poor growth, and increased susceptibility to diseases.

- **Bodyweight and uniformity monitoring:** Monitoring bodyweight and uniformity is crucial for managing the growth and development of the flock. Weekly weighing of a sample of chicks, starting from the first week, helps track their growth rate.

- **Body weight monitoring:** Initially, collective weights can be taken in batches of 5 or 10, and later individual weights can be recorded (Fig.62). To ensure accurate data, weighing the birds consistently on the same day and time each week is important.
- **Uniformity monitoring:** Besides body weight, assessing the uniformity within the flock is essential. Uniformity is measured by calculating the percentage of individual weights that fall within  $\pm 10\%$  of the flock average. The target is to achieve at least 80% of the body weights within this range, indicating normal flock development.



Fig. 62. Body weight monitoring

## TOPIC 7.2. Management of layer-type chicken

### ○ Management of Growers/Pullets

- **Identification of Good and Poor Pullets/Layers and Culling:** Identify and remove inferior chickens from the flock to reduce production costs and disease incidence and create more space for productive birds. It is best to cull these birds as soon as they are noticed.

During placement, cull or remove pullets that are small-sized, underdeveloped, weak, crippled, or diseased. Consider available space in the laying house when determining the number of birds to cull. However, it's important not to be overly critical as some good laying hens may mature late. Give them a chance to develop if they show potential.

### ○ Lighting Program/Lighting Management During Pullet Rearing

- Guidelines for lighting: Follow specific rules regarding lighting during different stages (Table 6):
  - ✓ Do not increase the day length during the growing phase (8-14 weeks).
  - ✓ Do not increase day length when the flock's average body weight is below 1250 grams.

- ✓ Do not decrease the day length after the start of lay.

**Table 6. Lighting program during chick rearing and grower phases**

Age (weeks)	Lighting program
1-2	23 hours for 2-3 days; then 22 hours
3	22 hours
4	20 hours
5	18 hours
6	16 hours
7	14 hours
8-16	Natural day length (12 hours)
17	14 hours (increase by 2 hours)
18	14.5 hours (increase by half-hour weekly to 17 hours by week 23)

○ **Management During Transfer to the Layer House:**

Transfer pullets to the layer house around 16 to 17 weeks of age, before the onset of egg production. To minimize stress during transfer, complete vaccinations and deworming one week earlier. Increase light intensity to encourage water consumption and maintain a temperature similar to the rearing period.

○ **Management of layer hens**

Roosters are not necessary for egg production intended for consumption. Hens typically start laying eggs between 20 to 22 weeks of age.

- **Identification of Good and Poor Layers:** Before the laying period, you can further select the hens to identify those suitable for egg production. Hens with fewer feathers are often good layers, as their energy is focused on egg production. Conversely, hens with beautiful, well-feathered plumage may indicate lower egg-laying capacity. Such hens can be culled or sold for meat. Table 7 provides a comparison of features between productive and unproductive hens.

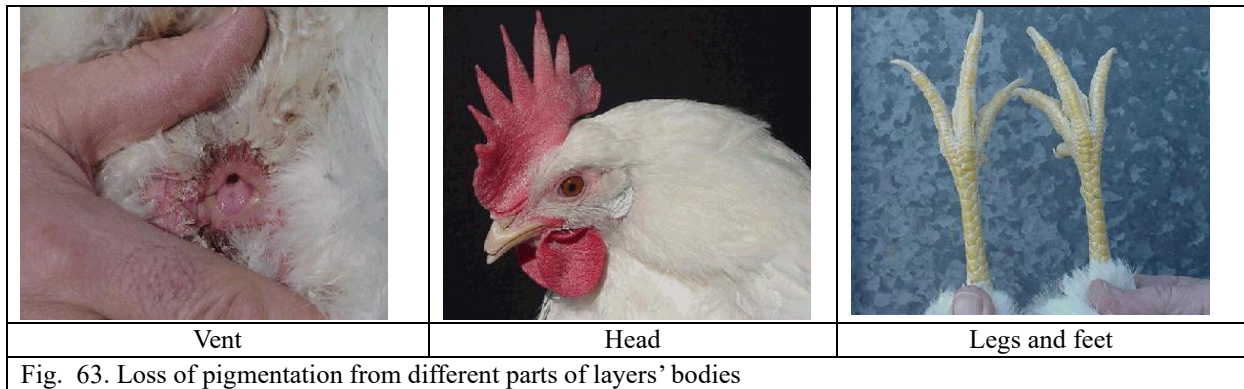
**Table 7. Comparison between productive and unproductive hens**

Parameter	Good layer	Poor layer
General condition	Lively	Dull
Weight	Good	Usually fairly light
Wattle and comb	Soft, bright red, warm,	Pale and rough
Eyes	Lively, bright	Dull; yellow rims
Pigment (yellow breeds)	Disappears	Stays longer
Cloaca	Large, soft, moist	Shriveled, dry
Distance between pubic bones	Large (5 cm)/at least 3 fingers	Small (2 cm)/1 finger (max)
Distance between the tip of the breast-bone and pubic bones	Large (8 cm)/at least 4 fingers, soft, pliable	Small (4 cm)/ Hardly 2 fingers, very hard, rubbery

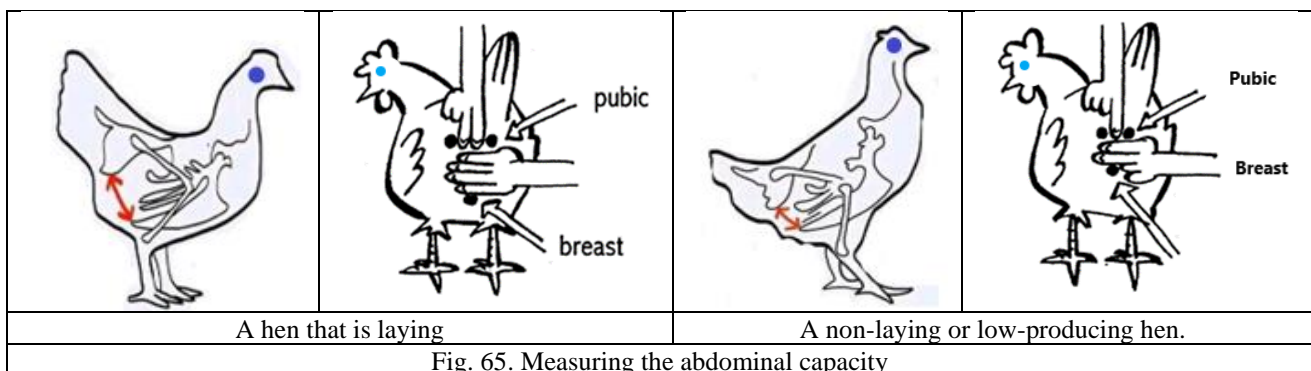
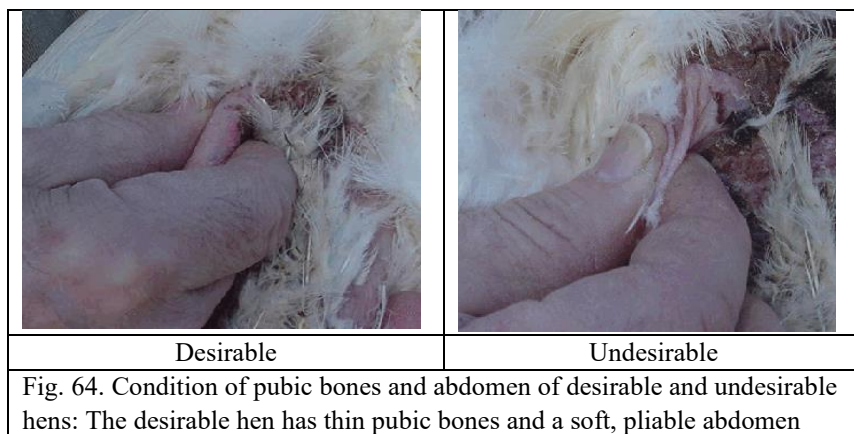
The degree of pigment loss in different body parts of laying hens indicates their stage of egg production. The bleaching order is as follows:

- Vent
- Eye ring, ear lobe, beak (corner of the mouth to the tip of the beak)
- Bottom of feet, entire shanks, hock, and top of toes.

When a hen stops laying eggs, the pigmentation returns in the reverse order but at a faster rate. Fig.63 shows the loss of pigmentation from different parts of a layer's body.



- **Abdominal capacity:** is a useful indicator of whether hens are laying eggs. In small flocks, it is easy to check by assessing the size of the abdomen. A desirable hen will have a significant abdominal capacity, typically measuring two fingers wide by four fingers deep. Fig. 64 and 65 show this.



### TOPIC 7.3. Management disorders/bad habits/troubleshooting in chicken production

Such habits are often a result of poor farm management, particularly in feeding methods. Some common disorders include:



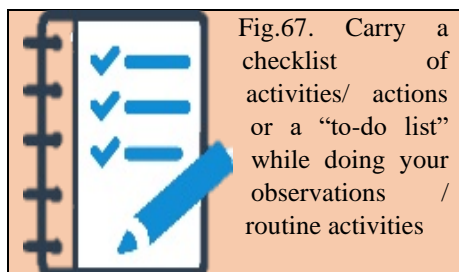
- **Cannibalism:** This destructive behavior involves birds attacking and eating each other. The two figures on the left side of Fig. 53 show this vice. Cannibalism can occur at any age and cause injuries such as feather plucking, vent, head, wing, intestine, and toe picking. It is usually triggered by poor management practices that stress the birds.
  - *Causes of cannibalism:* include nutrient deficiencies, poor ventilation, overcrowding, and the presence of pests.
  - *Preventive measures:* include addressing nutrient deficiencies, improving environmental factors, providing adequate feeder and drinker space, reducing light intensity, and considering beak trimming.
- **Egg eating and prevention:** Egg eating can become a habit among laying hens, leading to significant losses. The last picture in Fig. 66 shows the egg-eating habit. To prevent egg eating, it is important to:
  - Minimize egg breakage by ensuring strong eggshells and reducing stress levels.
  - Providing proper nutrition and collecting eggs frequently can also help prevent this behavior.
  - Identifying and culling egg-eating hens from the flock is crucial to prevent the habit from spreading.

Farmers can effectively address and mitigate these management disorders and promote better flock health and productivity by implementing these preventive measures.



- **Inspection, monitoring, and troubleshooting in chicken houses:** are crucial for maintaining the well-being of the birds. Farmers should recognize signs of trouble, diagnose the causes, and take corrective measures to minimize losses. It is important to focus on key areas of concern. Here are some recommended practices:

Extra care and attention are required during the first few days of a chick's life. Regular visits and observations, including evenings, should be conducted without disturbing the chicks. Move quietly and slowly to avoid accidentally harming them.



Carry a checklist/to-do list of activities and actions while conducting observations and routine activities in the poultry house. Appendix 3 provides a guide to routine activities for different circumstances, which can be used to develop a personalized checklist. Observe the behavior of the chicks or chickens using all your senses. Their behavior often indicates if any changes need to be made.

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Here are some key aspects to focus on during the observations:

- *First, through the window to see the flock's condition without disturbing them*
  - ✓ *Look at how the birds behave:* Observe their distribution throughout the brooding area or house. They should be evenly scattered.
  - ✓ *Listen to the birds' sounds:* Happy birds make a low, singing-like noise. Loud noise indicates discomfort due to high temperatures, while no noise suggests cold or weakness.
- *Conduct a closer inspection* of the birds after entering the house:
  - ✓ Pay attention to any smell of ammonia or dusty conditions, which may indicate ventilation or litter issues.
  - ✓ Monitor feed and water consumption, the condition of the droppings, etc.

Appendix Table 2 provides a detailed troubleshooting guide based on inspections and close observations. Use this guide as a checklist to identify possible problems and take appropriate follow-up actions. Recommended actions for different issues are outlined to assist farmers in promptly addressing any concerns.

Additionally, refer to Appendix 3 for a summary of daily routine management activities in the chicken house. This can serve as a checklist to ensure all necessary tasks are accomplished as prescribed.

### **Common mistakes in chicken management**

Common mistakes can have detrimental effects on the well-being and productivity of chickens. Therefore, it is vital to identify and rectify these mistakes to ensure maximum benefits from the chick-rearing enterprise. Here are some most common mistakes at different stages of chicken production:

- Mistakes during the chick-rearing stage:
  - *Inadequate pre-placement preparation:* Failure to properly prepare and check the brooder setup before the chicks' arrival can lead to unnecessary losses.
  - *Not covering litter with absorbent paper:* Using non-absorbent plastic sheeting instead of absorbent paper or newspaper can contribute to coccidiosis and other health issues.
  - *Offering feed immediately after introducing chicks to the brooder:* It is essential to provide water for at least 2 hours before offering feed to ensure proper hydration and digestion.
  - *Insufficient attention to chicks not drinking or eating:* Regularly inspecting and assisting chicks that may have difficulty with feeding and drinking is crucial to assist.
- Mistakes across stages (chick, grower, and layer):
  - *Inadequate monitoring of management conditions:* Lack of record-keeping, basic monitoring equipment, and random inspections can hinder performance improvement and early disease detection.
  - *Poor litter management:* Neglecting to regularly inspect and address issues with litter conditions, such as extremely dry/dusty or wet litter, can lead to health problems.
  - *Overcrowding:* Stocking chickens at high densities without adequate space can increase stress, aggression, and disease transmission.
  - *Sudden management changes:* Abrupt changes in management routines can cause stress, particularly in young chicks. Transition times should be appropriately supervised.

- *Poor labor management*: Effective management of farm staff is crucial. Some common mistakes include:
  - ✓ inadequate staff training,
  - ✓ unclear roles and responsibilities that can lead to confusion and inefficiencies,
  - ✓ poor communication channels can lead to misunderstandings, errors, and missed opportunities for improvement.

By recognizing and addressing these common mistakes, chicken farmers can improve their management practices, minimize losses, and optimize the health and productivity of their flocks.

### **Improvement action plan to apply chicken management knowledge/skills**

***Chicken management-related improvement plan:*** List at least two challenges you may have related to the management of chicks, growers/pullets layer hens. Indicate the action(s) required to address it and the time you commit to completing it.

<b>Chicken management-related Challenges</b>	<b>Action(s) to address the challenge</b>	<b>Action completion date</b>	<b>Remarks</b>
<b>Challenge 1</b>	Action 1:		
	Action 2:		
<b>Challenge 2*</b>	Action 1:		
	Action 2:		
	Action 2:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement using the examples at the end of the previous modules. Use the troubleshooting guide in appendix 2 to identify your activities.

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## MODULE 8

### MARKETING CHICKEN AND CHICKEN PRODUCTS

**Description/Introduction:** Effective marketing is crucial to running a profitable chicken farming business. While farmers often focus on production, it is essential to recognize that the market drives financial success. Understanding market requirements allows farmers to make informed decisions about what, when, and how much to produce. Therefore, a basic knowledge of marketing concepts is essential for success in the chicken business. By answering key questions such as the demand for their products, how to reach potential customers, and how to deliver goods to the market, farmers can develop effective marketing strategies. This module provides valuable techniques to help farmers market their chicken and chicken products for maximum profitability.

**Key learning outcomes:** By implementing the skills and knowledge under this module, training participants/chicken farmers will be able to:

- Implement effective marketing strategies for eggs and spent hens
- Market chicken and chicken products efficiently and effectively

#### **TOPIC 8.1: What is marketing?**

Marketing in chicken farming involves producing high-quality products (such as eggs, chicken, and chicken meat) and selling them to targeted customers at a profit. Here are key points to understand about marketing:

- *Customer orientation:* Marketing requires understanding and meeting the needs of your customers.
- *Profit focus:* Marketing aims to generate revenue and profit from selling to customers.
- *Relevance for all businesses:* Marketing is important for businesses of all sizes, not just large ones.
- *Cost-effective options:* Marketing doesn't have to be expensive. You can engage with potential customers at a low cost and advertise locally. Setting reasonable prices for your products is also part of effective marketing.
- *Align marketing with goals:* It's crucial to have a specific marketing plan that outlines your ambitions and how you will achieve them. Consider your target market, how to reach them, and specific strategies for expansion. To market your product and grow your business, you can consider the following approaches:
  - Selling more of the same product to the same market (e.g., increasing the number of eggs sold to existing customers, such as a village kiosk).
  - Introducing a new product to the same market (e.g., offering spent hens in addition to eggs at the village kiosk).
  - Selling the same product to a new market (e.g., selling eggs to a kiosk in another village, targeting new customers).
  - Introducing a new product to a new market (e.g., selling poultry litter to nearby farmers, targeting new customers).

#### **TOPIC 8.2: Marketing mix and strategies**

##### ○ **Marketing mix = the 4Ps**

To enhance your market, profitability, and overall benefits from your chicken farming, consider the following marketing mix, also known as the "4Ps" of marketing:

- **Product:** Identify your target consumers' preferences and needs, such as meat quality, price, packaging, and quantity. To meet market requirements, focus on product features and attributes, like clean and

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graded eggs. Consider adding value to your products, such as marketing specialty items like yellow-yolked eggs, to cater to niche markets and increase income.

- **Price:** Customers are price sensitive, so set an attractive and competitive price for your product while ensuring profitability. Compare prices with competitors and use promotions and discounts to attract new customers and build brand loyalty.
- **Place:** Determine how and where your product will be available to customers. This includes physical locations, such as your farm gate or retail outlets, and distribution channels through which you deliver your products to customers. Aim for convenient and easily accessible locations.
- **Promotion:** Promote awareness and interest in your products through advertising, sales promotions, and other marketing communication tools. Be creative in your approach, using methods like road signs, leaflets, word of mouth, participation in exhibitions, and advertising through various media channels. Provide product samples to encourage trial and purchase.

Consider the following information and considerations to optimize the benefits from your chicken production business:

- **Customer:** Understand your customers' needs and preferences. Provide excellent customer service, maintain communication, and swiftly address their queries.
  - **Competitors:** Research and understand your competitors' market share, strategies, and offerings. This knowledge will help you adjust your marketing strategy accordingly.
- **Marketing Strategies**
    - *Farm gate marketing:* Collaborate with other farmers to aggregate your products and attract local traders. This reduces transport costs and ensures reasonable prices.
    - *Contract marketing:* Establish connections between rural chicken farmers and urban markets, offering pre-fixed product prices.
    - *Producer organizations:* Consider joining or forming marketing groups to supply chicken and chicken products collectively. This lowers costs through shared activities like transportation, grading, and packaging and provides access to market information and advisory services.
    - Additional tips to improve your market for chicken and chicken products:
      - ✓ Sell non-performing cocks, excess off-layers, and culled hens.
      - ✓ Increase the frequency of sales to establish a reputation for selling fresh products.
      - ✓ Leverage high demand and prices during festive seasons.
      - ✓ Differentiate your products through attractive and informative packaging, setting them apart from competitors.

### **Common mistakes in chicken marketing and sales**

To ensure successful marketing and sales management, it's important to avoid the following common mistakes:



- **Poor marketing strategy:** A weak or ineffective marketing strategy can hinder your ability to reach and engage with your target audience.
- **Inadequate sales channels:** Establishing appropriate channels can limit your reach and prevent you from building strong relationships with key customers and suppliers.
- **Ineffective advertising and promotion:** If your advertising and promotional efforts are not reaching your target market effectively, you may struggle to generate awareness and interest in your products.

**Include in your development plan.**

When exploring potential market growth opportunities, it is crucial to consider the 4Ps of the marketing mix: Product, Price, Place, and Promotion. Take into account the needs and preferences of your target market, as well as the competitive landscape, when defining these elements. What factors hold the greatest significance for your customers? How can you differentiate yourself from competitors and gain a competitive edge? By carefully evaluating and addressing these questions, you can develop a comprehensive marketing strategy that maximizes your chances of success.

*Market growth Opportunity 1:* \_\_\_\_\_

<b>Product (What product features are important?)</b>	<b>Price (How much will customers pay?)</b>
<b>Place (How will you distribute your product?)</b>	<b>Promotion (How will you make customers aware?)</b>

## MODULE 9

### HANDLING AND TRANSPORTATION OF CHICKEN AND EGGS

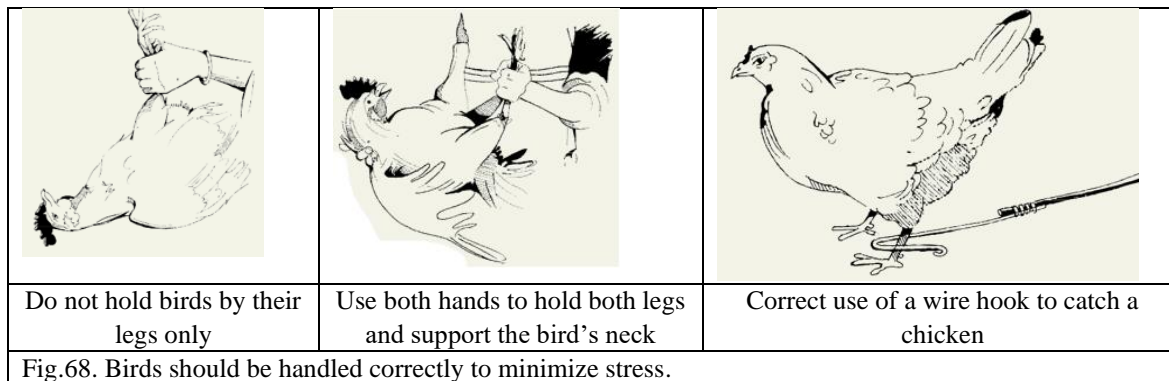
**Description/Introduction:** Proper handling and transportation of chickens and eggs are essential to prevent damage and ensure their well-being. This module provides guidelines on humane handling and transportation methods for different categories of chickens (chicks, pullets, layers). It emphasizes the correct procedures for collecting, handling, storing, packaging, and transporting eggs to maintain quality.

**Key learning outcomes:** By acquiring the skills and knowledge presented in this module, participants and chicken farmers will be able to:

- Understand the precautionary measures involved in collecting, handling, storing, packaging, and transporting eggs.
- Learn how to transport spent chickens humanely and effectively market them.
- Explain the proper techniques for collecting, handling, and storing eggs to ensure their freshness.
- Develop the ability to recognize signs of freshness in eggs.

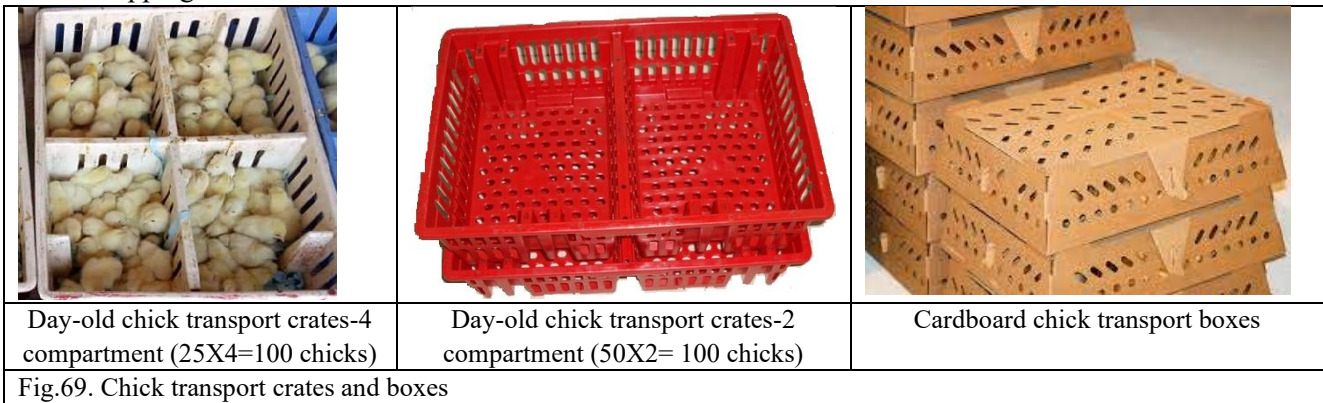
#### **TOPIC 9.1. General tips on handling, catching, and transporting chicken**

- *Entering the chicken house:*
  - Change clothing and disinfect footwear.
  - Minimize disturbance:
    - ✓ Softly knock on the door of the pen before entering to avoid scaring the chickens with loud noises.
    - ✓ Speak in a quiet, low voice.
    - ✓ Enter quietly and avoid sudden movements.
- *Catching a single bird out of the flock:*
  - Use proper techniques to minimize stress and prevent injury.
  - Do not chase the chicken.
  - Select a nearby chicken, preferably one with its tail toward you.
  - Slowly extend your hand towards one of its legs and catch it (use a hook if the bird is too far away).
- *Carrying a bird:*
  - Hold both wings near the body of the chicken.
  - Keep the bird at a distance where it cannot scratch you with its legs.
  - Expect the chicken to release some manure after being caught.

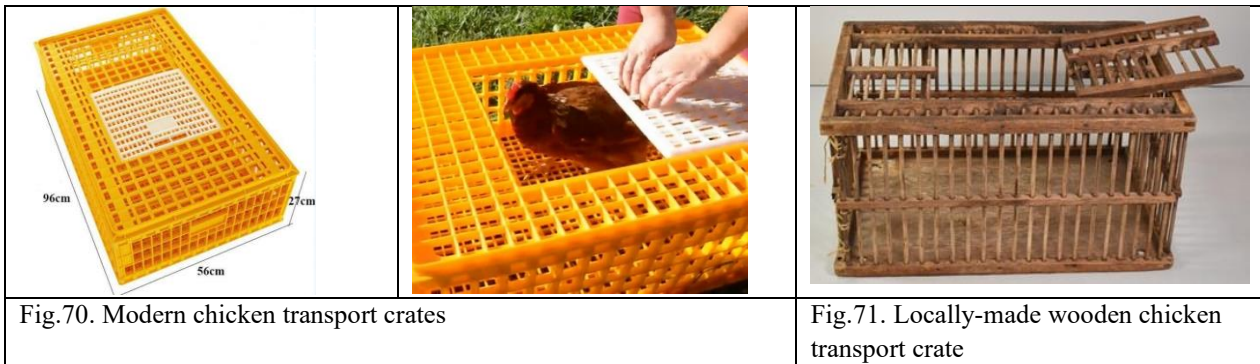


○ *Transport equipment/facilities*

- *Chick boxes:* Made of cardboard or plastic (Fig.69). Plastic boxes can be reused after cleaning and disinfection, while cardboard boxes should be burnt after a single use to prevent infection. Chick boxes come in various sizes. Avoid overcrowding to reduce stress and prevent injuries. The number of chicks per box depends on outside temperature and transport distance. Each box can hold around 100-day-old chicks, divided into four or six compartments. Use suitable materials to prevent slipping and ensure freshness.



- *Adult chicken transport crates:* Well-ventilated crates (Figs.70 and 71) with upper side openings and flaps are suitable for moving chickens to the local market. Ensure proper temperature and ventilation control. Avoid overcrowding the crates with too many chickens.



○ *Means of transport and consideration during transport*

Chickens are transported using various means, such as vehicles and carts, depending on age, distance, and quantity. Consider the following guidelines:

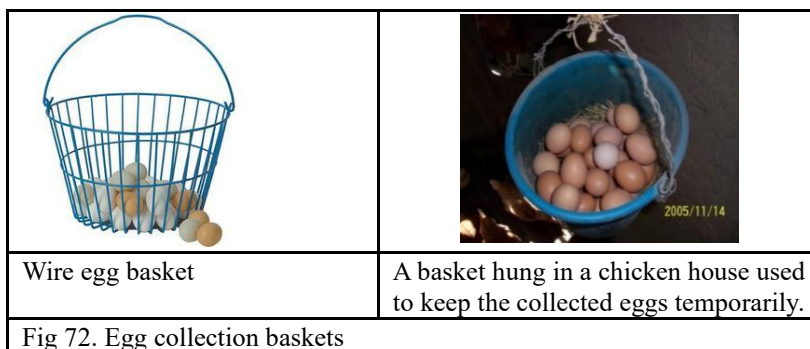
- *Chick transport*
  - ✓ Preferably transport chicks during cooler periods of the day.
  - ✓ Ensure chicks reach their destination within two days.
  - ✓ Day-old chicks do not require feed or water during transport as they still rely on their yolk.
  - ✓ Transport chicks in well-ventilated vehicles, protecting them from direct sunlight, drafts, and rain.
  - ✓ Load chick boxes to allow for proper air circulation and avoid squashing lower boxes.
  - ✓ Plan direct travel from the source (hatchery or sales office) to the farm without unnecessary stops.

- *Adult birds*
  - ✓ Provide clean water and feed before transportation.
  - ✓ Transport chickens during cooler periods to prevent heat stress.
  - ✓ Handle chickens gently and monitor their well-being.
  - ✓ Be mindful of stress levels.
  - ✓ Clean and inspect transport crates for sharp edges or gaps that may harm the birds.
  - ✓ Carry chickens by both feet and avoid overcrowding.
  - ✓ Load crates into the transport vehicle carefully.
  - ✓ Ensure adequate ventilation between crates, allowing for a 15 cm gap between rows.
  - ✓ For long-distance transport, provide feed and water before placing chickens in crates/coops.
  - ✓ Regularly check birds during the journey.
  - ✓ Transport adult chickens within a maximum of 12 hours.
  - ✓ Never transport sick, weak, or injured birds.

**TOPIC 9.2. Handling, storage, and transport of eggs**

○ **Egg collection**

- Collect eggs at least twice daily, preferably in the morning and late afternoon.
- Store eggs by collection date and size, prioritizing older eggs for sale or disposal.
- Use clean containers like wire egg baskets or plastic egg flats.
- Separate and dispose of broken or rotten eggs.



○ **Storage of eggs**

When stored correctly, eggs can be stored for up to three to four weeks. Follow these guidelines for optimal storage:

- Store eggs on clean egg trays at a temperature below 20°C.
- Avoid temperature fluctuations and high humidity, which can cause sweating and spoilage.
- Choose a sun-free and dry location for egg storage.
- Store eggs on egg trays with the large end up and separate different-sized eggs.

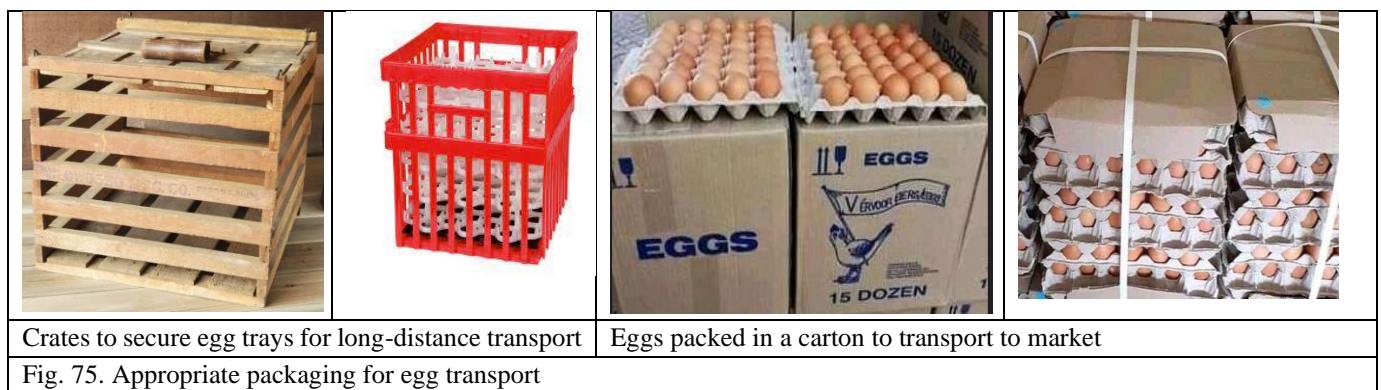
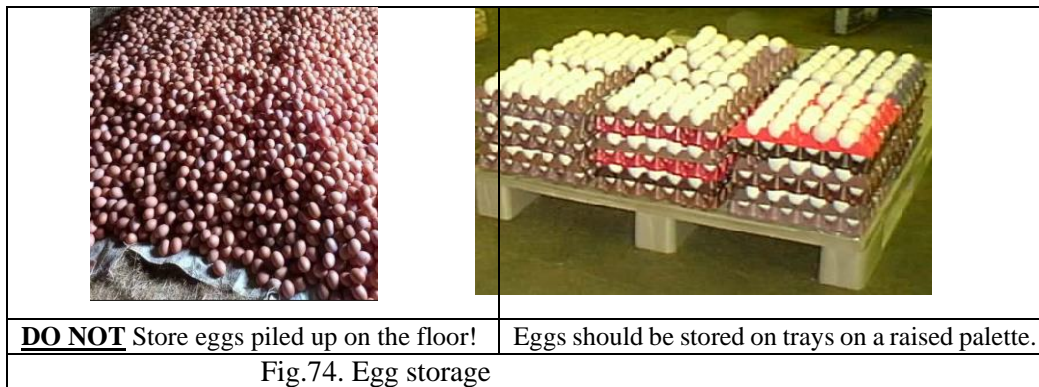
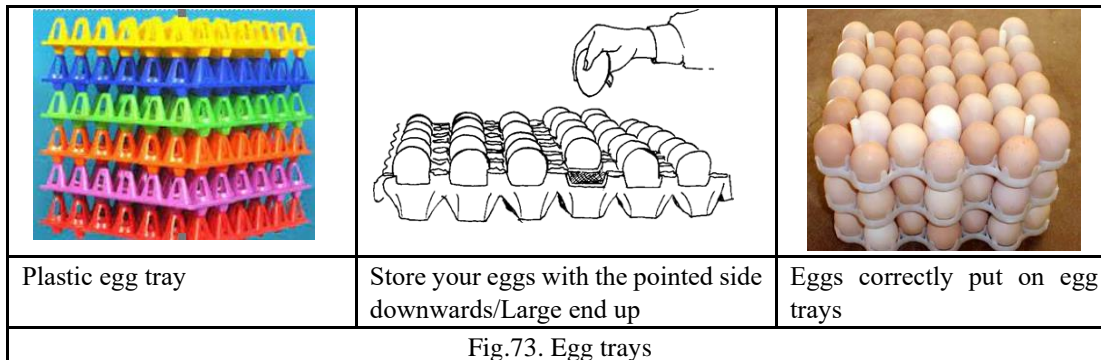
It is important to keep eggs cool, but refrigeration is not recommended as refrigerated eggs may sweat due to temperature differences with the surrounding environment, leading to faster spoilage.

○ **Transport of eggs**

- Use specialized egg packaging materials, such as trays and boxes, to minimize damage during transport (Figs. 73, 74, and 75).



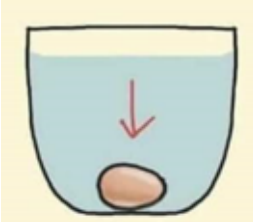
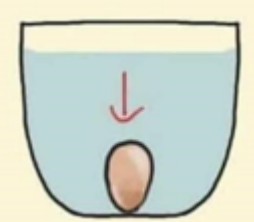
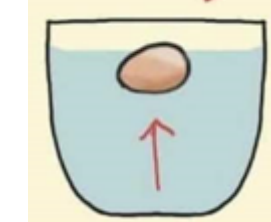
- Ensure the containers and packaging materials provide adequate protection against mechanical damage.
- Handle eggs carefully throughout transportation, protecting them from temperature fluctuations and contamination that can affect their quality.



○ **Aging eggs**

To determine the freshness of an egg, perform a simple water test (Fig.76). Place the egg in a bowl of water and observe its behavior. Fresh eggs will sink to the bottom and lie flat, while older eggs will start to tilt or float due to the accumulation of gas inside the egg.



		
It is fresh if it sinks on its side (1-7 days old)	If it sinks and stands up on its end, it is still good (8-12 days old)	If it floats to the top, it is no longer fresh (more than 12 days old)
Fig. 76. Water floating test for egg freshness (Ageing)		

### Common mistakes in chicken and egg storage and transport

- Inhumane transport of chicken (e.g., Fig. 77)
- Common mistakes in egg storage include:
  - ✓ Storing eggs on the floor;
  - ✓ Temperature fluctuations: lead to bacterial growth and fast spoilage;
  - ✓ Washing eggs before storage: Washing eggs removes the natural protective layer on eggs making them more susceptible to contamination and rapid spoilage;
  - ✓ Storing eggs with strong-smelling foods: Eggs absorb smells quickly, e.g., when stored with onions and garlic;
  - ✓ Storing eggs with cracked shells increases the risk of spoilage
- Inappropriate crates and egg transport: These can result in
  - ✓ Death losses during transport and at the buyer's farm
  - ✓ Breakage losses of eggs
  - ✓ Use of bags for chick transport instead of proper crates (an inappropriate practice)
  - ✓ Compromised animal welfare
- Insufficient cleaning and disinfection of transport crates:
  - ✓ Movement of crates without proper cleaning and disinfection
  - ✓ Biosecurity breaches and potential disease transmission



Fig. 77. Inappropriate chicken transport to market hanging on a motorbike (Cambodia)  
Photo by Bunnara, Kampong Chhnang

### Improvement action plan to apply knowledge/skills

**Marketing management-related improvement plan:** List at least two challenges you may have related to the marketing of eggs and spent hens, one related to egg collection/storage/handling. Indicate the action(s) required to address it and the time you commit to completing it.

Challenges*	Action(s) to address the challenge	Action completion date	Remarks
Challenge related to Marketing 1	Action 1:		
	Action 2:		
Challenge related to Marketing 2	Action 1:		
	Action 2:		
Challenge related to egg collection/storage/handling	Action 1:		
	Action 2:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement using the examples at the end of the previous modules. Use the troubleshooting guide in Appendix 2 to identify your activities.

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## MODULE 10

### RECORDS AND RECORD KEEPING AS A MANAGEMENT TOOL IN CHICKEN FARMING

**Description/Introduction:** Record-keeping is crucial for chicken farmers to track the performance and productivity of their flocks. However, it is not enough to just keep records. In this module, participants will learn how to effectively utilize these records to make informed decisions and improve chicken production. By identifying strengths and weaknesses in their production system, farmers can plan for future success.

**Key learning outcomes:** By implementing the skills and knowledge from this module, participants will be able to:

- Describe different types of records commonly kept in chicken farms.
- Maintain and utilize production and financial records effectively.
- Make informed decisions to optimize production and financial outcomes in their chicken business.
- Utilize business records to secure loans and credit for expanding their enterprises.

#### **TOPIC 10.1: Performance/progress monitoring**

- **Importance and considerations in record-keeping**
  - **Importance of records:** Records are vital for any business, providing valuable benefits such as:
    - ✓ Capturing essential details of each chicken batch (quantity, age, mortality rate, etc.).
    - ✓ Comparing performance between batches, benchmarking against industry standards and competitors, and evaluating the impact of management changes.
    - ✓ Replicating past successes and avoiding previous mistakes.
    - ✓ Serving as a reference for professionals, auditors, and lenders, facilitating access to loans and credit.
    - ✓ Monitoring the financial health of the business, including profitability and growth.
    - ✓ Scheduling and tracking the effectiveness of vaccinations.
    - ✓ Identifying strengths and weaknesses in the production operation.
    - ✓ Facilitating better decision-making in areas such as investment, breed selection, and vaccine choices.
  - **Considerations in record-keeping**
    - ✓ Records should be reliable, relevant, and readily accessible.
    - ✓ Keep records simple, avoiding unnecessary repetition while ensuring all necessary information is included. As the business grows, records may require upgrading and expansion.
    - ✓ Start the record-keeping system immediately, without delay.
    - ✓ Key characteristics of records should include brevity, standardized units of measurement, simplicity of language and format, accuracy of data, and timely recording.

- **Types of records relevant to chicken businesses**

Farm records can be classified into two main categories:



Fig. 78. Primary daily record hangs in the chicken house

- **Production/Technical records:** These provide information on flock performance and guide management decisions related to feeding, medication, and breeding. Examples include egg production, growth, feed consumption, water consumption, mortality, medication, and litter records.

**Financial records:** These capture costs and revenues associated with chicken farming, helping farmers assess the profitability of their business and make informed investment and resource allocation decisions. Examples include income records

(product sales) and expense records (feed costs, medication/vaccination costs, labor, equipment, infrastructure, etc.).

Daily records (Fig. 78) should be kept for feed consumption, egg production (if applicable), bird removals (deaths, illnesses, sales), vaccinations, medications, etc. These records should be summarized weekly or monthly and used for decision-making (Fig. 79). Examples of different record formats can be found in Appendix 1.

<p>Transfer primary information/data to a ledger/record book</p>	<p>Analyse data and use it for decision making</p>
<p>Fig 79. Summarize records information/ data in a ledger and used for making management decisions</p>	

Daily records are typically maintained in a format displayed in the chicken house for real-time data entry. Summarized information should be transferred to a more permanent register kept in the office for reference.

### TOPIC 10.2. Use of records for making management decisions

- **Utilizing records for decision-making:** Keeping records is meaningless if they are not compiled, analyzed, interpreted, and used to guide technical, financial, and managerial decisions (Fig.64). The output from record analysis can be used for various purposes, including:
  - Evaluating the farm's performance over time and assessing if goals are being met.
  - Assisting in managerial control.
  - Aiding in farm planning and budgeting.
  - Providing insights into earnings.
  - Identifying gaps and taking appropriate measures.
  - Showcasing the financial health of the business to secure loans and credit for expansion.
- **Routine monitoring and inspection:** Regularly monitoring activities in the chicken house is essential for improving technical performance. Key steps for effective monitoring include:
  - Establishing a record-keeping system.
  - Using checklists or "to-do" lists to ensure timely completion of tasks.
  - Being an observant farmer:
    - ✓ Using your senses to observe keenly.
    - ✓ Understanding what to look for.
    - ✓ Differentiating between normal and abnormal circumstances (troubleshooting).

- Taking immediate action when necessary.
  - Seeking professional advice or technical support as needed.
- *Developing an improvement plan for long-term business growth:* Enhancing performance and expanding the chicken business is ongoing. Key considerations for improvement include:
- Implementing a record-keeping system.
  - Calculating technical and financial performance indicators during and at the end of production.
  - Analyzing and comparing results against recommended standards.
  - Creating an action plan to address identified gaps:
    - ✓ Focusing on issues within your control.
    - ✓ Prioritizing action items.
    - ✓ Implementing corrective actions independently.
    - ✓ Seeking professional support for other issues and training opportunities to enhance knowledge and skills.
  - Evaluating progress and making necessary adjustments.
  - Continuing the cycle by updating checklists and starting anew with step 1 to assess the success of the improvement plan.

### **Improvement action plan to apply knowledge/skills**

***Improvement plan related to records and record keeping:*** List your challenges on records and record-keeping. Indicate the action(s) required to address it and the time you commit to completing it.

<b>Challenges related to records and record keeping*</b>	<b>Action (s) to address the challenge</b>	<b>Action completion date</b>	<b>Remarks</b>
<b>Challenge 1</b>	Action 1:		
	Action 2:		
	Action 3:		
<b>Challenge 2</b>	Action 1:		
	Action 2:		
	Action 3:		

\* Continue Identifying and prioritizing other/additional challenges and plan actions for improvement using the examples at the end of the previous modules. Use the troubleshooting guide in Appendix 2 to identify your actions.

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## APPENDICES

### APPENDIX 1. Sample record formats

#### 1. Rearing record

House No. .... Breed..... Date placed ..... No. Placed.....

Age (weeks)	Week ending	Weekly mortality	Feed (g/ bird/ day)	Average weight (g)	Remarks
1					
*					
20					

#### 2. Vaccination record

House No. .... Breed..... Date placed ..... No. Placed.....

Date	Age (wks)	Type of vaccine	Batch No.	Expiry date	Delivered by	Remarks

#### 3. Medication record

House No. .... Breed..... Date placed ..... No. Placed.....

Date	Type of Medication	Dosage	No. of birds Treated	Age (weeks)	Delivered by	Remarks

#### 4. Chicken mortality and culling record card

House No. .... Breed..... Date placed ..... No. Placed.....

Date	Age (weeks)	Number Lost			Done by	Remarks
		Dead	Culled	Total		

#### 5. Chicken feed store record

Month..... Feed Type..... Starting Stock (Kgs) ..... Date Placed.....

Date	Delivered (Kgs)	Issued (Kgs)	Balance (kgs)	Remarks

#### 6. Sales ledger account

Date	Product sold	No. of units	Unit cost	Total cost	Description

#### 7. Egg Production record

House No. .... Breed..... Date placed ..... No. Placed.....

Week of production	Age (wks)	Week ending	Total eggs	Comment/remarks
1				
2				
*				

## ***APPENDIX 2. Troubleshooting in chicken farms and remedial measures***

The tables under this appendix provide a guide on findings of the close observations, troubleshooting possible problems/challenges, and recommended actions. Use the guide as a checklist for troubleshooting and follow-up action.

**Table A2.1. Brooding period - Chick condition**

<b>Condition/Observation /Challenge</b>	<b>Possible Problem</b>	<b>Needed Action</b>
Chicks spread over the floor area and at the feeding and watering equipment.	Good sign	No action needed
Chicks crowded along the walls.	They are likely too hot.	Reduce heat
Chicks panting and gasping.	May either be too hot and/or have a disease problem	Check thermometer reading; Reduce heat if too high; observe further if there is no change; consult a health professional
Chicks grouped close to the heat source.	They are too cold	Increase heat
Chicks huddling and piling in small groups or the corners	they are too cold	Increase heat
Chicks crowd around feeders and drinkers.	Inadequate feeder, drinker space	Increase feeder and drinker space.

**Table A2.2. Chick growth**

<b>Condition/Observation /Challenge</b>	<b>Possible Problem</b>	<b>Needed Action</b>
Lack of uniform growth	Inadequate feeder and drinker space; poor chick quality/uniformity	Increase feeder and drinker space; consider feeding chicks with poor growth separately
Overall growth is lower than the standard for the age	<ul style="list-style-type: none"> <li>• Diet imbalance/ malnutrition;</li> <li>• Poor feed intake</li> <li>• Genetic factor: a low-grade strain of chicks;</li> <li>• Mycotoxins (Aflatoxin) in feed</li> <li>• Inappropriate environment ( cold, heat, poor ventilation, lighting, hygiene, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>• Check diet composition;</li> <li>• Increase feeder and drinker space;</li> <li>• Buy chicks from a reliable hatchery;</li> <li>• Appropriate feed storage, use fresh feed, Possible use of effective toxin binders in the feed</li> <li>• adjust house environment (e.g., temperature, ventilation, light, etc.)</li> </ul>
High Early Mortality (>1% in the first week)	<ul style="list-style-type: none"> <li>• Poor Chick Quality</li> <li>• Incorrect Brooding</li> </ul>	<ul style="list-style-type: none"> <li>• Check hatchery practice and egg hygiene</li> <li>• Check chick transport</li> <li>• Re-adjust brooders</li> </ul>

**Table A2.3. Chicks' social behavior**

<b>Condition/Observation /Challenge</b>	<b>Possible Problem</b>	<b>Needed Action</b>
Chicks pecking at each other's feathers.	<ul style="list-style-type: none"> <li>• Poor spacing</li> <li>• Idleness.</li> <li>• At times a methionine deficiency can lead to pecking on feathers</li> </ul>	<ul style="list-style-type: none"> <li>• Check for spacing and adjust;</li> <li>• Immediately remove injured chicks;</li> <li>• Reduce light intensity</li> <li>• Increase feed offers to three times daily to stop them from having time to peck each other.</li> <li>• Hanging greens to keep them busy (at the late stage of rearing)</li> <li>• Use a well-balanced feed.</li> </ul>

**Table A2.4. Chick Close inspection**

Condition/Observation /Challenge	Possible Problem	Needed Action
<ul style="list-style-type: none"> <li>• Chick condition upon inspection               <ul style="list-style-type: none"> <li>○ Moving slowly/Acting sluggish</li> <li>○ Refusing to eat or drink</li> <li>○ Huddling on the floor during the day with closed eyes</li> <li>○ Head pulled tightly in</li> <li>○ Droopy wings and tail</li> <li>○ Heavy or strained breathing.</li> <li>○ Ruffled feathers</li> <li>○ Pale or purple comb, wattles.</li> <li>○ Cloudy, leaky, swollen, or watery eyes</li> <li>○ Sneezing, gasping, or coughing.</li> <li>○ Swollen legs or feet</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Most probable disease condition</li> </ul>	<ul style="list-style-type: none"> <li>• Seek professional assistance</li> </ul>

**Table A2.5. Litter condition**

Condition/Observation /Challenge	Possible Problem	Needed Action
Litter packed and wet	Water spillage; type of litter material, litter depth, poor ventilation, temperature	improve the ventilation, avoid water spillage, and/or add new litter
Litter too dry and dusty	Can be one of many indications that birds may not be drinking enough	Follow-up water consumption
Strong ammonia odor in the house	Inadequate ventilation	improve ventilation and/or change the litter
Abnormal feces (color and consistency)	Possible disease problem	Check for possible causes against the feces indication guide in Table 2.8 below.

**Table A2.6. Feed intake**

Condition/Observation /Challenge	Possible Problem	Needed Action
Feed intake lower than standard for the age	<ul style="list-style-type: none"> <li>• House temperature too high</li> <li>• Inadequate feed supply</li> <li>• Inadequate water supply</li> <li>• Poor Lighting</li> <li>• Feed wastage</li> <li>• The feeder height is too high</li> <li>• Poor palatability               <ul style="list-style-type: none"> <li>○ Feed too dusty</li> <li>○ Moldy feed</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Keep fresh feed available at all times.</li> <li>• Providing feed at the proper time of day, i.e., early in the morning and late in the afternoon when it is cooler;</li> <li>• limit the amount of feed in the feeders to a maximum of 1/3 of their capacity</li> <li>• Stirring the feed frequently (two or three times a day) will stimulate feed intake;</li> <li>• Adjust feeder height</li> <li>• Providing cool and fresh water at least 2-3 times daily will increase feed intake.</li> <li>• Make the feed wet to make the feed less dusty and easier to consume</li> <li>• If leftover feed in a feeder is not clean and palatable, remove it before refilling</li> <li>• Never put moldy or contaminated feed in feeders.</li> <li>• Clean feeders as needed</li> </ul>

Feed intake higher than the standard	<ul style="list-style-type: none"> <li>• House temperature too low;</li> <li>• Diet imbalance, especially low in dietary energy</li> <li>• Feed wastage?</li> </ul>	<ul style="list-style-type: none"> <li>• Take measures to increase house temperature,</li> <li>• Check ration composition;</li> <li>• Check for faulty feeders and repair/replace</li> <li>• limit the amount of feed in feeders to a maximum of 1/3 of the capacity and refill as needed</li> </ul>
A sudden drop in feed intake	<ul style="list-style-type: none"> <li>• Usually, the first indication of trouble, i.e., a disease outbreak, stress, or poor management</li> </ul>	<ul style="list-style-type: none"> <li>• Observe and follow up for other signs of disease;</li> <li>• Check for stress conditions (e.g., increase in temperature, abrupt change in feed composition, etc.) and take corrective measures.</li> </ul>

**Table A2.7. Feeding and watering management**

Condition/Observation /Challenge	Possible Problem	Needed Action
Feed wastage	<ul style="list-style-type: none"> <li>• Direct: <ul style="list-style-type: none"> <li>○ Spillage of feed upon delivery</li> <li>○ Too much feed in the troughs (more than 1/3 filled)</li> <li>○ Feeders lower than the height of the chicks' back</li> <li>○ Feed stolen and contaminated by rats and birds</li> <li>○ Moldy feed</li> </ul> </li> <li>• Indirect <ul style="list-style-type: none"> <li>○ Illness (e.g., Coccidiosis)</li> <li>○ Temperature</li> <li>○ Too high nutritive value</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Limit the amount of feed in feeders to a maximum of 1/3 of the capacity and refill as needed;</li> <li>• Increase the height of the feeders gradually to the height of the chicks' backs.</li> <li>• Rodent control;</li> <li>• Supply fresh feed</li> <li>• Check and provide treatment for Coccidiosis,</li> <li>• House temperature and feed composition and take appropriate corrective measures.</li> </ul>
Litter in drinkers	<ul style="list-style-type: none"> <li>• Drinker height is too low.</li> </ul>	<ul style="list-style-type: none"> <li>• Raise drinker height so that chicks will stretch slightly to get the water; Make sure it is not too high!</li> </ul>

**Table A2.8. Appearance of feces**

Appearance of feces	*Indication/suggestive of	Proposed measure
Bloody	Coccidiosis	<ul style="list-style-type: none"> <li>• Treat with Amprolium or similar coccidiostat</li> </ul>
Greenish	<ul style="list-style-type: none"> <li>• late stage of worms,</li> <li>• Newcastle Disease,</li> <li>• fowl cholera.</li> </ul>	<ul style="list-style-type: none"> <li>• Deworm</li> </ul>
White, Milky, running	<ul style="list-style-type: none"> <li>• worms,</li> <li>• Gumboro disease</li> </ul>	<ul style="list-style-type: none"> <li>• Deworm</li> </ul>
Brown, runny	<ul style="list-style-type: none"> <li>• <i>E.coli</i> infection.</li> </ul>	<ul style="list-style-type: none"> <li>• Treat with antibiotics</li> </ul>
Yellow and foamy	<ul style="list-style-type: none"> <li>• an early stage of Coccidiosis</li> </ul>	<ul style="list-style-type: none"> <li>• Treat with Amprolium or similar coccidiostat</li> </ul>
Black dropping	<ul style="list-style-type: none"> <li>• Possibility of internal bleeding or too much protein in the diet</li> </ul>	<ul style="list-style-type: none"> <li>• place them on vitamins for 3-5 days;</li> <li>• amend the feed formulation based on feed analysis results</li> </ul>
Clear or watery running	<ul style="list-style-type: none"> <li>• stress or infectious bronchitis;</li> <li>• high fiber in the diet</li> </ul>	<ul style="list-style-type: none"> <li>• Correct the stress condition (heat, transport, etc.) and put chicks on vitamins;</li> <li>• Treat for IB after confirmation</li> <li>• Adjust ration composition</li> </ul>

\*The suspected disease indications will have to be confirmed through Postmortem and other laboratory procedures

**Table A2.9. Decreased performance**

<b>Condition/ Observation/ Challenge</b>	<b>Possible Problem to check</b>	<b>Needed Action</b>
Decreased egg production	Poor balance of nutrients (Poor feed quality)	• Adjust the balance of nutrients to support rapid growth
	• Inadequate amount of feed supply	• Adjust quantity to desired levels.
	• Stress and environmental factors (Overcrowding, poor ventilation, high or low temperatures, and inadequate lighting)	• housing environment should be clean and well-maintained, with adequate space for exercise. • Lighting should be sufficient to provide at least 14-16 hours of light per day to encourage egg production.
Poor egg quality (thin or weak-shelled eggs,	• Inadequate Calcium and Vitamin D supply	• Adjust Ca and Vit D supply
	• infectious diseases such as infectious bronchitis or Newcastle disease	• Regular monitoring for signs of illness, prompt treatment with proper medications
Slow growth or poor weight gain of broilers	• Poor feed quality	• Adjust the balance of nutrients to support rapid growth
	• Inadequate amount of feed supply	• Adjust quantity to desired levels.
	• Disease conditions (e.g., Coccidiosis, external parasites)	• Regular monitoring for signs of illness and prompt treatment
	• Poor housing conditions (Overcrowding, poor ventilation, high humidity, and drafts)	• housing environment- clean and well-ventilated, with adequate space



### APPENDIX 3. Checklist of routine activities on a chicken farm

**Table A3.1. The brooding/rearing period**

Period	Activities
Before ordering chicks	<ul style="list-style-type: none"> <li>✓ Review the gaps during the previous brooding period (if reared chicks earlier) and make preparations to fill that gap.</li> <li>✓ Clean the surroundings of the brooder house of all grasses and vegetation (at least 1 meter from the house wall).</li> </ul>
A week before the chicks arrive	<ul style="list-style-type: none"> <li>✓ Clean and disinfect the house.</li> <li>✓ Place the footbath/dip containing a disinfectant solution at the entrance of the brooding house.</li> <li>✓ Check and repair equipment (heating, lighting, feeding, watering, etc.) to ensure they are in good working order.</li> <li>✓ All equipment cleaned and put in place.</li> <li>✓ Check the house for proper ventilation/draft and good condition (free of rats, predators, etc.)</li> </ul>
24 hours before the chicks arrive	<ul style="list-style-type: none"> <li>✓ Evenly spread clean and dry litter materials to about 5cm thickness/depth.</li> <li>✓ Set up a brooder guard (cardboard, plywood, aluminum sheets, etc.) in a circle around the brooder.</li> <li>✓ Pre-heat the brooder house at least 24 hours before the arrival of chicks.</li> <li>✓ The temperature near the heat source should be about 35°C and not lower than 28°C in the whole house.</li> <li>✓ Touch the floor under the brooder and check that it is warm and dry</li> <li>✓ Check that there is adequate light for the chicks to see, as the chicks can't eat or drink in the dark.</li> <li>✓ Place cleaned and disinfected drinkers and chick feeding trays just outside the brooder box.</li> </ul>
Arrival of chicks	<ul style="list-style-type: none"> <li>✓ Put drinkers filled with fresh, clean, and lukewarm water (about 18°C or slightly higher) for the chicks to drink. Provide at least one drinker for every 20 chicks (a few hours before arrival). Provide water with a 5-8% (50-80g/liter) sugar solution for the first day if chicks have been transported for long hours to rehydrate them. This helps a good start-up of chicks.</li> <li>✓ Remove chicks from the boxes and immediately put them under the brooder</li> <li>✓ Check for symptoms such as coughing, sneezing, watery eyes, labored breathing, diarrhea, or pasty butt and separate.</li> <li>✓ Isolate chicks showing any obvious signs of weakness or sickness. Cull sick or injured chicks and use proper disposal methods (burn or bury deep).</li> <li>✓ Provide feed after about 30 minutes to one hour (observe whether the chicks are drinking and then provide feed). This helps the chicks to replace the fluid lost through dehydration.</li> <li>✓ Regulate heat source and observe the behavior of the chicks. The correct temperature is indicated by chicks being evenly spread throughout the brooding area.</li> <li>✓ Check for chicks that may not be drinking or eating. Then, take one at a time, dip their beaks in the water, and be sure they drink; this step is essential to survival.</li> <li>✓ Once the chicks start to drink, repeat the process with their feed.</li> </ul>
Days 1 & 2	<ul style="list-style-type: none"> <li>✓ Do the following to make sure that the chicks don't get chilled. <ul style="list-style-type: none"> <li>• Closely inspect the chicks several times daily, at least once at nightfall, to ensure they return under the brooder.</li> <li>• Check first thing in the morning to make sure they're warm enough.</li> </ul> </li> <li>✓ Provide 24 hours of lighting so the chicks can eat and drink.</li> <li>✓ Frequently check whether there is enough fresh, clean drinking water and feed.</li> <li>✓ Check for sick or dead chicks under the brooder and remove them each time you visit the brooder house.</li> <li>✓ It is good practice to provide vitamins in the drinking water</li> <li>✓ Check the brooding temperature (the behavior of the chicks)</li> <li>✓ Prevent chicks from falling into the feeder plates, drinkers, and holes in the bedding material.</li> <li>✓ Recording the daily data, information</li> </ul>
Days 3-7	<ul style="list-style-type: none"> <li>✓ Inspect the baby chicks at least twice per day.</li> <li>✓ Good to supply antibiotics and vitamins in the drinking water.</li> </ul>

	<ul style="list-style-type: none"> <li>✓ Gradually reduce the temperature of the brooders and room</li> <li>✓ Starting on day 5, expand the brooder guard to give the chicks more space and make room for additional equipment.</li> <li>✓ Make any changes gradually, as sudden changes in routine easily stress chicks.</li> <li>✓ Add larger chick feeders gradually. Gradually remove the feed trays (one or two per day) until only the trough or tube feeders remain.</li> <li>✓ Add larger drinkers. Place on stands that keep them above the floor and prevent litter from contaminating the water. Height to be adjusted as they grow. Gradually remove the small drinkers (one or two per day) until only the large drinkers remain.</li> <li>✓ Check and adjust the feeders' height to the chicks' back height.</li> <li>✓ Check the health and vigor of the chicks.</li> <li>✓ Mortality should have ceased altogether by the end of the first week. Remove dead chicks, if any.</li> </ul>
Second and third week	<ul style="list-style-type: none"> <li>✓ Keep checking the brooder house twice daily.</li> <li>✓ Gradually reduce room temperature.</li> <li>✓ Remove the brooder guard after about 7-10 days with due consideration of the condition of the chicks.</li> <li>✓ Place additional feeders and continue increasing the height of the feeders as the chicks grow.</li> <li>✓ Turn off the heating (if the environment is not too cold for the chicks)</li> <li>✓ Inspect litter quality. Check for caked litter around the brooder and wet litter around the drinkers. Remove as they appear.</li> <li>✓ Start increasing ventilation a little at a time.</li> <li>✓ Introduce a small amount of fine "chick" grit to chicks' diet -- needed to assist digestion (which they would typically get if raised naturally outside).</li> <li>✓ If mortality is higher than expected, seek technical support from a professional</li> </ul>
Fourth week	<ul style="list-style-type: none"> <li>✓ Lower brooder temperature further, if possible and necessary. Depending on the weather, be prepared to give brooder heat for up to four weeks. Adding one more week in a cold area or during the cold season may be necessary.</li> <li>✓ Keep humidity at the required level by ventilation</li> <li>✓ Reduce the light intensity to 2.8 watts/m<sup>2</sup> of floor area</li> <li>✓ Check for fresh, cool, and clean drinking water</li> <li>✓ Check the condition of the bedding material</li> </ul>

**Table A3.2. The grower/pullet rearing period**

Period	Activities
Week 5-10	<ul style="list-style-type: none"> <li>✓ Reduce light intensity to 2.0 watts/m<sup>2</sup> of floor area.</li> <li>✓ Check the weight of the chicks</li> <li>✓ Debeaking the chickens if there is cannibalism</li> <li>✓ It's time to mix in grower chicken feed as you finish your chick starter feed. Switch from Starter to Grower ration.</li> </ul>
Week 10-18	<ul style="list-style-type: none"> <li>✓ Debeak if necessary</li> <li>✓ Beware of stresses like debeaking, vaccination, and changes in feeding</li> <li>✓ Weigh the birds</li> <li>✓ Transfer pullets to the layer house around 16 to 17 weeks of age. Please refer to the section on management during the transfer of pullets to the layer house (if it is different)</li> </ul>

**Table A3.3. The layer period**

Activity	Daily routine
Feeding	<ul style="list-style-type: none"> <li>• inspect whether previously offered feed has been consumed or not</li> <li>• if not finished, adjust the amount accordingly</li> <li>• remaining feed to be removed if spoiled</li> <li>• fill the feeders to approximately 1/3rd, not more</li> </ul>

	<ul style="list-style-type: none"> <li>• add feeders if there is not enough feeding space</li> </ul>
Drinking equipment	<ul style="list-style-type: none"> <li>• wash drinkers daily and scrub with a brush</li> <li>• add a mild disinfectant to the washing water</li> <li>• rinse disinfectant with clean water</li> <li>• fill drinkers or reservoirs and check whether the system is working as it should; adjust if necessary</li> <li>• avoid spilling water</li> </ul>
Changing disinfectant in the footbath	<ul style="list-style-type: none"> <li>• drain and clean the entrance foot bath weekly or more frequently if needed</li> <li>• fill the bath and disinfect as prescribed</li> </ul>
Egg collection	<p>Collect eggs preferably several times per day, e.g.:</p> <ul style="list-style-type: none"> <li>• 1st collection 3 hours after sunrise</li> <li>• 2nd collection 5 hours after sunrise</li> <li>• 3rd collection 7 hours after sunrise</li> <li>• 4th collection is just before sunset</li> </ul>
Egg grading	<ul style="list-style-type: none"> <li>• Select eggs according to grade. e.g., A = large, B = medium, C = small, and whether broken or dirty and according to use (hatching or table/consumption)</li> <li>• wipe dirty eggs clean with a soft cloth</li> <li>• dirty eggs are for immediate consumption; this also applies to cracked eggs</li> <li>• beat contents of broken eggs (if fresh) with a fork, put in a container, and store in the freezer</li> </ul>
Supply green feed	<ul style="list-style-type: none"> <li>• hang green feed just above the heads of the chickens; this will keep the chickens busy (jumping) or, alternatively</li> </ul>
Condition of the litter	<ul style="list-style-type: none"> <li>• replace or add litter as required</li> <li>• keep litter loose by raking</li> <li>• remove caked and muddy parts immediately</li> </ul>
Inspection of flock	<ul style="list-style-type: none"> <li>• the first thing you should do when entering the house after an absence for an extended period</li> <li>• check behavior (anything abnormal?)</li> <li>• remove dead birds immediately</li> <li>• remove and/or separate sick or injured birds</li> </ul>
Records	<p>Keep daily records of:</p> <ul style="list-style-type: none"> <li>• feed consumption (amount and type)</li> <li>• egg production (if applicable)</li> <li>• removed birds (dead, sick, sold)</li> <li>• vaccination</li> <li>• medication</li> </ul>

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#### ***APPENDIX 4. Glossary of chicken farming-related terms***

This is a list of terms commonly used in chicken farming and this manual. It is by no means all-inclusive, nor are the definitions claimed to be universally used.

**All-In-All-Out:** Completely fill a house or farm with chickens and then empty it to allow for cleaning and disinfection before the next group of chickens arrives.

**Backyard chicken:** Small numbers of chickens are kept in urban and peri-urban areas. If they are housed all or most of the time, the system is often called “backyard production.”

**Balanced:** A term used for feed that contains all the essential nutrients in proper proportions based on recognized authorities' recommendations in animal nutrition for specific physiological requirements.

**Beak trimming:** The removal of the tip of a chicken's beak using specialized equipment to prevent cannibalism and related vices. Also referred to as debeaking.

**Biosecurity:** Procedures aimed at reducing the likelihood of disease outbreaks involving preventing the entry of pathogens before an outbreak and containing them within infected premises to prevent the spread.

**Breed:** Chickens with common traits passed uniformly to their offspring through selective breeding.

**Broiler:** Chicken raised for highly efficient tender meat production

**Brooder:** Equipment providing extra warmth during early chicken life using various heat sources.

**Brooding:** Carefully managing baby chicks from day-old until additional warmth is unnecessary, typically 3-4 weeks for broilers and 6/7 weeks for layer-type chicks.

**Cannibalism:** Birds attacking flock members, including feather plucking, vent, head, wing, intestine, and toe picking, as well as comb and wattle injuries and egg eating.

**Chick:** Young chickens from day old to the end of brooding.

**Cleaning and Disinfection:** Practices involving physical and chemical processes that kill or remove pathogenic microorganisms that cause diseases.

**Cloaca:** The common external opening for the fowl's digestive, urinary, and reproductive tracts.

**Cock:** Mature male that has finished one season as a breeder with coarse skin, toughened and darkened

**Cold chain:** System for safely storing and distributing vaccines within the temperature range of +2 °C and +8 °C.

**Crossbred:** Bird with parents of two or more different genotypes, breeds, or varieties.

**Culling:** Removing unproductive or otherwise undesired birds from the flock based on productive and physical characteristics.

**Decontamination:** All stages of cleaning and disinfection to remove, inactivate or destroy infectious agents on a surface or items such as tools, equipment, clothing, structures, or premises.

**Deep litter:** The system of housing where a suitable litter material is provided on the chicken house floor for the birds to live on.

**Detergent:** Chemical products that disperse and remove soil and organic materials from surfaces, enhancing the penetrating ability of water and disinfectant efficacy.

**Disease:** Any condition that affects the proper functioning of the bird's system(s), organ(s), or tissue(s).

**Disinfectant:** Substance used on surfaces to eliminate specific infectious or public health microorganisms. Physical means like heat or light can also achieve disinfection.

**Extensive system of production:** A Chicken production system allowing birds to scavenge for food over a wide area. Basic shelters or roosting in trees may be provided.

**Flock:** Chicken of the same genotype and age managed similarly within one chicken house.

**Floor eggs:** Eggs laid on the house floor instead of designated nest boxes.

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**Free range housing:** A system of housing where chickens have shelter and daytime access to an outdoor area.

**Growers:** all stock between the end of brooding and sexual maturity.

**Hen:** Mature female chicken, usually more than 11 to 12 months.

**Hover:** A canopy used on brooders to direct the heat downward to the chickens.

**Hybrid:** An offspring resulting from the cross between parents of different species or populations within species.

**Incubation Period:** Duration between setting eggs for incubation and hatching.

**Incubation:** Subjecting fertile eggs to suitable embryonic development and hatching conditions.

**Infection:** Entry, development, or multiplication of infectious agents within a host, potentially causing disease.

**Insoluble grit:** Hard material consumed by birds to aid food grinding in the gizzard.

**Intensive system:** Indoor housing without outside access, often with higher stocking densities.

**Layer:** A laying female solely kept for egg production.

**Management:** The Human factor in the production process involves decision-making, action, and responsibility.

**Molt:** Feather shedding and cessation of egg production are usually initiated by hormonal influences but are often triggered by stress.

**Morbidity:** The level of disease in a population.

**Mortality:** The number of deaths occurring in a flock.

**Point-of-lay:** Females nearing the start of egg-laying.

**Pullet:** Young female post brooding to the point of lay.

**Purebred:** Birds with the same origin and the ability to reproduce similar offspring.

**Quarantine:** To place animals in strict isolation to prevent the spread of disease.

**Relative humidity:** Percentage of moisture saturation in the air.

**Roost (Perch):** A resting place for chickens at a higher elevation from the floor.

**Sanitizer:** A substance that significantly reduces the bacterial population in the environment.

**Scavenging:** Searching for locally available feed (such as organic matter, including insects) in the environment.

**Semi-scavenging:** A system in which chickens are under partly controlled management, relying on scavenged

**Semi-intensive:** A system of production with shelter and enclosed/fenced outside run to keep chickens safe from predators.

**Slatted floor housing system:** A housing system with slats with approximately a 2 cm gap between the bars instead of litter allows feces to pass through.

**Soluble grit:** Various sources of calcium in the diet – usually a granulated or grit form of limestone.

**Spent hen:** A layer hen that has reached the end of its economic egg-laying life, usually at 72 weeks in layer chickens.

**Supplementary feed:** Extra feed given to chicken in addition to scavenged feed.

**Vent:** The common external opening from the cloaca for the digestive, urinary, and reproductive systems.

**Vitamin/mineral premix:** A concentrated source of vitamins and/or minerals mixed to make adding to the diet much easier.