



**SASAKAWA GLOBAL 2000**  
**ETHIOPIA**

**SMALL SCALE IMPROVED POULTRY  
PRODUCTION AND MARKETING MANUAL**



**TRAINING MANUALL FOR FARMERS,  
RURAL WOMEN AND YOUTH**

**SASAKAWA AFRICA ASSOCIATION**



**Published by Sasakawa Africa Association/Sasakawa Global 2000  
Ethiopia (SAA/SG2000)**

P.O. Box 12771.

Addis Ababa, Ethiopia

*www.saa-safe.org,*

*www.sg2000ethiopia.org*

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**Printed by:** Everest Printers

### **Note**

This manual is prepared in consultation with the MoA senior experts and adheres to the structures and procedures of the 'Ethiopian Occupational Standard' and 'Unit of competencies' prepared by the Ministry of Agriculture.

August 2015  
Addis Ababa



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## MODULE/MANUAL INTRODUCTION

This Improved Small Scale Poultry Production Trainers' Guide is designed to arm extension workers and professionals with skills that will assist them in developing the commercial potentials of small-farm agricultural production.

Over 85% of the Ethiopian population live in rural areas and mainly engaged in subsistence agriculture as their major livelihood. A large portion of this farming community is unable to meet basic household needs and thus live in poverty. To improve such adverse condition, it is highly essential to transform the agriculture sector into a kind of agro business.

In Ethiopian farming poultry in particular offers a very feasible and profitable undertaking for rural as well as semi-urban communities. Therefore rural farmers as well as semi-urban communities engaged in Small Scale Poultry Production gain better income provided that they effectively utilize locally available materials and resources. Farmers and rural women/youth interested in Poultry Production could insure profitability if they differentiate the strategy between traditional and improved poultry production. This Improved Small Scale Poultry Production and Marketing Training Manual are prepared to train farmers, rural women and youth and equip with all the necessary knowledge, attitude and practical skills. The Module also supports Development Agents and professionals (engaged in rural development) since it can be used as source document for training farmers, rural women's and youth.

- The Manual has been designed according to occupational standard (OS); following that each unit of competency (Module) is presented as follows: Learning Modules.
- Module Title.
- Module Description.
- Nominal Duration.
- Learning Outcomes.
- Module Content.
- Learning Methods.
- Module Learning Procedures (Learning and Practical Work Orders).
- Module Assessment.

- Assessment Criteria.
- Resource Required.

### **Training/Learning Outcomes**

After completing this training the trainees will differentiate the traditional and improved poultry production systems and the set of occupational competencies required at the work place listed in this occupational standard.

### **Unit of Competencies: Training program**

The following are the set of occupational competencies to be acquired:

1. Introduction and profitability study of improved small scale poultry production (8 hours).
2. Build houses for poultry production (16 hours).
3. Select suitable poultry breeds (16 hours).
4. Properly feed poultry chickens (16 hours).
5. Natural incubation and hatching chicks (12 hours).
6. Artificial method of incubation and hatching chicks (16 hours).
7. Care and management of young chickens (20 hours).
8. Poultry health prevention, control and management (16 hours).
9. Keep personal and poultry hygiene, prevent spread of diseases and protect environmental pollutions (16 Hours).
10. Appropriately Handle, manage, supply and undertake marketing activities for poultry products (8 Hours).
11. Record, organize and keep poultry data (8 Hours).

### **Duration of the Training Program**

The training program will cover 188 hours (24 days) including the practical exercises.

### **Target Groups**

This training manual targets farmers with the intension of supporting development and improvement in the livelihood of a large portion of rural community... In other words the primary target groups are rural smallholder farmers, rural/semi urban women, youth and citizens/local entrepreneurs who have interest and/or experience in poultry farming.

### **Entry Requirements**

The prospective participants of this program are expected to have the following requirements:

- Farmers engaged and have experience in multiple farming sectors.
- Who have the plan to be part and work in market led/ oriented poultry business.
- Already started or intended to engage in poultry production, have a piece of land and capital to launch the production.

### **Mode of Training Delivery**

As part of TVET Program the mode of training delivery is cooperative and participatory oriented approach. This include: lecture-discussion, simulation and actual practice (learning by-doing).

The details of the training methods are presented below:

- Short briefing.
- Lecture with discussion.
- Group discussions.
- Practical exercise.
- Simulation and actual practice (exercise).
- Group work and individual assignment.
- Field visit to exemplary business activities.
- Training using different audio-visuals and documentaries.

### **Learning Outcome Assessment Methods**

- Questions related to the topic.
- Interview on underpinning knowledge.
- Practical exams.
- Facilitation of discussion and home works/assignments.
- Practical assessment through direct observation of tasks/role-plays, evaluation practical exercise.
- Theoretical exams; written exams at the end of each module.
- Final exam and practical test at the end of training program.
- Questioning and interview on main unit of competency.



Table 1: Training program structure

Module Title	Learning Outcomes	Duration (In hours)
1. Introduction and profitability study of improved small scale poultry production	<ul style="list-style-type: none"> <li>☞ Acquire the basic knowledge about small and large scale improved poultry production system.</li> <li>☞ Identify poultry production systems and the logic behind each system.</li> <li>☞ Prepare formats and collect all data's required to study feasible and profitability.</li> <li>☞ Assess data analysis profitability of the poultry.</li> </ul>	16
2. Build houses for poultry production	<ul style="list-style-type: none"> <li>☞ Select suitable site for building poultry houses.</li> <li>☞ Prepare suitable designs of poultry houses.</li> <li>☞ Prepare materials, tools and equipment's for building poultry houses.</li> <li>☞ Undertake poultry house building activity as per the design.</li> </ul>	24
3. Select suitable poultry breeds	<ul style="list-style-type: none"> <li>☞ Identify the basic characteristics of different breeds and locate their sources.</li> <li>☞ Identify the type of breed required for poultry production.</li> <li>☞ Purchase and transport selected breeds safely to poultry farm.</li> </ul>	16
4. Properly feed poultry chickens	<ul style="list-style-type: none"> <li>☞ Design and prepare poultry feeders and drinkers.</li> </ul>	24



Module Title	Learning Outcomes	Duration (In hours)
	<ul style="list-style-type: none"> <li>☞ Recognize type of feeds/ local feedstuffs, nutritional content and supply feeds for poultry.</li> <li>☞ Formulate and prepare balanced feed for poultry chickens based on nutritional needs.</li> <li>☞ Establish feeding program and properly feed chickens.</li> </ul>	
<p>5. Natural incubation and hatching chicks</p>	<ul style="list-style-type: none"> <li>☞ Select eggs suitable for hatching chicks.</li> <li>☞ Select brooding hens having good mothering ability.</li> <li>☞ Prepare brooding house and (nest) for incubation and hatching.</li> <li>☞ Properly feed and undertake good care and management for brooding hens.</li> </ul>	<p><b>12</b></p>
<p>6. Artificial method of incubation and hatching chicks</p>	<ul style="list-style-type: none"> <li>☞ Select and supply the type and size of incubator that suites poultry purpose.</li> <li>☞ Select suitable eggs for incubation and hatching.</li> <li>☞ Insert eggs; carry out follow-up activity as per instructions given on the incubators manual and hatch chicks.</li> </ul>	<p><b>32</b></p>
<p>7. Care and management of young chickens</p>	<ul style="list-style-type: none"> <li>☞ Build brooder for young chickens</li> <li>☞ Prepare materials, tools and equipment needed for chick house.</li> <li>☞ Prepare balanced feed, properly feed and undertake care and</li> </ul>	<p><b>16</b></p>

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Module Title	Learning Outcomes	Duration (In hours)
	management activities needed for young chicks.	
8. Poultry health prevention, control and management	<ul style="list-style-type: none"> <li>☞ Identify, supply and use basic hygiene, sanitation and medical materials, tools and equipment.</li> <li>☞ Recognize and undertake personal, poultry houses and environment hygiene and sanitation activities.</li> <li>☞ Regularly clean and disinfect poultry feeders and drinkers.</li> <li>☞ Recognize and regularly practice poultry diseases and parasites prevention measures.</li> <li>☞ Prevent poultry diseases through professional support and appropriate treatments and control methods.</li> <li>☞ Prevent, treat and control most important poultry diseases and parasite.</li> </ul>	16
9. Keep personal and poultry hygiene, prevent spread of diseases and protect environmental pollutions	<ul style="list-style-type: none"> <li>☞ Keep personal and poultry hygiene, identify; supply and use basic sanitation and hygiene chemicals and materials.</li> <li>☞ Prevent and control introduction and spread of diseases into and from poultry to humans and animals.</li> <li>☞ Appropriately handling and managing poultry by-products and protect environmental pollution.</li> </ul>	16

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Module Title	Learning Outcomes	Duration (In hours)
10. Appropriately handle, manage, supply and undertake marketing activities for poultry products	<ul style="list-style-type: none"> <li>☞ Appropriate handling and management of poultry productions.</li> <li>☞ Undertake market assessment aimed at poultry productions.</li> <li>☞ Decide on profit, fix prices and sale poultry products.</li> </ul>	8
11. Record, organize and keep poultry data	<ul style="list-style-type: none"> <li>☞ Recognize the importance and benefit of recording and documenting data's.</li> <li>☞ Types of poultry data record/register and document regularly.</li> <li>☞ Keep records and organize data related to poultry production, feed supply and consumption.</li> <li>☞ Record revenue and expenditures</li> <li>☞ Record poultry health data.</li> </ul>	8

### Supplementary Information on Training Delivery Methods

Maximum efforts are made to make the training manual to focus more on practical exercise (learning by-doing). It is also expected that the trainers do all possible efforts to make it even more practical. To this effect nearly 70% of the training time is allotted for practical works and the trainers should strictly follow TVET Program Mode of training delivery approach which will be supported with lecture-discussion, simulation and actual practice (exercise).

The trainers in charge of delivering and controlling the overall activity of the training program should have sufficient theoretical and practical knowledge and experience, as well as marketing occupational standards and related



issues on poultry production. Before the start of training program, the training facilitator should be well prepared and make ready all the required training resources. This includes lecture materials (text books, reference books, journals), learning facilities (lecture rooms, working sites etc.), consumables (pen, pencil, paper, marker fillip chart) and tools and equipment needed for both theoretical and practical training. Furthermore it is advisable to have general knowledge about the local context such as, trainer's current occupation, religion, culture, custom and other social and cultural issues; what is more, giving respect to the culture and values of the community is quite essential.

Make sure that the location and rooms selected for training are convenient for trainers and delivery of training; in addition properly address women trainee's especial needs. For both theoretical and practical training delivery the condition must be free from causing any damage on trainees. To that end, prepare and supply safety wears and protection shields for safety and personal hygiene, as well as environmental sanitation. The trainers should be well prepared on daily bases concerning training topics, means of delivery and procedure to be followed. Assessment methods are some of very important preliminary concerns which should not be ignored as it have significant impact on the outcome of the training.

Total estimated time for the training including the practice should not be less than 180 hours

## MODULE ONE: FEASIBILITY STUDY ON IMPROVED SMALL SCALE POULTRY PRODUCTION

### 1. Module Description

This Module deals with knowledge, skill and proper attitude in terms of analyzing profit and loss, as well as costs and benefits. In addition, deals with the features of improved small scale poultry farming, types and features of poultry production.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Work out on poultry production and feasibility analysis.
- Identify features of poultry production systems.
- Undertake profitability study on poultry production.

### 3. Learning Methods and Assessment Criteria

- Read and realize learning notes given under *Learning Outcome 1*
- Answer all questions given under *Theoretical/Written Exams*
- Submit to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise read and recognize notes given under *Learning Outcome 1* and answer all questions given under *Self-Assessment And Written Exams*
- Next proceed to practical exercise number 1 and do the activities.
- Continue and do all the assignments, exams and practical activities given under each learning outcomes in the same manner

### 4. Module Contents:

#### 4.1 Learning Outcome 1: Introduction to poultry production and viability or feasibility analysis

Preliminary studies and documents indicate that Ethiopia has more than 53 million poultry (chickens). Out of this more than 98% are endogenous /local breeds owned and managed by small holder

farmers through traditional poultry farming systems. The country's 98.5% of egg and 99.2% of poultry meat production is supplied from the traditional poultry production system.

Production and productivity of the sector as compared to the country's huge resource and potential are very low. The average eggs a single layer chicken can produce up to 60 per year and meat production from a grown cock is 1.5k.g. The main reasons for this low productivity of poultry farm are identified to be absence of systematic balanced feeding, poor shelter, low productivity of Indigenous breed, Limited health care and lack of awareness/less consideration for the sector are the main factors. Meat and egg are the main products of poultry farming which are the main sources of proteins for humans; besides the feces of chickens can be used as farm fertilizer and feathers are inputs for decorations.

With increase in population, there is a need for protein, establishment and improvement of livestock breeding including poultry production. According to global assessment our country is ranked among the lowest; per capita consumption of egg is 57 and meat 2.85k.g. The population calorie and protein supply and consumption are very low and the community is liable to different diseases triggered by shortage of balanced diet, which result in high mortality of children. Strengthening and supporting poultry production activity and improving productivity of the sector therefore are decisive not only to address the problems discussed above, but also enhance business and employment opportunity.

The poultry sector was identified as significant in its all rounded potential for farmers because of the following facts:

- Only low levels of skill and capital required to establish and manage small poultry farm.
- Poultry are cheap, easy to rear, easy to manage.
- Owing to the fewer weeks at which fowl reproduce themselves and mature, poultry farmers can easily manage the number of poultry based on the prevailing situations; this will enable the farmer to control diseases and droughts.



- In more densely populated areas rearing chickens are more preferable than other big size animals.
- Existence of huge market due to considerable demand and consumption increment for poultry meat and egg.

Owing to the above mentioned facts and the opportunity created due to wide gap difference between supply and demand for poultry product make the sector more profitable. Therefore this training manual will help people in rural, urban and semi urban to acquire all the necessary knowledge and skills to engage in this profitable sector.

#### 4.2 Learning outcomes 2: Types and Features of Poultry Production

Poultry production systems can be categorized into two:

##### 1. Small backyard/traditional poultry farming

*Traditional poultry farming:* This production system is currently practiced by smallholder farmers in rural, semi urban and urban areas either with indigenous poultry or improved birds (improved free-range). This system of poultry rearing is not done with the intention of profit rather considered as supplementary. Village chickens are left with minimal care. The birds find their feed by scavenging in compounds around households. In addition they may get leftovers from the harvest and kitchen. This type of production system is very cheap, but nutritional needs of the birds are difficult to meet provide with less nutrition. Traditional poultry farming is based on a household unit of production and is characterized by: mainly for home consumption, sale at gate or local market; small cash income, low input/low output, indigenous breeds, and high mortality. Birds do not have access to an enclosure or a shelter to protect them from wind and rain, or to keep them safe from predators with no or limited health care.

Normally, the household uses inputs and produces outputs without costing the value of either. Farmers are not bothered about the costs and benefits of their local poultry production efforts, there is rarely any systematic method of minimizing costs and maximizing benefits.

**Main problem and challenges related to traditional poultry farming are as follows:**

- Difficult to control chickens thus damage farm crops.
- Birds do not have access to an enclosure or a shelter to protect them from wind and rain, or to keep them safe from attacks and theft.
- Susceptible to multiple disease and attacks by predators resulting in high mortality rate.
- Nests for hens are rarely provided, causing the birds to lay their eggs on the ground and in the bushes. As a result substantial numbers of eggs are wasted and many eggs go bad before they are not hatched or consumed
- Disease prevention/control is hardly practiced, and is regarded as insignificant.

## **2. Modern and improved poultry farming**

### **Improved Small Scale Poultry Production**

The main objective of improved poultry production is to obtain better profit. Chickens are allowed to scavenge in confined compounds. In most of cases the compound is fenced using wire mesh; the height of the fence is fixed at a level not to allow chickens jump out of the compound and to restrict other animals and predators. Night shelters are also constructed within the compound; the shelter and the compound should be free from stagnant water and wet condition. Under this production system interventions that will improve production and make the farm more profitable are practiced.

### **Improved large scale poultry production**

This is industrial production systems established for commercial purpose with the objective of high profit through improved poultry management. This includes: using improved breeds like commercial layers or broilers, compounded home-made or commercial feeds under highly controlled conditions. In this production system chickens are reared on the floor beaded with enough litter and/or in poultry houses supplied

with all necessary provisions. In both cases chicken are confined within poultry houses.

#### 4.3 Learning outcome 3: Conduct feasibility study on poultry production

Farm business emphasizes a shift from subsistence farming to profit oriented farming. Trainers must learn to critically examine costs related production and marketing, as well as the benefits that accrue through improved efficiencies from making informed management decisions.

Before starting a poultry production enterprise, the trainer should calculate if it is economically feasible and viable to do so, thereby making the right decisions about the type of production and interventions needed. Following that, this Module provides a detailed methodology for cost-benefit analysis. Cost-benefit analysis is a very good decision making tool regarding the profitability of the poultry enterprise which a trainer would like to undertake.

Before starting poultry business it is very important to study and critically examine the following preliminary conditions (issues) to make sure the feasibility of poultry production.

- A trainer /group, who likes to be efficient in managing the flock, earn income and alleviate poverty need to follow improved poultry management system. This is because that chickens, especially highly productive breeds, require proper treatment and management.
- The main purpose and objective of poultry farm activity is to produce and sell birds or eggs. Therefore it is important to know the local markets situation, that is, where it is possible to sell the products. Eggs should be collected and marketed as quick as possible to the consumers while fresh. This requires a secured local (nearby) market for the product where there is high demand and attractive price. To deliver the required input to the farm and transport and supply farm products to the consumers there should be dependable transportation service.



- Basic farm inputs like selected breeds, adequate feed source and fair price, vaccines and other veterinary services, good demand and price offer for the producer in the vicinity are also key issues. Decision made to run poultry without analyzing and understanding the above stated facts will result in crisis. In line to this, consulting experienced producers engaged in the sector will also help to learn from the pros and cons they come across
- The trainer needs to make sure the availability of funds for establishment and running the poultry activity.
- Analyze the market situation and make sure secured markets for the product are available in the locality.
- Study consumers' preference regarding production type, production time, taste and texture of meat, egg nucleus (embryo) and even chickens color. Knowing consumers need helps for selecting the required type of poultry breeds and supply products that meets consumers' preference.
- At local markets, the price of cocks and hens vary significantly depending on factors such as demand (high during festivals), size or weight, plumage, and color.
- It is advisable to know the local market situation very well through detailed market studies, before deciding on the type (egg, meat or both) and size of production system. In running business oriented modern/improved poultry production, choosing one among multiple production options (for instance producing eggs, broilers, day old chicks etc.) is more preferred.
- The trainer must also identify the type and source of poultry feeds including issues involving where and how to find, the required quantity, and the price. The source of feed can be plants, animals or others.
- Poultry rearing can be managed using different production systems; if the main objective of producing birds or eggs is to generate family income the trainer has to adopt improved poultry management system. Which is more efficient and profitable but requires capital investment and a secured market for the product

Self-Assessment Questions

Self-Assessment Question 1	The production and productivity of domestic chickens is limited as compared to huge number of poultry resources. Why?
Self-Assessment Question 2	Explain the main difference between small backyard and small scale improved poultry production systems.
Self-Assessment Question 3	What are the main points of priority concerns or issues that you have to study to secure profitability of poultry farm in your locality?

FIGURE 1: PROFITABILITY STUDY



**Learning information:** Before starting a poultry production enterprise, you should make calculation to know whether it is feasible or not. To that end, consider the following:

- ☞ Select poultry production (egg or meat).
- ☞ Select breed type 1) indigenous variety 2) exotic breeds 3) cross breeds (both). Search and find initial capital or finance.
- ☞ Select appropriate site for building poultry house.
- ☞ Decide the size and type of your poultry house.

Identify different materials, tools and equipment required for the poultry, and know where they are found. The following issues are major challenges to work in poultry sector:

- a. Lack of initial capital and absence of credit services needed to start poultry production
- b. Prevalence of diseases outbreak difficult to control or in some cases uncontrollable at the producers' level.
- c. Shortage of skilled and unskilled man power.
- d. Frequent attacks on poultry animals by predators, parasites or pests that is difficult to control by producer.
- e. Lack of experience in the sector.

**Note:** It is very important to understand the main concepts discussed in this module, particularly related to potential/capacity, and quality inputs. Capacity is two pronged, financial and skill/ knowledge. The other issue is the availability and quality of basic poultry inputs. All these are basic points that you should consider and secure before starting poultry business.

#### 4. Module Assessment Questions

Module1	Module Assessment Questions
Question 1	☞ Explain the main issues that should be studied and examined to insure feasibility of poultry farm.
Question 2	☞ What is the annual egg production of indigenous chickens under traditional poultry farming system?



Question 3	☞ What are the main challenges of improved/ modern poultry production system?
Question 4	☞ How mach eggs can a single indigenous chicken produce per year? What about improved breeds?
Question 5	☞ Explain the main differences between traditional and improved small scale poultry productions.

#### 4. Practical Assignment Steps and Procedures

Module 1	Detail of practical work
<p><b>Practical exercise 1</b></p> <p>Divide trainees in groups; let them study and examine the local market and other local situations to make decision regarding the feasibility of poultry production.</p> <p>The study result (findings) should be written and presented to the trainer for evaluation.</p>	<ul style="list-style-type: none"> <li>☞ Identify and list the main points included in the study and assessment activity.</li> <li>☞ Select poultry production (egg or meat) and identify breed type including availability.</li> <li>☞ Roughly estimate the initial capital required, and indicate where and how to get finance for poultry business.</li> <li>☞ Select appropriate site for building poultry house in your locality.</li> <li>☞ Decide the size and type of your poultry house based on available finance, cost and available local materials.</li> <li>☞ Identify all materials, tools and equipment required for poultry and where and how to find.</li> <li>☞ Write about the major diseases frequently affecting poultry; their prevalence/ rate of outbreaks; possible prevention and control methods along with related veterinary services and medicines.</li> <li>☞ Write about the frequent attacks on poultry animals by predators, parasites or pests and possible prevention and control methods.</li> </ul>

## MODULE TWO: BUILD HOUSES FOR POULTRY PRODUCTION

### 1. Module Description

This Module covers skills, knowledge and attitude required to build suitable poultry house. It also deals with the skill that helps to recognize and select suitable site, setup a design, prepare materials, tools and equipment and undertake poultry house building activity.

### 2. Learning Outcomes

At the end of this training the trainees will be able to:

- Select suitable site for building poultry house.
- Prepare suitable designs for the construction of poultry house.
- Prepare materials, tools and equipment for building poultry House.
- Build poultry house as per the design.

### 3. Learning Methods and Assessment Criteria

- Read and realize learning points given under *Learning Outcome 1*.
- Answer all questions given under *Theoretical/Written exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next section; otherwise read *Learning Outcome 1* and answer *Self-Assessment And Written Exams*
- Next proceed to practical exercise number 1 and do the entire activities accordingly.
- Continue and do all the assignments, exams and practical activities given under each learning outcomes in the same manner

### Resource Required

- Site for poultry house.
- Construction materials for poultry house.
- Tools and equipment to build poultry house.
- Construction standards.

#### 4. Module Contents

One of the criteria required for keeping poultry is constructing suitable shelter. A good poultry house prevents the introduction of multiple diseases, offers protection for the birds from bad weather as well as from predators. It also needs to be well ventilated and easily cleaned, and reduce the risk of disease spreading in the flock.

##### **Potential benefits of building improved poultry housing.**

- Prevents chickens from being infected and affected by diseases.
- Offers protection for the birds from predators attack.
- Prevents farm crops from being damaged by chickens.
- Reduces loss of egg laid randomly in unsafe places.
- Dramatically reduces mortality and hence increases productivity of poultry farm.
- Protects the bird against incremental weather (rain, sun, very cold winds, dropping night temperatures).
- Provides potential benefits for improved poultry management through creating better opportunity to control and improve feeding, health and other situations.

Well managed poultry chickens provide good production. Suitable and comfortable poultry house is extremely important to maintain efficient production and convenience of the poultry farmer. The most important criteria of a good shelter are those that allow: easy cleaning and application of hygienic measures, enough space for the number of birds to avoid over-crowding, reducing wind chill or heat and provide adequate ventilation, accessing sunshine and sunlight for the birds.

#### Self-Assessment Questions

Self-Assessment Question 1	What are the benefits of building suitable houses for poultry chickens?
Self-Assessment Question 2	Explain in detail the different types of poultry production systems?



#### 4.1 Learning outcome 1: Select suitable site for poultry houses

Poultry farm should be established or located in an area that gives comforts to chickens and also suitable for farm activities. To select the site you must carefully consider the area, the materials, and the costs involved.

When choosing the right site, consider the following points:

##### 1. Site topography, soil type and area required

**Site topography:** The area must not get flooded during heavy rains because it may lead to diseases. A sloping hillside provides good drainage, air ventilation and affords some protection also. Shady and dry place on sloppy ground or flat but raised ground is preferable to keep the floor dry during the rainy season.

**Soil type:** A well-drained soil is desired. Predominantly sandy soils are more suitable; soils with significant proportions of clays are not suitable.

**Area required:** The area or size of poultry farm is dependent on the production strategy and size of poultry farm (breed type and number of chickens). Area of the compound and size of houses should have enough space for the number of birds to avoid over-crowding, reduce the risk of disease spreading in the flock and comfortable for the birds,

##### 2. Local climatic condition and orientation of the house.

- The temperature of the location is preferred not to be hotter than 30°C and cooler than 15°C. If the local temperature is different from the above extreme limits provision of instruments or equipment's for regulating incremental temperature must be installed during construction of the house.
- Poultry houses should be built in the direction which provides sufficient morning sun light because chickens prefer the morning sun shine than day or evening sun. Therefore the orientation of a chicken house has to take in to consideration the movement of the sun making the house naturally shaded and ventilated at certain times of the day and provide sufficient sun light in the morning and evening. In a wet or rainy and cold locality it is best

to select a site in which the poultry house (long side) faces east and west (the long side of the house should be constructed following north and south direction) in such a way that it receives both morning as well as evening sun light. In dry and hot localities it is best to select a site in which the poultry house (long side) faces north and south (follows east and west direction) to minimize the effect of strong and long hour sun light effect.

- In a rectangular house in hot and dry locality's the end walls (short side) must face east and west. This will ensure that only the end walls face the hot morning sun or the hotter sun during the afternoon.
- Windows placed on the south side of the house will be a good source of light and warmth during the cold weather and a good source of ventilation in hot weather.
- The house has to be large enough so that there is sufficient room for the birds, and also the air inside does not become too heavy with humidity and gasses.
- The end walls of house must face the movement of the dominating winds. The long side (front side) of the house should not be constructed in the direction of dominant wind.

### **3. Suitability for supplies and services**

- Certainty of sufficient Electric power in the locality improves poultry income.
- Required type and quantity of poultry feed should be available in the vicinity or nearby market.
- To get immediate treatment and medication during prevalence and diseases outbreak Veterinary services should be available in the locality.
- Sufficient water supply should be available in the location to satisfy high water requirement for keeping poultry clean and hygienic and Chickens high water consumption.

### Self-Assessment Questions

Self-Assessment Question 1	Describe the main evaluation criteria to choose the right and suitable site for poultry farm?
Self-Assessment Question - 2	The orientation of chicken houses has to take into consideration the direction of the morning sun. Why?
Self-Assessment Question 3	Land topography with sloppy and raised ground is suitable for poultry housing. Why?

#### 4.2 Learning outcome 2: Prepare suitable designs of poultry house

After the activity of selecting appropriate site suitable and comfortable for chickens and farm activities are completed the next and important activity is preparing design of poultry houses. At this step one must consider carefully the site, poultry size and local materials, and not least the costs involved.

##### 1. General design criteria and considerations

Based on the size and poultry production systems, the type and purpose of houses, number and size of chickens houses and the quality and cost of construction should be decided and the design prepared in a way that fits the actual situation.

During the design step take the following into account:

- Shape and size: The shape and size of poultry houses are dependent on the economy, poultry type, size and technology used and your preference. Though the size of the house will depend on the number and breed of chickens to be kept. The maximum width of end wall for all poultry houses should not be greater than 10 meter.
- To prevent or minimize the spread of diseases and parasites from one to the other minimum distance of 12 meter must be kept between successive poultry houses.
- If the poultry farm also includes chicks booming house; houses for young chickens should be constructed isolated or far away from all other poultry buildings.



- Depending on financial availability, the ground floor of houses can be made from earth or cement but the floor should be kept 25 cm higher than the original ground level.
- Walls of the house in our country are made in a way that on the left and right of one of the long wall is opened, one meter below the roof in the opposite direction of the prevailing rain covered by wire mesh. This opening will provide sufficient light and insure good ventilation
- In wet and rainy areas the slope of the roof should be increased to improve down flow of rain water. To protect entrance of splashed rain water the roof should be off sated 1 meter from the wall.
- In dry and hot areas the slope of the roof should be reduced and 0.5 meter off set from the wall is sufficient. For good ventilation and air movement height of the roof from the ground should be increased.
- If the size of the house is big the roof should be fixed at 3.7 meter height from the ground. The roof can be made from different materials like iron sheet or grasses depending on the available budget.
- The house designed and built for poultry purpose should protect the birds from dogs, rats, snakes and other predators.

## 2. Preparing design for layer houses

Layer houses are built for the purpose of keeping layer chickens from the age of 18 weeks (five and half to six month) until layers halt producing eggs or substituted by new layers. Houses for layers are designed and built following the criteria and considerations listed above. Though the size of the house is governed by poultry management, local climate and number of chickens should considered; broilers house should be sufficient enough for the number and type of chickens inside the farm or it should provide adequate space for birds In general, it is reasonable to keep and breed 5 - 7 layers per square meter space.

The structure of layer houses is the same as for the broilers except that laying boxes are provided and that there is more space per square foot per bird for the layer houses compared to the broilers houses. In general layer houses should protect the birds from strong winds, from thieves, predators, rodents, wild cats and birds. The house should also provide good ventilation, enough sunlight and sunshine and adequate drainage so that the house remains dry. If possible the orientation of the house should allow proper lighting, sunshine and prevent wind chills.

### 3. Preparing design for broiler house

In majority of cases broiler are reared on the floor covered with enough litter. The design and construction of houses for broilers follow the same criteria and considerations listed above. Though the size of the house will be governed by poultry management, local climate and number of chickens need to be considered; broilers house should provide adequate space and sufficient enough for the number and type of chickens inside the farm; in general, it is reasonable to keep and breed 10 -12 broilers per square meter space.

The structure of houses for broilers follows same procedure as for the layers except that there is less space per square foot per bird for the broiler houses compared to the layers houses. In the same way broiler houses should protect the birds from strong winds, from thieves, predators, rodents, mongoose, wild cats and birds; provide good ventilation. Provide enough sunlight and sunshine and adequate drainage so that the poultry house remains dry. If possible the orientation of the house should allow proper lighting, sunshine and prevent wind chills.

### 4. Preparing design for isolated houses

During disease outbreak or disease prevalence chickens can be infected and got ill; this ill chickens can transmit diseases to others and result in disasters effect on poultry farm; therefore these sick chickens should be kept isolated and treated in a separate house. For the purpose of isolating sick birds a separate house shall be built from locally available materials with minimum cost. The size and number of

houses depend on the type, size and economy of farm. Small scale improved poultry should have two small size separated rooms.

**During the design and building isolated houses all necessary care should be taken in relation to the following issues:**

- To protect the transmission and dissemination of diseases the house should be constructed in the opposite direction of the prevailing wind and opposite to the direction of poultry houses.
- Similarly like other poultry houses isolated houses should be supplied with all materials and equipment used only by chickens kept under isolation.
- Depending on the size of poultry especially for big poultry farms a separate room should be constructed to keep feed and other equipment in a safe place protected from weather and contamination by humans, rodents and wild birds.

#### **5. Preparing Design for Brooding Houses**

Irrespective of the size and technology applied in any poultry farm, weather natural or artificial method of hatching chicks should be in separately constructed house for hatching chicks are important.

Incubation and hatching shelter (house) is a brooding house built for incubated and naturally hatched chicks using broody mother hen, or artificially using manmade hatching machine or Incubator. The house is used to keep selected brooding hens, nests and equipment's used for brooding hens, or incubating machine and other related tools for 21 days ( for hens, or incubators to incubate and hatch eggs). The house should be big enough to contain brooding basket, brooding hen and all the equipment related tools used for both the natural and artificial incubation

#### **Size of house and other criteria**

- Size of house to incubate and hatch eggs following natural method of incubation depends on the number of broody hens kept in the house at a time. For instance if you have a plan to keep 20 broody hens at a time the house should be sufficient enough to keep the following basic provisions and conditions: 20 brooding basket one for each brooding hen- size (35 x 35 cm base width and 40 cm



height); minimum of 1 meter space between each brooding basket; minimum 2m space away from the door in all direction to keep the house a little bit darker. Considering the above criteria to hatch chicks, keeping the broody hens in three rows of a house (5 meter width and 10 meter length) is sufficient. This brooding house is wide enough for 300 chicks that are naturally hatched at once using broody mother hens.

- The house should be a little darker, not very cold and well ventilated.
- The house should not allow entrance for dogs, rats, snakes, cats, and other animals attacking poultry.
- If man made machines are used for incubation and hatching, the size of the house depends on the size of incubating machine, incubators capacity (number of eggs keep in the machine at a time) and other criteria's detailed in the incubator manual to achieve the best result. In general the size of the house should be big enough to keep the incubating machines and related tools and equipment should have enough working space and allow free movement inside the house. The optimum temperature of the house should be 23.9 degree centigrade.

**Note:** For detail information please refer Module 7- houses for young chickens.

**Table 2: Chickens floor area requirement**

Poultry Breed or Type	Size in Square Meter
Small weight layer breed female chicks	14
Medium weight layer breed female chicks	13
Broiler breed female chicks	11
Broiler breed male chicks	9
Broiler breed chicks mixed sex	10
Small weight layer breed pullets	
From 18 -22 month age	12
From 18 -22 month age	7

Medium weight layer breed pullets	
From 8 -18 month age	9
From 18 -22 month age	6
Broiler breed pullets used for cross-breed	4
Broiler breed cocks used for cross-breed	3
Layer breed /medium weight/	5
Broiler breed Natina chickens	4

## 6. Prepare Design of Equipment Inside Poultry Houses

### 6.1. Designing perches

It is natural behaviour of chickens and all birds to sleep and spend the night at highest or elevated position above the ground in trees as means of protection from attacks. Perches are important for chickens to rest on during night.

Parasites may infect poultry resting on the floor, and perches often reduce the risk of external parasites crawling onto the chickens at night. Perches are best made of round sticks, bamboo, wire and other locally available materials in square and flat form to accommodate for the number and size of the birds. If Perches are made of round sticks the distance between sticks should be 5 cm, fixed at minimum height of 50-60 cm above the ground, space between successive perches should be 35-40 cm and a plate or similar structure should be provided below Perches to receive chickens faces.

The number and size of perches required in a house can be determined by the number, size and age of chickens; for instance one square meter area of perch can be sufficient to accommodate 20 pullets and this same area can be sufficient for 15 layers.

### 6.2. Designing egg nests

Often, nests are not provided for the hens, and eventually the hens will lay their eggs on the ground, in high grass or in natural shelters, where they may be difficult to find. Some poultry farmers build nests on the ground outside the chicken house. This should be avoided, as eggs outside houses are exposed to predators and theft.

Nests should be placed inside the chicken house and preferably above the ground. For laying one may have a battery of nests where more hens can lay at a time. There must be 1 nest for every 5 hens. The nests may be made of local materials or, for small scale confined systems, there are commercially available nests made of wood and rubber floor. These commercially available nests are preferred due to the easiness of cleaning.

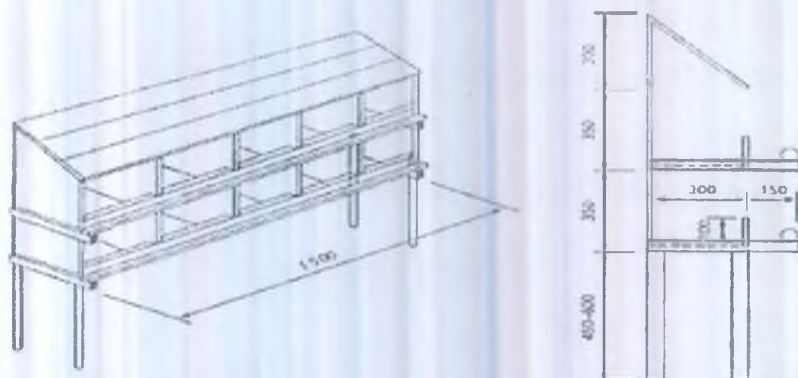


Figure 2 Design of egg nests

Local materials like timber, wooden box, mud, purlins, iron sheet bamboo and other materials are suitable for making nests. Nests should be of the right size for the hen to feel comfortable. A nest box will typically measure, length 30 cm x width 30 cm x depth 30 cm is sufficient for 5 layers. Do not make nests too big, as the hen will not feel comfortable. Prepare separately or a battery of nests based on the number of hens (layers) and keep inside chickens houses.

- Nests kept inside layers house should be sufficient for the number of layers in a house placed in comfortable and suitable location
- Nests should be Easy to clean and disinfect
- Nests should be darker, cooler and well ventilated

To protect wastage of litter and give comfort to chickens all nests should have a front protection ridge made from timber from 5-10



cm height at the door of the box. Nests should not be very high and suitable for birds to fly or jump and get in to the box and also easy to collect eggs otherwise intermediate landing space should be provided.

### 6.3. Preparing rates, small insects and predators protectors.

There are three strategies to prevent the chickens from being predated. One is to ensure that the ventilators are not below one meter from the ground. Secondly you are advised to build some fences around their chicken so that the predators are kept out and the third method is preparation of predator protectors. Figure 7 shows the methods of preparing protectors from flat sheet metal or closed metal tins.

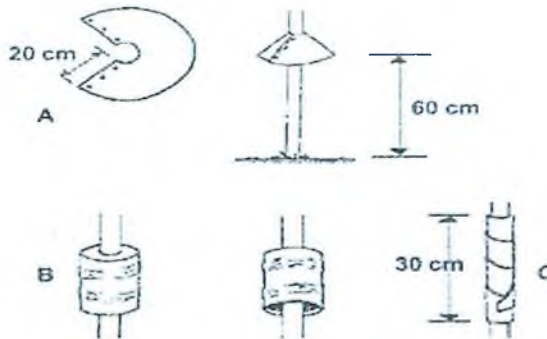
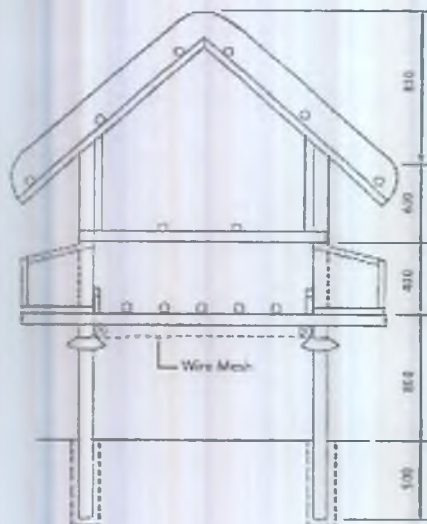
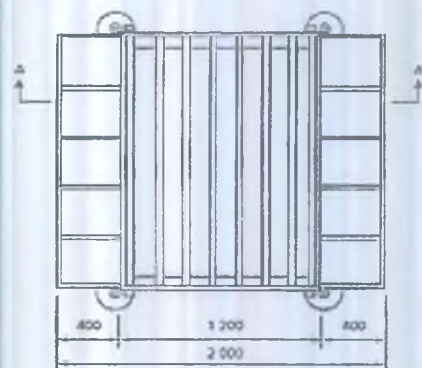
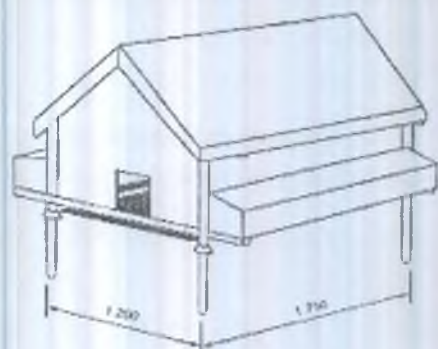


Figure 3: Rates, small and predator protections

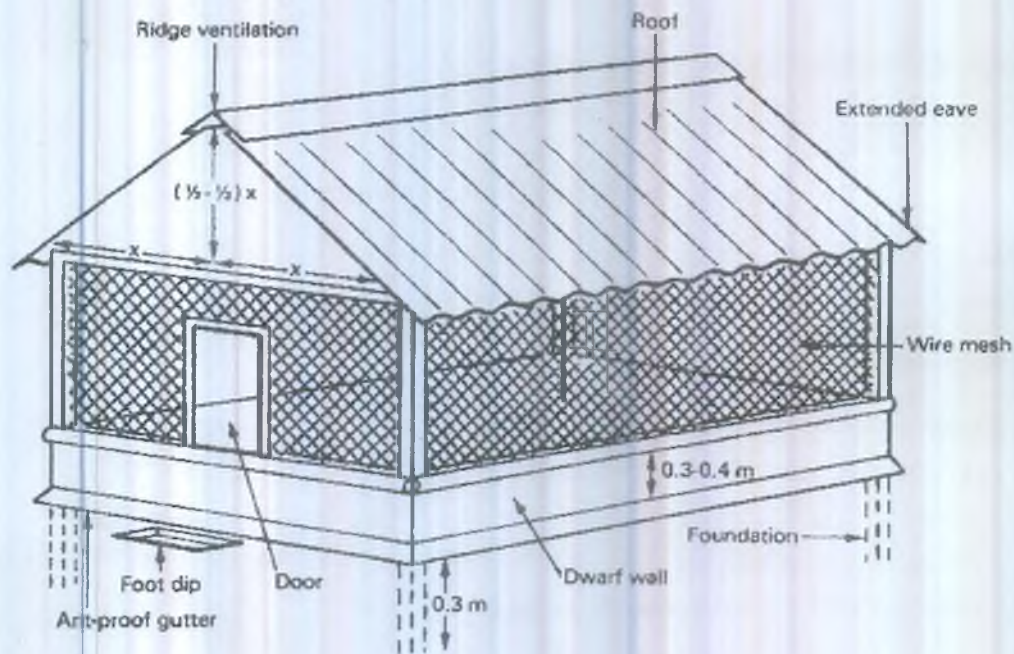
*Note: Refer Module 4 for details on the preparation and use of Poultry feeders and drinkers.*

#### Additional resources

Based on learning information given above, prepare suitable design for your poultry house taking in to consideration the financial resources available. At this point you are advised to use locally available materials to minimize your cost without compromising the health and safety of chickens. Refer design examples given below as hints for your project.



SECTION A-A



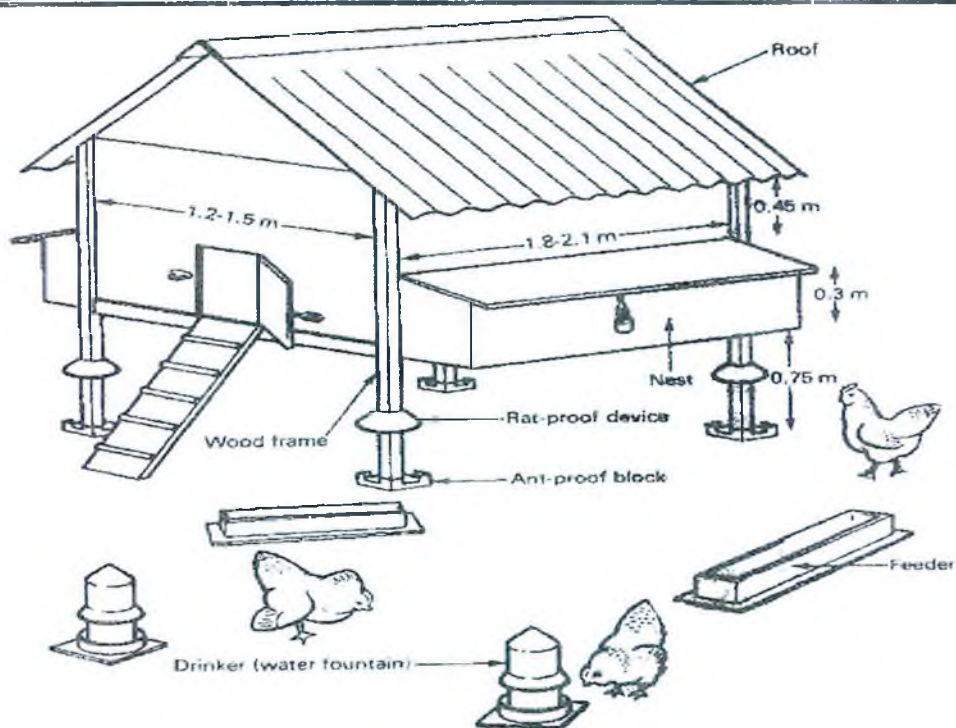


Figure 4: Poultry house for 50 layers

### Self-Assessment Questions

Self-Assessment Question 1	☞ Explain in detail the types, purpose and benefits of houses built-in poultry farm.
Self-Assessment Question 2	☞ List the main criteria you have to consider during the designs preparation of poultry housing. At least mention four criteria among others?
Self-Assessment Question 3	☞ Write the purpose and benefit of building isolated houses for poultry.
Self-Assessment Question 4	☞ If perches are to be made of round sticks, at what height above the ground should the perches be fixed? How much space between successive perches required?
Self-Assessment Question 5	☞ What are the main characteristics of good nest built for egg layers?



#### 4.3 Learning Outcome 3: Prepare materials, tools and equipment to building poultry houses

It is recommended to build houses and poultry equipment out of suitable local materials with minimum cost. Build houses using the cheapest materials like bamboo, wood, reeds, corrugated iron sheet, stone or clay bricks combined with cement. Before starting construction activity, refer your design and prepare the list and quantity of items/materials and tools needed for construction purpose. The following are construction materials and tools used for:

- Building main house for layers and broilers.
- Building isolated house.
- Making different equipment included in the main house like perches and nests.
- Other consumables items should be identified and supplied properly.

#### 4.4 Learning Outcome 4:- Undertake poultry house building activity

Referring your design, undertake the construction activity if possible by yourself or for medium or big size houses; get technical support from skilled masons. At this point, your role is to lead and control the construction activity. During construction the trainees are responsible to perform the following duties:

- Design construction plan (the plan should include time, materials, finance and manpower).
- Supervise and control quality of construction.
- Check the location, dimensions and orientation of the house against to design.
- Coordinate and measure the day to day activity.

##### ***Building small poultry houses from local materials***

Houses and related poultry equipment are encouraged to be made of locally available materials with minimum cost. Materials like bamboo, wood, reeds, corrugated

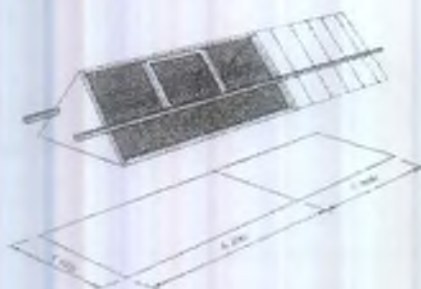


Figure 5: Portable house for 18 layers

iron sheet, stone and hollow blocks can be used for building purpose. But the most important criteria is that It should have enough space for the number of birds, protect from bad weather and predators, provide adequate ventilation and sunshine/ sunlight, facilitate easy cleaning and application of hygienic measures. Designs of small houses made of local material are given below.

***Folding type poultry houses***

- This house is made from wood timber, chicken mesh wire and corrugated iron sheets top covered by iron sheet to protect rain, sides covered by chicken mesh wire for good ventilation and bottom or floor mad from



timbers. As shown in the figure the number of chickens is determined by the size of the house and local climate. In general it is better to keep 2 or3 chickens per square meter area of house. that means a house having 6 meter length and 1.5 meter width can keep up to 16-18 chickens. The house is made in a way that you can easily move the house from place to place.



- Small and permanent poultry houses are shown in the figure. The house does not have any means to prevent wild animals enter and attack chickens.
- As shown in the figures you can easily build poultry houses from locally available materials with minimum cost.
- The next figure shows simple poultry house made from wood sticks, bamboo and other local materials; this type of house can be used for keeping young chicks.

- As shown in the figure below, it is an elevated poultry house made from local material for protecting chickens from attacking predators. It also shows how to make predators protection from flat sheet metal or closed metal tins.



### Self-Assessment Questions

Self-Assessment Question 1	Safe and suitable poultry houses can be made from local materials like wood, corrugated iron sheet and hollow blocks. Explain the key criteria which should be considered during construction (from chickens safety and suitability point of view).
Self-Assessment Question- 2	What are the benefits of building poultry houses and equipment form local materials?

### 5. Module Assessment Questions

Module 2	List of Module Assessment Questions
Question 1	☞ Explain step by step the main criteria are used or considered during selection of appropriate site for poultry house?
Question 2	☞ Describe at least three main criteria's we should take into account during the preparation of designs for poultry houses?
Question 3	☞ List the names and purpose/tasks of different equipment's required inside poultry houses?
Question 4	☞ Clarify the different methods of poultry production?
Question 5	☞ List the names of different equipment's needed by poultry farm?



Question 6	☞ Write the advantage and objectives of isolation house? Also list the main issues we should take into account very carefully during construction?
Question 7	☞ Write the number of pullets or layers that can be suitably kept on one square meter area of perches?

### 6. Practical Assignment Steps and Procedures

Module 2	Details of Practical Works
<p><b>Practical exercise 1:</b></p> <p>Group the trainees for practical assignment. Let each group select suitable site, Identify locally building materials and prepare design for poultry house sufficient to keep 200 layer chickens.</p>	<ul style="list-style-type: none"> <li>☞ According to local climate select appropriate poultry production strategy.</li> <li>☞ Calculate the required size of chicken's house base based on your previous lesson.</li> <li>☞ Identify suitable, cheap and locally available materials used for the construction of chicken shelter. .</li> <li>☞ Prepare suitable design of poultry house sufficient to keep 200 layer breed chickens.</li> </ul>
<p><b>Practical exercise 2"</b></p> <p>Let each trainee prepare appropriate design and then build a one egg nest accordingly from local materials.</p>	<ul style="list-style-type: none"> <li>☞ Decide the number of layer chickens (not less than 10).</li> <li>☞ Select suitable local building materials for poultry house.</li> <li>☞ Prepare design of a nest adequate enough for the number of layer chickens.</li> <li>☞ Build the nest as per your design.</li> </ul>

### MODULE THREE: SELECT SUITABLE POULTRY BREEDS

#### 1. Module Description

This Module focuses on the basic knowledge and skills required to identify and select breeds for poultry purpose. It also deals with the knowledge and skill required to identify the nature of different breeds, select breed required for poultry production, how chickens are handled and safely transported to the poultry farm.

#### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Identify the basic characteristics of different breeds and locate their sources.
- Identify/select the type of breed required for poultry production.
- Purchase and transport selected breeds safely to poultry farm.

#### 3. Learning Methods and Assessment Criteria

- Read and realize learning points given under *Learning Outcome 1*.
- Answer all questions given under *Theoretical/Written exams*
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read and recognize the points under *Learning Outcome 1* and answer all questions under *Self-Assessment And Written Exams*
- Next proceed to *Practical Exercise Number 1* and undertake the entire activities as directed
- Continue and carry out all the assignments, exams and practical activities given under each learning outcomes in the same manner

#### Resource Required

#### 4. Module Contents

Like all other animals chickens also have different breeds (varieties). A breed is a group of poultry with a characteristic body form and feather contours. Chickens belonging to one breed are genetically very closely related. Chickens are categorized in to three breeds grouped based on

their purpose that is, Layers (egg production), broilers (meat production) and dual-purpose (both egg and meat production) breeds.

To increase productivity through the introduction of better breeds, you should know how to ascertain the quality of the available types at various ages, based primarily on their appearance, size, sound, and behavior.

In this section explains basic concepts of breeds, their production characteristics, and the means to select birds for optimal productivity.

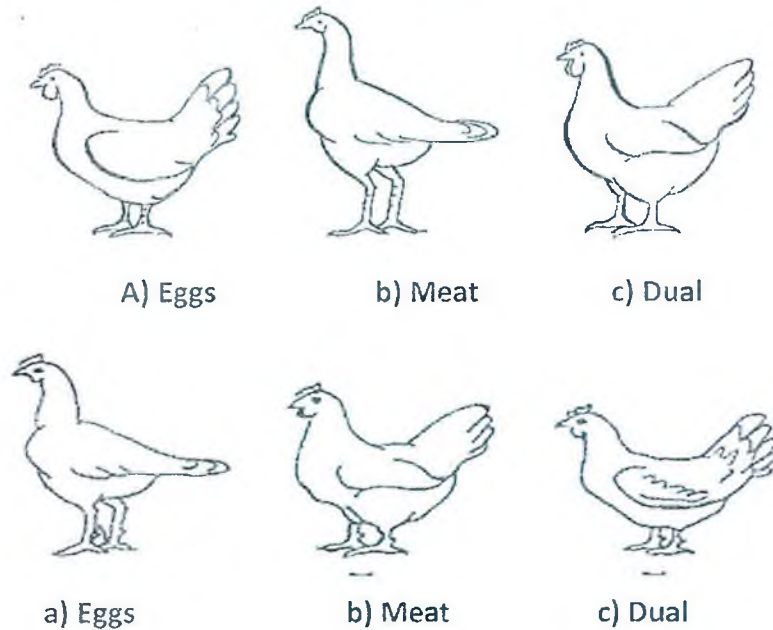


Figure 6: Classical shape of breeds producing eggs, meat and dual (both egg and meat)

#### 4.1 Learning Outcomes 1: Identify Different Characteristics of Breeds and Locate their Source

##### Domestic Verities

Productivity of domestic verities depends on the environment, management or feed availability and nature of the variety itself. At rural farmers' management level, a chicken can produce on average 30 - 60 eggs per annum. Through improved management, housing, feeding and health care, egg production of domestic chickens can be increased from 80-120 per year. Average weight of an egg is only 40 grams which is very small.





Figure 7: Domestic chickens

### Improved exotic breeds

Different varieties of chickens don't exist all over the world. In our country in addition to domestic chickens different breeds of exotic chickens are widely distributed to farmers. Among these, the main breeds are *White leghorns* and *Rod island red*. White leghorns are known for their good egg production, *Rod Island red* are dual purpose breeds, known for giving more eggs as well as meat than traditional indigenous bird.

#### A. Layer breeds

*Layers* are chicken varieties known for their high productivity in egg production. White leg horn; *anko* and *mainerkan* are known breeds for this purpose. Both sexes of white leg horns are white



ROD ISLAND RED



NEW HAMPSHAIR

in color whose behaviour is improved over time; thus they do not have broodiness and continuously producing eggs. Though chickens of these breeds do have very high egg producing capacity they are poor in meat production. Therefore these breeds are preferred and selected for egg production. Single layer can produce up to 236 eggs per year. Because of their white color chickens are visible from distance and susceptible to attacks by predators.

### B. Broilers breeds

Broilers have been selected for high/ increased meat production or yield. Broilers are big in size, have very high growth rate and better feed conversion ability. Among *broilers breeds orrington, cornish and jersey* are known for their high meat yield. Physically broilers are short legged, muscular and big in size. Egg productions of these varieties are small.

### C. Dual purpose breeds

Varieties with dual purpose are known for production of both egg and meat in a balanced manner. Among these varieties *rod island red, New Hampshire and Austrolop* are known and worth to mention. *Rod island red* breed is selected for this purpose and at present under multiplication at different centers and distributed to the farmers through the extension program. The annual egg and meat production of Rod Island Red breed are very good. After their effective laying period completed, you can generate good income by selling their meat. Except white Leg horn some of this variety chickens display broodiness. Convenience

#### Finding improved variety for your poultry farm:

Finding the required varieties having good output in terms of egg and meat production is an important preliminary activity to run profitable poultry. For this purpose some of the known places are listed below to help the search.

- Different poultry breeds multiplication and distribution centers established and controlled by Agricultural Development Office.
- Agricultural research centers
- Higher education institutions.
- Non-governmental organizations supporting the sector
- Privately owned poultry farms established at the outskirts of different Townes.

At this point trainees are requested to search and identify in their locality which of the above mentioned or other institutions do exist, what type support do they provide to the local community mainly towards enhancing poultry development and discuss on the findings.

## 4.2 Learning Outcomes 1:- Identify/Select Type of Breed Required for Poultry Production

After deciding on the type of poultry farm in terms of production based on the findings of the study conducted in your locality the next important activity is to Identify breeds of Chickens that suites your poultry farm based on the selection criteria's to help the selection process the criteria's and behaviors displayed by breeds of different purpose are detailed below.

### 1. Layer Breeds Selection Criteria

Among multiple *layer verities* white leg horn and brown leg horn are widely known for their good egg production. In *layer chicken verities* the pullet starts laying eggs on average at the age of five and half months. The number of eggs a layer can produce exceeds 240 per year. Laying hens are light in weight; though weight increment per day was small layers reach egg production stage fast. Laying hens are very active, fast and do not have broodiness behavior, have red, bigger and hot comb. Refer the box given below (additional resources) for good egg-layer identification strategy. .

### 2. Broilerbreeds selection criteria

Broiler chicken verities reach slaughter stage within three months or less. Though the number of eggs produced by each broiler chicken varies from one to the other, single broiler chicken can produce 150-170 eggs per year. Broiler chickens are big in size, get high weight increment every day, high feed consumption and display behavior of broodiness.

**A healthy good broiler should have the following features:**

- Appear healthy and lively.
- Feathering shiny and normal (may depend on the breed).
- Large size for the age.
- Eyes clear and shiny.
- Clean and dry beak and nostrils.
- Clean feathers around the vent.
- Straight legs and toes.



### 3. Dual purpose variety chickens selection criteria

Dual-purpose breeds are results of breeding programs. This variety chickens are well known for their dual benefits because they can produce more eggs as well as more meat in a balanced manner than traditional indigenous birds. Dual purpose variety chickens are big in size, have medium weight increment per day and display behavior of broodiness less than broiler chickens. Although their meat yield is better than layer chickens they produce lesser egg production. These varieties are assumed suitable to small holder farmers as they give better egg and good meat yield than broiler.

#### Additional Resources

*To increase production from local chickens, crossbreeding with established breeds' can be introduced. It is, however, important to consult professional breeders or breeding companies, who may recommend suitable and available breeds to increase egg production, growth, or both. It is important to be aware that the offspring will obtain different qualities depending on whether the cock or the hen of the new breed is used. This is because some qualities are sex-linked, and thus it is important to consult a breeder.*

#### **Rules to choose the right breed and improve selection**

- ☞ *Practice judging the external features of cocks, hens, growers, and chicks, to know which features indicate a good healthy and productive animal.*
- ☞ *Always choose birds with a lively behavior.*
- ☞ *Always check whether the hens are in lay.*
- ☞ *A potentially good layer has a long straight back and a broad bottom.*
- ☞ *Always check the belly and navel spot of newly hatched chicks.*
- ☞ *Keep new birds isolated for 2 weeks before mixing them with the flock.*
- ☞ *Make sure that new birds are vaccinated against important diseases in an area and are free of parasites before being introduced into the flock.*
- ☞ *The results of crossbreeding should always be monitored carefully.*

- ☞ *Uncontrolled use of exotic cocks in free-range village production should be avoided.*
- ☞ *If you use crossbred or exotic breeds, you must be sure that housing, feeding, and health management are improved and available at all times.*

***Domestic/Indigenous breed with Improved exotic breed chicken cross-breeding methods.***

*The two strategies used to cross-breed domestic breeds with exotic breeds are that using **the exotic breed as cock, and the exotic hen as layer.** :*

**Identifying a good egg-layer :**

It is very important to give practical assignment for trainees and compare the features of layers identified by trainees with the features listed below:

A healthy and good egg-layer should have the following features:

- ☞ Should be healthy and lively.
- ☞ Feathering normal for the breed.
- ☞ A red comb (more colored when in lay).
- ☞ Eyes clear and shiny.
- ☞ Clean and dry beak and nostrils.
- ☞ Clean feathers around the vent.
- ☞ Straight legs and toes, with no signs of scaly legs.
- ☞ Legs less colored in lay.
- ☞ The breast bone should not be sharp.
- ☞ A big broad bottom (laying status can be checked, see figure below).

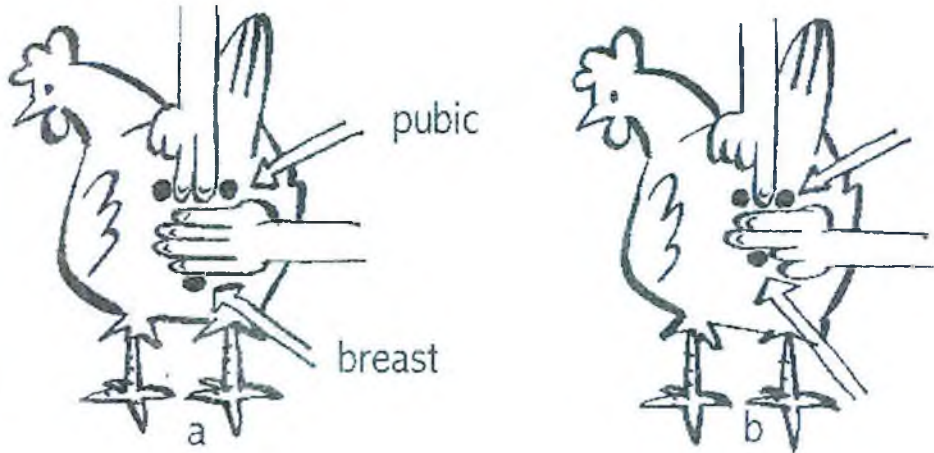


Figure: a) Hen in lay

b) Hen outside lay

*Check with your hand. The distance between the pubic bones (top) will be equivalent to two fingers when the hen is in lay. Only one finger may pass between the pubic bones when the hen is outside lay. The distance between the pubic bones (top) and the breast bone (bottom) will be equivalent to three to four fingers when the hen is in lay. Only two fingers may pass when the hen is outside lay. The criteria must be interpreted carefully when selecting indigenous chickens. Using these methods it is relatively easy to check whether the hens are laying or not. This experience can only be developed through repeated practical exercise.*

It may be an advantage to keep records on the growth and productivity of each bird in order to select birds according to features such as egg production, growth (meat production), and broody behavior. Keeping records may help you select the best layers or the best mother to protect the chicks.

#### 4.3 Learning Outcome 3: Purchase and Transport Selected Breeds Safely

In the process of transporting purchased chickens to the poultry farm, all the necessary safety measure should be taken to prevent chickens from physical damage, disease infection and death along the route. Some of the main precautions which should be considered are:



- Weather the means of transportation is cars or on foot chickens should be given enough rest; for instance 30 minutes of break time after each 2 hours journey.
- Provide sufficient feed and water during break times and make birds relax without being disturbed.
- At the market, the birds must be kept in the shade and given adequate feed and water.
- Clean feces of birds dropped inside the containing basket and/or the vehicle at interval during break times
- It is advisable to have veterinarian during purchase and transportation; otherwise try to get guidance and/or advice through telephone.

It is recommended that you should buy chickens for poultry production from controlled or known sources, but not when outbreaks of diseases are occurring. If you are forced to buy 'better breeds' from live bird market or from uncontrolled sources due to different reasons, keep them isolated and quarantined for three weeks in separate cage to make sure they are free from any diseases. This will enable you to find out about possible diseases or disorders in the new birds. If they show signs of any kind of illness, the birds should be slaughtered. When a bird is bought-either at the market or at a hatchery, you should ask whether or not they have been vaccinated; if vaccinated, identify against which diseases they did so.

Risk of disease transmission is high in the different stages of the marketing chain. Don't forget the fact that they may carry the tray home which has been used for ferrying the eggs to the market. Shoes and clothes may also pick up infectious agents from the market. Infectious agent picked at the market will be transported to the farm on trays, shoes and clothes or vehicles. If possible try to disinfect materials (baskets, egg trays, vehicles etc.) you use for marketing your products.

#### Self-Assessment Question

Self-Assessment Question 1	Describe the names of layer breeds known for good egg production?
Self-Assessment Question 2	Describe the main precaution and care you have to follow during transportation of chickens?

Self-Assessment Question 3	If you want to select dual purpose breeds for your poultry farm, what strategy do you use? Write the details of your selection criteria?
Self-Assessment Question 4	Write in detail the main criteria used to select layer variety chickens.

### 5. Module-Assessment Question

Module 3	Module Assessment Question
Question 1	Write in detail the criteria/features used to select the best breeds of A) Layers B) Broiler.
Question 2	Compare the productivity of domestic breeds with improved exotic breeds.
Question 3	Explain the positive sides of domestic/ indigenous chickens.
Question 4	What is main advantage of cross breeding of indigenous chickens with exotic breeds?

### 6. Practical Assignment Steps and Procedures

Module 8	Details of Practical Work
<p><b>Practical Exercise 1</b></p> <p>Give trainees practical field assignment. Let them attend a relevant local poultry market, identify chicken that are suitable for egg and meet production</p>	<ul style="list-style-type: none"> <li>☞ Study and locate the place and time poultry product market take place in your vicinity.</li> <li>☞ Study selection criteria and physical features used for selecting layer broiler chickens known for good meat production</li> <li>☞ Identify/select layer chickens known for good egg production.</li> <li>☞ Identify/select broiler chickens.</li> </ul>

## MODULE FOUR: FEED POULTRY CHICKENS PROPERLY

### 1. Module Description

This Module covers the process of identification, compounding balanced feed and properly feeding poultry chickens. It also discusses the designing and preparation of feeders and drinkers, different type of feeds/ local feedstuffs and nutritional content; it also focuses on formulating balanced feed that meets nutritional requirement of chickens, planning and feeding chickens.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Design and prepare poultry feeders and drinkers.
- Recognize type of feeds/ local feedstuffs, nutritional content and supply feeds for poultry.
- Formulate and prepare balanced feed for poultry chickens based on nutritional needs.
- Establish feeding program and properly feed chickens.

### 3. Learning Methods And Assessment Criteria

- Read and realize learning points given under *Learning Outcome 1*
- Answer all questions given under *Theoretical/Written exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read and recognize the points under *Learning Outcome 1* and answer all questions under *Self-Assessment And Written Exams*
- Next proceed to practical *Exercise Number 1* and do the entire activities as directed.
- Continue and do all the assignments, exams and practical activities given under each learning outcomes in the same manner.



#### 4. Module Contents

Feeding is essential to increase and achieve the maximum production of meat and eggs from poultry. Lack of feed or water will also reduce the birds' resistance to diseases and parasites, and subsequently increase flock mortality and lower the bio security level.

One of the major factors for a successful poultry business is proper feeding. Obtaining feed for improved poultry farm is by far the biggest investment in a poultry business, and it is therefore extremely important that spending on feed is cost effective. Commercial premixed feeds are more expensive therefore to keep the costs down; you are advised to mix your own feed from locally available feedstuffs that can meet the energy, protein and mineral requirements of the chicken. You have to understand the different type of feeds and nutritional content. Feeds need to be given in the right quantity, to avoid wastage, and with the right balance of ingredients to meet the nutritional requirements of the chickens. This is detailed information that you need to learn.

Different developmental stages also call for more of the nutrients. For instance, if it is a day-old chicken, the first eight weeks you should give them starter feed since it provides them with high energy and protein. At that particular the chicks will be in the stage of fast growth. Then, at the next stage, broiler would grow very fast and be ready for market, thus, you have to make use of grower feed high in energy and protein. In terms of layers at this age, their protein requirement is less than that of broilers but during the production, they will require very high amount of calcium and phosphorus for production of eggs. Therefore it is quite essential to provide chickens with the required type/quality and quantity of feeds based on the purpose of breed (layer or broiler) and their developmental stage.

For efficient poultry production you need to know balanced poultry feed, the different ingredients of feed, where to find, how to mix and prepare and feed chickens and also practice good feeding for good production and cost effective poultry.

**Start the training by asking trainees the following questions.**

- What is your local poultry feeding strategy?
- What do good feed and good feeding mean?

#### 4.1 Learning Outcome 1:-Design and Prepare Poultry Feeders and Drinkers

##### 1. Preparing drinkers

**Type of drinkers and preparation methods:** Poultry drinkers may easily be produced out of local materials like wood, sheet metal, timber, pottery and plastics.

Drinkers should fulfill the following requirements:

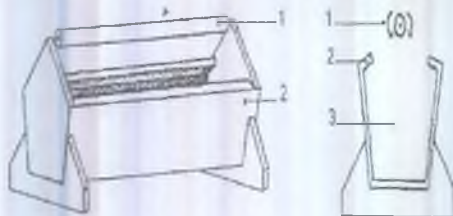
- Easy to clean on daily bases.
- Space between successive drinkers should not greater than 3 meter.
- Should be adequate or big enough for all birds to drink at the same time.
- Chickens drinking space (size of drinkers) requirement at different age :
  - For Chickens (0 to 6 week) 1.5 centimeter.
  - For Chickens (6 to 18 weeks age) 2.5 centimeter.
  - For Chickens (above 18 weeks age) 3.0 centimeter.



**Note:** Likewise separated drinkers should be prepared and delivered for sick and isolated chickens to control spread of disease from infected to healthy chickens. Isolated or sick chickens shall not be allowed to use drinkers of healthy birds.

##### 2. Methods of preparing Feeders

Chicken feeders can be made according to the local context from materials like wood, bamboo, sheet metal, timber, pottery and plastics in different shape. Wood log diameter 10-12 cm can be cut and drilled in the shape of trough and by cutting thick bamboo.



**Poultry Feeders should have the following property:**

- It is important that feeders are made in a way that feed waste is minimized.
- To feed all the chickens in poultry without any problem, avoid competition and minimize feed waste; sufficient number and size of feeders should be available inside all poultry houses.
- The number and size of feeders placed in a house should be big enough to feed at least half of the birds in a house at the same time.
- Feeders should feed chickens in all direction

**Chickens feeding space requirement:**

- For Chickens from (0 to 6 week) 4.0 centimeter.
- For Chickens from (6 to 18 weeks age) 6.0 centimeter.
- For Chickens above 18 weeks age from 8-10 centimeter according to breed type.

Refer Table 3 for improved poultry management; the required size of feeders and drinkers are given based on the type of breed, growth stage and type of production (layer or broiler).

**Table 3:- Chicken feeders and drinkers space requirement**

Type of chickens(breeds)	Size of drinker ( in cm/chicken)	Size of feeder (in cm/chicken)
Layer breed chicks	1.5	
Broiler breed female chicks	1.8	
Broiler breed male chick	2.5	
Broiler breed mixed sex chicks	2.2	
Small weight layer breed pullets	1.9	6.4
Medium weight layer breed pullets	2.2	7.6
Broiler breed pullets	2.5	
Broiler breed cokes	3.2	15



light weight layer breed chickens	2.5	8
Medium weight layer breed chickens	3.1	10.5

**Self-Assessment Questions**

Self-Assessment Question 1	Identify and list the names and purpose of poultry equipment required for feeding and drinking chickens?
Self-Assessment Question 2	Write down chickens feeding space requirement for different age groups?
Self-Assessment Question 3	Write down chickens drinking space requirement under different age?
Self-Assessment Questions 4	Write down the basic property of feeders made for feeding poultry chickens should fulfill?

**4.2 Learning Outcome 2: Recognize type of local feedstuffs, nutritional content and supply feeds for poultry**

Successful poultry business requires the supply, mixing and delivery of proper feed to chickens. Obtaining feed for improved broilers and layers is the main duty of poultry business, and it is extremely important to find locally available feedstuffs that can meet the nutritional needs of chickens. Therefore you should have adequate knowledge about types of feeds, requirements at different age and the contents of different feed stuffs.

**Recognize and identify different types of feeds suitable for poultry**

**Types of feeds**

If the birds are fed fully on pre-mixed feed, it should be available all day together with free access to clean water. Depending on type, the feed contains more or less energy, protein, vitamins and minerals.

**Energy-rich feeds**

Normally, at least 75 percent of a poultry diet consists of energy feeds. Energy feeds are the most important nutrient to maintain body

temperature and exercise levels of the birds. Cereals, grain, roots, and tubers are the most important energy feeds.

#### **Protein-rich feeds**

Protein is needed for growth, egg production, and keeping up good health status. Normally no more than 20% of a diet is protein-rich feeds, as they are normally very expensive.

#### **Mineral-rich feeds**

Minerals are important for bone formation, eggshell formation, and for a good health status. The most important minerals are calcium and phosphorous. To produce strong shells for their eggs, laying hens need free access to calcium (limestone or crushed shells).

#### **Vitamin-rich feeds**

Birds get vitamins by eating green grass, vegetables, fresh cow dung, and through sunlight. Vitamins A, B2, and D3 are considered very important because lots of irregularities arise when birds lack these vitamins. Sunlight and green grass or green fodder normally provide Vitamin A and D, whereas Vitamin B may be derived from fresh cow dung.

#### **Main sources of poultry feed/local feedstuffs,**

Feed is the biggest input cost for improved poultry production (between 60-80% of total costs). Obtaining a well-balanced feed at a low cost can greatly improve profitability. While many producers buy commercially mixed poultry feeds, a cheaper option is for poultry producers to mix their own feed using locally available resources, such as by-products from local industries, breweries, fishing, oil mills, and crop processing factories.

To prepare balanced feeds and properly feed poultry birds, it is extremely important to find locally available feedstuffs that can meet the nutritional requirements of their chickens. Therefore farmers should have good knowledge about different types of feeds and the nutritional content of different feed stuffs.

#### **Types of poultry feeds/ feed stuffs and nutritional content**

##### **Crop grains**

Cereal crops covers from 60 -70% of poultry feeds and are the main sources of energy feeds. Major cereal feeds with high energy are maize (corn), sorghum, barley, oat, millet, wheat and its by-products. Among cereals,

maize is good feed for chickens because maize improves feed taste, feed consumption and digestibility. If chickens are to choose, their primary preference is maize.

#### **Crop residues**

Crop residues are left over or remains after field crops are screened it includes small size seeds and crashed grains, weed seeds and other external ingredients.

#### **Wheat bran**

Wheat bran is by-products of wheat processing meal or industries. Wheat bran contains rough external cover of wheat grain which has very high fiber content; therefore during mixing feed for poultry small quantity of wheat bran should be used in mixed feeds. The fiber content of feed for chicks and broilers should be very small therefore it is not advisable to mix wheat bran in this feed mix.

#### **Wheat screenings**

Wheat screening is the final by-products of wheat from crop processing meal or industries which contains fine wheat bran and small quantity of wheat floor. The fiber content of this by-products is less than that of wheat bran; therefore, higher in its energy content; as a result this by-product is more preferable than any other by-products of crop processing factories.

#### **Wheat middling**

Wheat middling is the second /next by-products of wheat from flour mill factory and is in between wheat bran and wheat screenings in its content. Wheat middling has less fiber content. Wheat middling is more preferred as poultry feed more than that of wheat bran and can be mixed in higher quantity in poultry feed.

#### **By-products of oil seeds**

By-products of oil seeds are the final by-product gained from oil mills after extracting oil from oil seeds. By-products of oil crops should not be mixed above the required quantity. These by-products are mainly mixed and delivered to broiler pullets. As weight increment of layers are not needed this feeds should not be given to layers in large quantity. By-products of oil crops should be mixed not more than 5 - 10% in quantity. Sesame oil cake



can be mixed up to 30% in quantity for good production of layers but for chicks and broilers the mix should be less than 30%.

#### **Dried and floored blood meal**

Dried and floored blood meal is prepared by powdering dry animal blood collected from abattoirs during slaughter. This meal is mixed in quantity not more than 2 - 4% for good result in poultry feed. If the meal is mixed more than the above quantity in the feed of growers, it will result in retarded growth and also change smell of feed which in turn reduce the acceptance and chickens consumption.

#### **Dried and floored meat meal**

Dried and floored meat meal is prepared by drying and milling leftover meat or unconsumable remains collected from abattoirs. During preparation of this meal care should be taken not to include animal hair, horn and dunk. Meat meal can be mixed in poultry feed up to 15%.

#### **Dried and floored meat and bone meal**

Dried and floored meat meal is prepared in the same way as that of meat meal except that meat and bone meal have high bone content. Dried and floored meat and bone meal can be added up to 15% in poultry feed.

#### **Fish meal**

Fish meal: Can be prepared by powdering fish or fish remains or by-products. Fish meal should be mixed up to 10% in the feed of grower broiler chicks from 0-4 weeks of age and from 3-5% for layers.

#### **Green leaf meal**

The color of egg nucleus eyed by chickens feed with green leafs and grass appears bright yellow while the color of egg eyed by layers not accessed to this meal appears light yellow. Therefore, we should deliver this meal. Feed chickens green leafs by hanging on the rope. Green leafs of alfalfa, cabbage, salad and other suitable leaves can be used for feeding chickens.

#### **Additional nutrients mixed with feeds**

Supplementary nutritional feeds are added to poultry feeds in small quantity for one or more purposes listed below:

- Prevent growth retarding situation and improve chickens growth.

- Improves palatability of feeds.
- Improve taste of feeds which in turn makes feeds more edible or consumable by poultry chickens.
- To keep/preserve feeds for extended time without being rotten, contaminated or polluted.
- To improve the color of poultry production (for instance green leaves, yellow maize and alfalfa can be used to improve the color of egg nucleus).

### Minerals and sources of mineral feeds

Minerals are important for bone formation, eggshell formation, and for a good health status. The most important minerals are calcium and phosphorus. To produce strong shells for their eggs, laying hens need free access to calcium (limestone or crushed shell)

**Bone meal:** It is a good source of calcium and phosphorus.

**Dried and floored meat and bone meal:** It is a by-product containing high bone content and rich in calcium and phosphorus.

**Lime stone:** It is good source of calcium and can be used to supplement high calcium requirement of layers. It can be added up to 5% in the mix of layer feeds. In addition to this we should deliver crushed lime stone in a separate feeder to layers.

**Salt:** To satisfy the salt need of different breed or age group of poultry chickens. 0.25 - 0.5% salt should be added and properly mixed with feeds.

### Self-Assessment Questions

Self-Assessment Question 1	Write the names of the most important energy-rich feeds.
Self-Assessment Question 2	What are the benefits of adding supplementary nutritional meal in the feeds of poultry chickens?
Self-Assessment Question 3	Dried and floored bone meal are considered as source of minerals. What are these minerals?
Self-Assessment Question 4	List the names of feeds considered as the main source of minerals.

### 4.3 Learning Outcome 3:- Formulate and prepare balanced feed for poultry chickens based on nutritional needs

#### Formulating and mixing balance feeds

Balanced feed means feed compounded or mixed from different types or sources of feeds containing nutrients (energy, protein, vitamins and minerals) needed by poultry chickens in proportional manner. Balanced poultry feeds can be commercially pre-mixed feeds purchased from poultry feed producers or can be mixed at home from locally available feed raw materials/feedstuffs based on different feed formulas.

The need for feed will change, depending on the age and status of the bird (chicks, growers, egg layers) and of the purpose of the production (meat or eggs).

Feeds need to be given in the right quantity, to avoid wastage, and with the right balance of ingredients to meet the nutritional requirements of the chickens. Mixing and formulating poultry feeds may be based on simple assumptions about the nutritional requirements of the birds and the content of the feedstuffs.

In compounding your own feed you have to look for easily available raw materials to be considered in your formula. For this purpose you can consider the different types of crops grown in your locality, by-products from food processors and oil industries (for oil seed cake). If you are producing good quality feed at a reasonable cost, that's very important, because that is cost effective. Therefore you have to keep in mind the price of the raw material and the amount of the raw material to get to the end product. They should balance; but avoid using cheap feeds that do not meet the standards, because it will turn out to be the most expensive.

#### Mixing and formulating feeds from locally available feedstuffs

- Group 1- Cereal seeds (carbohydrate): Sorghum, Millet, maize, wheat, oat, barley, *teff* and by-products bran and screenings and also crop seeds such as peas, beans.
- Group 2- Oil crops: Sesame, ground nuts and brans and cake from cotton seed, sunflower, cake peas, beans, and ground nuts cake.
  - Preparation/ mixing procedure



- Purchase and collect the above listed feeds from the local market with reasonable price.
- Take the feedstuffs to the local miller and ground (should not be powdered) it in a mortar before mixing.
- Bring back the grounded feedstuffs carefully to proven from being contaminated.
- Take equal proportion of feed from group one and two and mix properly on a clean floor.
- Perform mixing activity based on the amount given below:
  - Half quintal mixed cereal crop feed from group 1
  - Half quintal mixed oil seeds feed from group 2
  - Two kilogram mineral feed whichever is available in your locality from mineral feeds listed above
  - Add one kilogram salt and mix feed ingredients uniformly in hygienic and clean manner

### **Composition of balanced feed for different poultry chickens**

Balanced feed means feed containing different types of feeds nutrients needed by poultry chickens in proportional manner. The need for feed will change, depending on the age and status of the bird (chicks, growers, egg layers, brooding hens) and of the purpose of the production (meat or eggs).

Therefore, providing chicks with the required type and quantity of feeds based on the type and purpose of breed (layer or broiler) and their developmental stage are the main and important concern for good production and cost effective poultry.

### **Composition of feed for broilers:**

Broiler should grow very rapidly and brought to the market; therefore you have to provide the required type and quantity of balanced feeds at all time without limitation in two developmental stages.

During the first developmental stages of broilers from hatch up to four weeks, you should give them starter feed containing high protein. At the grower stage greater than 4 weeks of age until fully grown you should give them growers feed which is medium in protein.

- Starter feed: It is high in protein (>22 %) and comparatively less energy sources feed (2800-2900 Kcal/kg ME) content, could be given to chicks from date of hatched up to 4 weeks.
- Growers feed: It is high in energy content/sources (>2900 Kcal/kg ME) and comparatively medium in protein (20 %), could be given to growers' age greater than 4 weeks until fully grown and ready for sale.

At this stage you can purchase commercial pre-mixed feeds from poultry feed producers or purchase locally available feed raw materials/ feedstuffs from local market and mix their own feed that can meet the energy, protein and mineral requirements of their chicken's based on alternative feed formula as given in Table 4 below.

For poultry farm having large number of chickens (above 15,000) at a time, it is more advantageous and cost effective for you to compound or mix your own feed. If you need to mix balanced feed from other feedstuffs (different from those listed in Table 4) you have to understand the different type of feeds and nutritional content; thus prepare by substitute the one listed in Table 4 with feedstuff that can fulfil the nutritional content given in the formula.

A fully grown broiler can consume 4kg feed on average to reach marketable stage. Therefore by considering the numbers of broiler in the farm one can calculate the quantity of feed required and supply Commercial premixed feeds from feed producers or mix own feed from locally available feed raw materials/ feedstuffs based on feed formula given under table 4.

### **Composition of Feed for Layers**

Different developmental stages of layers also call for more of the nutrients. For the first eight weeks you should give them starter feed. It is high in energy, high in vitamin, high in protein, because during that time there is a very fast growth. Then, at the grower stage, they don't require all that high nutrient density, therefore the feed is a bit lighter in nutrient density. During the production, they will require very high amount of calcium and phosphorus, therefore you have provide that, otherwise they won't give you the eggs the way they are supposed to.



A little before pullets start laying eggs (before 20 weeks/5 months), start changing the type of feed. Feed should be changed from grower to layer feed. All the necessary condition should be fulfilled to increase feed consumption further more for the production of egg they will require very high amount of calcium and phosphorus, therefore in addition to the amount available in the feed you have to provide very high quantity of calcium (crashed lime stone) in a separate feeder, otherwise they won't give you the eggs the way they are supposed to. Provide from 110-120 grams of feed for one layer on daily bases; the feed should contain 2,850 (Kcal/kg ME) kilocalorie per kilogram feed energy content. The protein requirement of layer chickens is related to the production of egg; therefore, to satisfy the average requirement, layers feed should contain 16.5% of protein.

Poultry feed that can meet the above listed nutritional requirements or content can be purchased from commercial pre-mixed poultry feed producers or purchase locally available feed raw materials/ feedstuffs from local market and mix your own feed that can meet the energy, protein and mineral requirements of the chickens based on alternative feed formula given in table 5. Water requirement (need) of chickens vary depending on type of breed, development stage and local climate (hot/cold); therefore for normal body growth and good productivity provision of sufficient, clean and cold water should be secured. Hybrid variety (breeds) chicken's having high egg production potential is more preferable for this type of poultry activity

### **3. Composition of feed for chicks (starters diet)**

For chicken in the first eight weeks from hatched up to 8 weeks of age you should give them starter feed well-balanced feed containing the required nutrients. It is high in energy, vitamin and protein; because during that time there is a very rapid development. Feed delivered should contain 18-20% protein and 2,900 (Kcal/kg ME) kilocalorie energy content per kilogram feed.

### **4. Composition of feed for pullets (growers diet)**

Feed delivered to pullets during first grower stage from 8 to 20 weeks is very decisive to increase and have the maximum production of eggs in the



next development stage. For pullets to grow according to their breed and start egg production on time, you should provide balanced feed relevant to the age and breed type. At this age protein requirement is less than they need at starter stage. Feed delivered should contain from 15 -16% protein and for pullets age ranging from 8 - 14 week should contain 2,900 (Kcal/kg ME) kilo calorie of energy per kilogram feed and for age from 14 - 20% to prevent accumulation fat the energy content of the feed should be 2,700 (Kcal/kg ME) kilo calorie per kilogram feed.

#### 5. Water requirement for poultry chickens

- Chicks during grower stage drink from 2-2.5 grams of water for each gram of feed they consume. The quantity of water taken by layer chickens ranges from 1.5-2 grams for one gram of feed consumed.
- Chickens water requirement (intake) varies depending on local climate as the climate gets hotter water intake also increases.
- Water delivered to chickens should not be very cold or very hot, otherwise their consumption will decrease.
- Provide sufficient and clean water for chickens at all-time according to their development stage; give especial attention for layers.
- Water delivered for chickens should always be clean and free from any pollution.
- Water stress depending on the level of stress will have the following effects on birds.
  - Poor digestion and feed assimilation.
  - Layers drop in egg production or in the worst situation layers stop production of eggs
  - Drop of body temperature followed by mortality are the main problems of water stress

**4.4 Learning Outcome 4:- Establish feeding program and properly feed chickens**

**Feeding chickens**

Feeders should not be filled more than a third of its full capacity. To improve the feed consumption of chickens delivered feeds should be mixed at least 2-3 times a day.

- Estimate or calculate the amount of feed needed for single chicken and deliver the feed for all poultry birds.
- Supply sufficient clean water based on their needs.

**Self-Assessment Questions**

Self-Assessment Question 1	Clarify the difference between starter and grower feed explained in balanced feed for broilers.
Self-Assessment Question 2	Layer chicken feed should contain the required nutrients. How much energy and protein content is good for layers?
Self-Assessment Question 3	What are the main problems caused on chickens due to water shortage?

**5. Module Assessment Questions**

Module 6	Module Assessment Questions
Question 1	Size of feeders and drinkers for poultry chickens are variable according to type of breed, type of production and age. Why?
Question 2	Write down the main features of feeders made for poultry purpose should fulfill.
Question 3	Mention some of the main feeds which are identified for its high protein content
Question 4	Write in detail the different ingredients of feeds that a well prepared balanced poultry feed consist of.

6. Practical Assignment Steps and Procedures

Module 4	Details of Practical Work
<p><b>Practical Exercise 1</b></p> <p>Divide trainees into small groups... Let them prepare one small size feeder sufficient to feed 100 egg laying chicken's from locally available materials.</p>	<ul style="list-style-type: none"> <li>☞ Calculate the required size of feeder based on your previous lesson.</li> <li>☞ Prepare the design of feeder.</li> <li>☞ Select locally available and low cost materials for making feeders.</li> <li>☞ Estimate/calculate the quantity of materials required to make the feeder.</li> <li>☞ Prepare feeders sufficient to feed 100 layer chickens.</li> </ul>
<p><b>Practical Exercise -2</b></p> <p>Again let the same group, prepare balanced feed from locally available feedstuffs sufficient enough to feed 50 broiler breed growers for 5 days.</p>	<ul style="list-style-type: none"> <li>☞ Select the most appropriate and locally available feed ingredients (crops, cereals, oil seeds and bran and by-products)</li> <li>☞ Estimate the quantity of balanced feed needed to feed 50 chickens for 5 days and the quantity of each ingredient to be mixed in the feed based on nutrition content of each feedstuff.</li> <li>☞ Prepare the feedstuffs as per the above calculation</li> <li>☞ Carefully mix and prepare balanced feed for your chickens.</li> </ul>



Table 1: Alternative feed composition formula for broiler breeds in (%)

Feed ingredients	Starters (0-4 week)feed							Growers (4-8 weak) feed						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Crashed maize	44	40	30	45	47	47	45	53	53	45	55	65	65	50
Bran	10	12	22	13	8	8	15	7	6	12	7	22.5	22.5	11
Grounded meat and bone	13	14	12	12	6	--	10	10	10	10	10	5	2	10
Sesame oil cake	32	--	--	--	33.5	33.5	15	29	--	--	--	--	--	18
Cabbage seed cake	--	--	--	29	--	--	--	--	--	--	27	--	--	--
Cotton seed cake	--	33	--	--	--	--	--	--	30	--	--	--	--	--
Sunflower bran	--	--	36	--	--	--	--	--	--	32	--	--	--	--
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mixed vitamin and mineral	0.5	0.5	0.5	0.5	2	2	0.5	0.5	0.5	0.5	0.5	2	2	0.5

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Dried and floored blood meal	--	--	--	--	3	6	--	--	--	--	--	3	6	--
Floored bone meal	--	--	--	--	--	3	--	--	--	--	--	3	2	--
Wheat screenings	--	--	--	--	--	--	9	--	--	--	--	--	--	10
Grounded fish	--	--	--	--	--	--	5							

\* Quantity of feed may vary depending on the instruction provided by producers

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Table 5: Alternative feed composition formula for layer breeds in (%)

Feed ingredients	Chicks (0 – 8 week age)									Growers (from 8 – 18 week age)					Layers (> 18 week age)								
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	1	2	3	4	5	6	7	8	9
Crushed maize	50	50	50	36	30	25	47	44	30	48	42	50	42	32	40	37	40	45	48	40	25	36	51
Middling	25	29	29	18	19	27	9	10	20	23	--	10	16	22	--	18	32	23	26	10	14	20	10
Grounded bone and meat	4	4	4	6	10	10	7	--	--	5	--	--	5	--	--	9	5	8	5	10	7	--	--
sesame oil cake		--	--	35	15	13	24	--	--	21	35	--	33	--	37	30	18		15	11	20	--	10
Cabbage seed bran	--	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



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Cotton seed bran	--	--	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mixed vitamin and mineral	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Crushed lime stone	--	--	--	--	--	--	--	1	1	2	2	--	1	1	2	1	3.5	--	4.5	3	3	3	3
Floored bone meal	--	--	--	3	--	--	--	2	2	--	--	1	2	2	--	4	--	5	--	--	--	3.5	3.5
Sorghum	--	--	--	--	25	23	--	--	14	--	--	2	--	15	--	--	--	--	--	--	30	16	--
Brewery residue	--	--	--	--	--	--	--	--	--	--	15	--	--	--	15	--	--	--	--	--	--	--	--

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Brewery malt by-product	--	--	--	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alfalfa leaves	--	--	--	--	--	--	--	5	5	--	5	5	--	5	5	--	--	--	--	--	--	--	4	4
Groundnut cake	--	--	--	--	--	--	--	20	20	--	--	15	--	15	--	--	--	--	--	--	--	--	10	--
Floored Meat meal	--	--	--	--	--	--	--	4	4	--	--	4	--	4	--	--	--	--	--	--	--	--	3.5	4.5
Floored fish	--	--	--	--	--	--	--	3	3	--	--	3	--	3	--	--	--	--	--	--	--	--	3	3
Barley	--	--	--	--	--	--	--	10	--	--	--	10	--	--	--	--	--	--	--	--	--	--	10	10

\* Quantity of feed may vary depending on the instruction provided by producers

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Table 2: Feed composition formula for different poultry breeds (nutrition ratio)

Quantity (%)	Layer chicks (0-2 month)	Layer grower (2 - 5.5 month)	Fully grown layer	Broiler (from 0 - 4 week)	Broiler (from 4 - 8 week)	Layers mother (breeders)	Broiler mother (breeders)
				Broiler verity	Broiler verity		
Maximum Moisture content in percentage	12	12	12	12	12	12	12
Portion	20	15	16	22	20	17	17
Crude fiber in percentage maximum	6	7	6.5	5	6	6.5	6.5
Salt (NaCl) maximum	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Calcium	1-1.4	1-1.4	3-4	1-1.4	1-1.4	3-4	3-4
Soluble (available) phosphors	0.4	0.4	0.4	0.45	0.45	0.4	0.4
Salicylin minimum	1.0	0.8	0.6	1.2	1.0	0.6	0.6
Methionine minimum	0.35	0.27	0.30	0.50	0.40	0.30	0.30
Energy source (metabolisable energy) in kilo calorie per kilogram feed	2600	2500	2600	2800	2900	2600	2600



## MODULE FIVE: NATURAL INCUBATION AND HATCHING CHICKS

### 1. Module Description

The purpose of this Module is to introduce the trainee with the knowledge, skills, and attitude required for hatching chickens through natural incubation and hatching strategy. The Module also focuses on the skill of recognizing and selecting suitable eggs and mother hens, preparation of suitable shelter for hatching hens, as well as on the necessary care and control strategy feeding and watering the poultry.

### 2. Learning Outcomes

**At the end of the module the trainers will be able to:**

- Select eggs suitable for hatching chicks.
- Select brooding hens having better mothering knack.
- Prepare brooding house and (nest) for incubation and hatching chicks.
- Properly feed, take good care and manage brooding hens.

### 3. Learning Methods And Assessment Criteria

- Read and realize learning notes given under *Learning Outcome 1*.
- Answer all questions given under *Theoretical/Written exams*.
- Submit your assignment to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next section; otherwise read *learning outcome 1* and answer *self-assessment and written exams*.
- Next proceed to practical *Exercise Number 1* and undertake the entire activities as directed.
- Continue and carry out all the assignments, exams and practical activities given under each *learning outcomes* in the same manner.

### Resource Required

- Hens and eggs for practical work.
- Materials tools and equipment's required for preparation of suitable house or nest for brooding hens.

#### 4. Module Content

There are two ways of hatching chickens from fertile eggs. The first method is the natural method of hatching chicken's using broody mother hen. The second method is an artificial method of hatching chicken's using manmade hatching machine called Incubator

##### Methods of incaution and hatching poultry chickens

Chicks can be hatched using selected fertile eggs. For chickens it takes 21 days of incubation for eggs to hatch. Broody hens incubate eggs by providing the required temperature and naturally providing all the necessary nourishment to eggs incubated by hens. Number of eggs incubated and hatched by single hen at a time is small in number. Thus, the technique is only appropriate for poultry production at household level and not suitable for improved poultry production managed as a business or family income.



#### 4.1 Learning Outcome 1: Select Eggs Suitable For Hatching Chicks

##### How to select suitable eggs for incubation

**Egg Size:** Eggs selected for incubation should be of average size. Eggs having average size between 50-55 grams are more suitable for incubation.

**Egg Shape:** The shape of egg selected for incubation should have normal and natural egg shape; eggs with deformed or unusual shape are not suitable.

**Age of Eggs:** In warm places eggs should not be more than 4 days old and in cool humid places age of eggs should be no more than 7 days.

**Egg Hygiene:** Eggs selected for incubation should always be clean and kept hygienic.

**Egg Physical Feature:** Eggs selected for incubation should have rough surface and smooth shell without cracks. If there are cracks in the shell, the loss of moisture from the egg can be too high and

the chick may die. There is also a risk of bacteria entering the egg, which may lead to unhealthy or dead chicks.

#### 4.2 Learning Outcome 2: Select Hens Having Good Mothering Ability

##### How to select suitable brooder hen

Mother (brooder) hen selected for incubation and hatching chicks should have and fulfil the following behaviors/criteria.

- Hen that goes broody for long time should be selected. Hens that do not remain broody and sit on the eggs until eggs are hatched are not suitable and should not be selected.
- Hen with full feather /hens at the period of changing feathers/ should not be selected.
- Hens with big body size (weight), large wings and full feather are more suitable as they can sit and hatch large number of eggs by providing enough heat/warmth. Pullets are not suitable.
- Brooder hen selected for incubation should be healthy to prevent transmission of diseases from mother to the newly hatched chicks.

#### Self-Assessment Questions

Self-Assessment Question 1	Describe the benefits of selecting eggs for incubation and hatching chicks. Explain the criterion for selection?
Self-Assessment Question - 2	Explain main behaviors of mother hen suitable for incubation and hatching eggs.

#### 4.3 Learning Outcome 3: Prepare Brooding House and (Nest) for Incubation and Hatching

##### Preparing brooding house and nest

Brooding house is shelter built for incubation and hatching chicks through natural method using broody hen or by artificial method using manmade machine or Incubator. This is a kind of shelter or nest used to keep selected brooding hens for 21 days for hens to incubate and hatch the eggs following natural method of



incubation. The house should be wide enough to contain brooding basket, brooding hen and all the equipment required for the task.

**1. House area (size) and other requirements.**

- Size of house to incubate and hatch eggs following natural method of incubation depends on the number of broody hen's keep in the house at a time. For instance if we have a plan to keep 20 broody hens at a time the house should be sufficient enough to keep the following basic provisions and conditions. 20 brooding basket one for each brooding hen size (35 x 35 cm base width and 40 cm height), minimum of 1 meter space between each brooding basket, minimum 2m space from the door in all direction to keep the house little bit darker should be necessary. Considering the above facts to hatched chicks, keeping the broody hens in three rows, a house having (5 meter width and 10 meter length) is sufficient. In this brooding house is sufficient enough for hatching up to 300 chicks at ones through natural method using broody mother hens. The house should be little darker, not very cold and be well ventilated. The Brooding house should not allow entrance for dogs, rats, snakes and other attacking animals.

**2. Preparing brooding nest or basket and required size**

To incubate and hatch chicks following natural method, the hen should be provided with a brooding nest or basket big enough to contain all her eggs.

- To initiate brooding hen sit on the eggs, the basket should be covered with sheets of clothes to make the surrounding darker. This cover should not restrict the bird from going out for feed and water.
- Before using the box properly clean and dry it under sun. Fresh hay or straw should be put in the nest and some ashes added to avoid parasites; place the straw in a way that eggs should not roll as said.

- To control or prevent fighting between brooders hens, the brooding basket should be spaced a minimum of 1 meter or more according to availability of space. The house should not give a chance for dogs, rats, snakes and other predators enter and attack /eat eggs under incubation.

### 3. Make hens go broody and sit on the eggs

- To make sure the selected hen is broody; place a couple of eggs or stones looking like eggs in the nests box and follow the hen and when the hen fully sit on the eggs, remove the false eggs and place the eggs selected for the purpose.
- During natural incubation, place the eggs inside brooding nest in such a way that eggs are laid on longer side keeping 2 centimeter space between eggs; do not place one egg over the other as this makes the hen change the position of the eggs.
- Before placing the broody hen in to the box, spray her whole body with anti-parasitic remedies/ medicines.
- Hens with big body size and full feather can sit on eggs ranging from 15 -20. Other hens can also sit on 10 - 15 eggs depending on their physical feature
- Eggs layered by exotic breed are big in size therefore the number of egg should not be more than 15.
- Place sand, ash, powdered lime stone or (mixed) below the straw to prevent reproduction and infection of parasites
- The most appropriate time for placing brooding inside the box is night time.

#### Self-Assessment Questions

Self-Assessment Question 1	Clarify in detail methods used to determine size, other requirements and preparatory activities needed for brooding houses.
Self-Assessment Question2	To incubate and hatch chicks a hen should be provided with a brooding nest or basket. Describe the size of the nest?
Self-Assessment Question3	Explain main activities and care you should consider during natural incubation and hatching.

#### 4.4 Learning Outcome 4:-Properly Feed and Undertake Good Care and Management for Brooding Hens

##### 1. Properly feeding and watering brooding hens

Brooding hens usually go out or leave their nest at least two times per day to eat and drink. After feeding and dropping faeces they will return back to the nest. The time spent by a brooding hen outside the nest is only 15 minutes. Therefore during this time sufficient feed and water should be available.

- Regularly provide water and feeds like wheat, oat and maize separately or mixing feeds and crushed lime stones.
- Sometimes brooding hens do not want to go out of brooding nest; in this case slowly peak the hen and place her in front of the feed and water.
- Brooding hens can frequently stand up inside the box and change the position of eggs this in normal activity.
- To minimize the time spent outside the nest, leaving eggs by brooding hen travel long distance in search of feed; therefore, brooding hen should be provided with free access to fresh water and feed within a short distance.
- Brooding hen should be separated from other flock to protect disease transmission, avoid competition for feed, prevent other hens from disturbing her as the hen leaves the nest briefly to drink and feed only.

##### 2. Follow-up and care for brooding hens

###### Identification of fertile eggs from unfertile (dead) eggs

During incubation one should always check which eggs are fertile and which are not. Fertile eggs very quickly develop blood vessels, which may be seen using focused torch light.

- When candling, a fertile egg will have visible blood vessels and a dark spot, if the embryo is dead. The blood vessels can be more or less developed depending on how strong the embryo is. If the chick is dead, a ring of blood can be seen around the embryo. An infertile egg has an enlarged air space and the yolk



causes a visible dark area in the egg. It is important that infertile eggs and eggs with dead embryos are removed from the nest as they will decompose and may break and spoil the fresh eggs under incubation. The first identification is performed on the 9<sup>th</sup> day and the second between 14 -18<sup>th</sup> days. After 18<sup>th</sup> day, touching and moving eggs will disturb eggs.

- It is important to frequently check the condition of the brooding box and make all necessary care; infertile eggs and eggs with dead embryos should be removed from the nest as they will decompose and may break and spoil the fresh eggs under incubation.
- Brooding hen should not be disturbed and go out leaving eggs after 19<sup>th</sup> day from the date of hatching starts until all the eggs are hatched.

The figures below show how fertile eggs, infertile eggs, and eggs with dead embryos are identified at the age of 7 days using sun light and home-made egg chandlers.

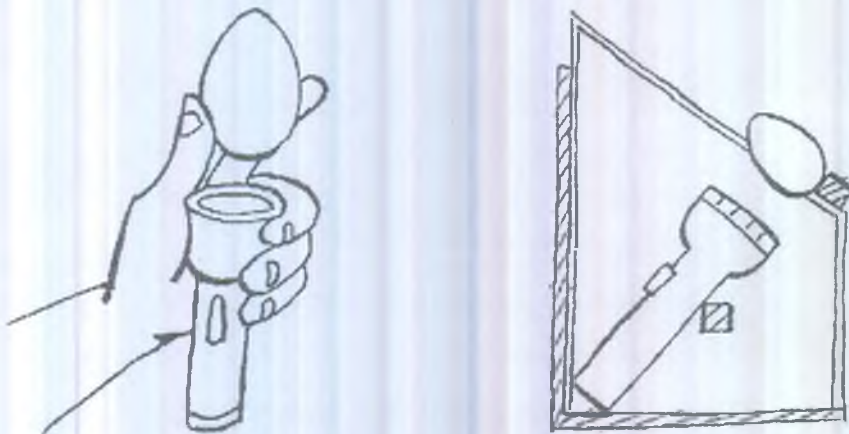
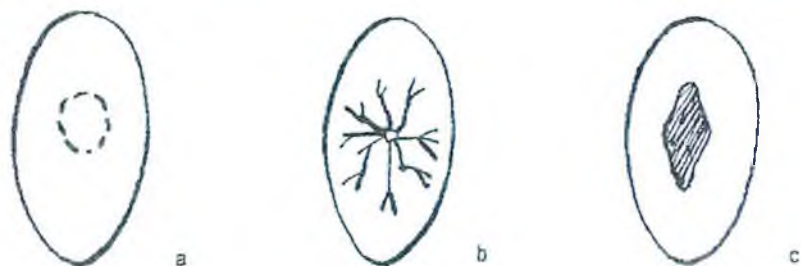


Illustration shows two simple home-made egg chandlers using either your hand or a wooden box and a torch



- a) Infertile egg; b) Egg with a dead embryo c) Egg after 7 days of incubation.

Using this simple method one can identify fertile and infertile eggs before and after incubation and hatching.

#### Self-Assessment Questions

Self-Assessment Question 1	Write the main activities included in feeding and watering, care and management of brooding hens.
Self-Assessment Question 2	What is the advantage of identifying fertile and infertile eggs? Describe the method.
Self-Assessment Question 3	Write main care and management activities you should regularly provide for brooding hens under incubation.

#### 5. Module Assessment Questions

Module 5	Details of Module Assessment Questions
Question 1	What types of care does a brooding hen require?
Question 2	Describe the methods of selecting eggs suitable for incubation and hatching?
Question 3	Write the methods of selecting hens suitable for incubation and hatching purpose?
Question 4	During incubation, the fertility status of eggs can be identified by observation under sun light or sharp torch light.. How do you know and differentiate fertile eggs (with developing embryo), infertile egg, and egg with a dead embryo?
Question 5	What does fertile egg mean?

6. Practical Assignment Steps And Procedures

Module 5	Details of Practical Work
<p><b>Practical exercise 1</b></p> <p>Let each trainee select one brooder hen, and incubate naturally hatched chicks. Let the trainee carryout all activities for brooding hen following the steps given in the next column.</p>	<ul style="list-style-type: none"> <li>☞ Prepare suitable place for incubation and hatching.</li> <li>☞ Select suitable brooder hen for incubation and hatching based on the criteria.</li> <li>☞ Select suitable eggs for incubation and hatching based on the criteria. Undertake all activities of incubation and hatching, follow up, care and hatching chicks.</li> <li>☞ Show your result (output) to your trainer for evaluation</li> </ul>



## **MODULE SIX: ARTIFICIAL METHOD OF INCUBATION AND HATCHING CHICKS**

### **1. Module Description**

The purpose of this module is to provide the trainees (Lerner's) with the knowledge skill and right attitude on the use of incubating machine. Requires the application of tasks including Selecting and supplying type and size of incubator that suites poultry purpose, Select suitable eggs for incubation and undertake all required for incubation and hatching chicks.

### **2. Learning Outcomes**

**At the end of the module the trainers will be able to:**

- Select and supply the type and size of incubator that suites your poultry purpose
- Select suitable eggs for incubation and hatching
- Insert eggs; carry out follow-up activity as per instructions given on the incubators manual and hatch chicks.

### **3. Learning Methods And Assessment Criteria**

- Read properly and understand the learning notes given under learning outcome 1
- Answer all the questions given under Theoretical/Written exams
- Show your work to your trainer
- If you receive approval from your trainer for your good work proceeds to the next learning section.
- if your work is not approved for need to improve please Read properly and understand the notes given under learning outcome 1 and Answer all the question given under self-assessment Theoretical/Written exams
- Next proceed to practical exercise number 1 and undertake the entire activities as directed
- Proceed and undertake the entire assignments, exams and practical activities given under each learning outcomes in the same manner

#### 4. Module Content

##### Artificial method of incubation

Manmade or artificial method of incubation and hatching chicks is done using manmade equipment following basic natural laws and procedure of hatching chicks by brooder hens. Such man made equipment used for incubation and hatching purpose is called incubators.

There are two ways of hatching chickens from fertile eggs. The first method is the natural method of hatching chickens using broody mother hen. The second method is an artificial method of hatching chickens using manmade machine called Incubator.

Chicks can be incubated and hatched from selected fertile eggs using incubators. For incubators like brooding hens it takes 21 days of incubation period for eggs to hatch. Incubating machines works following the basic natural laws of incubate eggs by brooding hens; it provides all the necessary and favorable conditions needed for eggs to hatch. Incubators are machines that need energy supply to undertake the desired activity. Although most of the machines use electrical energy, there is also gas or solar incubators. Large Number of chicks can be incubated and hatched from eggs by incubator at a time. Thus, this method is appropriate for improved large and small scale poultry production.

##### 4.1 Learning Outcome 1: select and supply type and size of incubator that suites your poultry purpose

###### Artificial method of incubation and hatching eggs

Artificial method of incubation and hatching eggs using incubating machine are designed so that you produce following the natural laws, provided that there is favorable conditions for eggs to hatch. Although variable depending on the size of and type of incubators, you can incubate and hatch large number of eggs at a time using this method.

Different types of incubating machines are available in the market. Some of these machines are manually operated which needs an operator to monitor and follow up all day. The second type is semi-

automatic which also requires an operator not all day but on and off. The third one is fully automatic which functions without human interference.

Some of these machines are designed with two separate compartments. In the first compartment, eggs are kept under incubation up to eighteen days; in the second compartments eggs are kept for three days that is the last nineteen<sup>th</sup>, twentieth<sup>th</sup> and twenty-first<sup>st</sup> days, until chicks are released at the outlet. Other incubators have the same compartments but they are made separately.

***How to select and supply the type and size of incubator that suites your poultry purpose***

*Incubators are expensive machine; purchasing incubator is a onetime activity. Therefore you have to take enough time to identify the quality, size, energy source, price and other factors in terms of finance, poultry requirement and future expansion potential to make decisions. Consulting professionals working in the agricultural sector especially those who have experience in poultry/poultry business could help to that end. .*

***Important points about incubators:***

☞ *Total time for incubation and hatching:*

*This time is the total time needed for incubation and hatching. Whether artificial (using incubators) or natural (using brooder hen) the time required for eggs to be hatched takes 21 days. This period is divided into two stages, incubation and hatching.*

***A) The first incubation/setting stage***

*During this stage, eggs inside incubators require turning from one side to the other every two hours. Many of the incubators do this automatically without human intervention. This stage takes the first 18 days. The different compartments are egg boxes that rotate the eggs at an angle of 45°.*

***B) The second hatching stage***

*Eggs that stayed in the first stage for eighteen days are shifted and treated in the second stage in different compartment. At this*



compartment eggs remain up to 21<sup>st</sup> day quietly without any movement. At the end of 21st day, chicks start to hatch breaking eggs shell. . This section of the incubator has two compartments: the hatching compartment and the compartment that host hatched chicks comfortably.

#### **Single and dual function incubator.**

☞ **Single purpose incubators:** This incubating machine has two separate components. It is suitable for large scale poultry productions. As already mentioned one of the sections serves the first purpose-**the setting stage**; the second is for **The hatching stage**. This type of incubator is more suitable for incubating and hatching very large number of chickens at a time; and it is more efficient in all respects, for example in terms of sanitary process.

☞ **Dual purpose (compo incubators):** this fits to small and medium scale poultry productions.

Compo incubator is a machine having both compartments assembled together and thus performs the processes required in the two stages as a single unit with only one incubator.

The second important issue is to identify the power source (electric, gas or solar energy sources) requirement of the machine and select the one that suites your poultry.

The final step is to select the size of incubator. For example compo incubator is available in different sizes/ capacity depending on the number of eggs incubated and hatched by the machine at once or single round.



*The above pictures are samples of two small size artificial incubators suitable for small scale poultry productions. The first setting stage compartment is the one at top, while the second hatching stage compartment is at the bottom of each incubator. If you want to buy them consult relevant expert like extension worker or poultry owner to know about the brand, cost, and other related issues. .*

#### **4.2 Learning Outcome 2: Select suitable eggs for incubation and hatching**

##### **Egg Selection Criteria**

**Egg size:** The eggs selected for incubation should be of average size (more suitable than small or big size eggs). Eggs having average size between 50-55 grams are more appropriate for incubation.

**Egg Shape:** The shape of egg selected for incubation purpose should have normal and natural shape of eggs; eggs with deformed or unusual shape are not suitable.

**Age of eggs:** In warm places eggs should not be more than 4 days old and in cool humid places age of eggs should be no more than 7 days.

**Egg hygiene:** Eggs selected for incubation should always be clean and kept hygienic.

**Egg Physical feature:** Eggs selected for incubation should have rough surface and smooth shell without cracks. If there are

cracks in the shell, the loss of moisture from the egg can be too high and the chick may die. There is also a risk of bacteria entering the egg, which may lead to unhealthy or dead chicks.

**4.3 Learning Outcome- 3: Place eggs in the incubator; carry out follow-up activity as per instructions given on the incubators manual and hatch chicks.**

**Hatching eggs:** It is very important for a poultry farm to gain good result or higher rate of hatchability from fertile eggs under incubation. To attain high rate of hatchability you should have the basic knowledge and skills required to operate and properly use incubators in relation to the required temperature, moisture level and others. Incubators made by different manufacturers also have different method of operation therefore it is very important to strictly understand and follow the manual (instruction for use) supplied by the manufacturer to achieve the best result. Understanding the following general ideas regarding incubators are helpful.

- Incubators should be placed (fixed) in a place where there is sufficient air movement or ventilation at least 15 centimeters away from walls. Should be fixed on a level ground checked by water level instrument. If the water level is not kept and fixed inclined some part of the machine did not function appropriately.
- Incubator should be regularly cleaned especially before and after every incubation and hatching activities to make the machine free from any disease causing agents.
- Before performing any incubation activity, run the machine at least for 24 hours to make sure that the machine is under good operational condition.
- It is also very important that the required temperature, moisture content and other condition of the machine are kept in accordance with the requirements at different steps or time of incubation.



Stage (time)	Temperature in degree Fahrenheit	Air moisture content (%)	Air in late condition
From 1 <sup>st</sup> – 3 <sup>rd</sup> day	100	88	closed
From 3 <sup>rd</sup> – 14 <sup>th</sup> day	100	86	1/8 <sup>th</sup> opened
From 14 <sup>th</sup> up to hatching day	99	86-96	1/4 <sup>th</sup> opened
Final and hatching day	98.5	86-92	1/2 <sup>nd</sup> half opened

- Average size, clean, normal shape, eggs without cracks, age of eggs not more than 7 days are inserted in to the incubator keeping narrow or longer side of the egg up (vertically positioned)
- Starting from 3<sup>rd</sup> day it's important to shift the eggs. During the first days from 4 to 6 times per day, after a week once within 8 hours shifting the direction of eggs is important. After 18<sup>th</sup> day eggs should not be shifted or touched at all.
- The binging of hatching chicks can be identified by the sound of chicks heard at the 21<sup>st</sup> day. Chicks should remain or kept inside the incubator after being hatched at least from 18 – 24 hours to improve strength of chicks
- During incubation of eggs using incubators the eggs should be placed in the egg box inside the incubator, keeping the arrow shape of the egg vertical upward in rows.

### Self-Assessment Questions

Self-Assessment Question 1	Define artificial method of incubation and hatching eggs.
Self-Assessment Question 2	How long does it take for an incubator machine to hatch chicks?
Self-Assessment Question 3	Write at least five points on how to use and operate incubators.

## 5. Module Assessment Questions

Module 6	Assessment Questions
Question 1	Compare and contrast the difference and similarity between two methods of incubating and hatching chicks using incubators and naturally (using brooder hen).
Question 2	What steps do you follow to select the incubators for incubating and hatching chicks depending on the size and need of your poultry farm?
Question 3	How do you select the correct type of incubator for your poultry?

## 6. Practical assignment steps and procedures

Module 5	Details of Practical Work
<p><b>Practical Exercise 1</b></p> <p>Let the trainees undertake all the activities required for incubating and hatching chicks using incubators following the steps in the next column</p>	<p>Prepare suitable site for incubating and hatching purpose. Read and understand incubators manual (instruction for use). Select eggs for hatching chicks based on the selection criteria. Based on orders listed in the incubator manual, insert eggs, turn on and calibrate the machine, perform all the necessary care and follow-up and hatch chicks. Show your result to your trainer for evaluation</p>

## MODULE SEVEN: CARE AND MANAGEMENT OF YOUNG CHICKENS

### 1. Module Description

The Module deals with the basic knowledge and skills required for the management and care of young chickens. It also focuses on the know how about the preparation of suitable houses for raising chicks, making and arranging equipment for young chickens. What is more the Module highlights the formulation of balanced feed, feed chicks and strategies of growing healthy chicks.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Build brooder houses for young chickens.
- Prepare materials, tools and equipment needed for chicks' house
- Prepare balanced feed, properly feed care and management activities needed for young chicks.

### 3. Learning Methods And Assessment Criteria

- Read and realize the learning points given under *Learning Outcome1*.
- Answer all questions given under *Theoretical/Written exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read the notes given under *Learning Outcome 1* and answer all questions given under *Self-Assessment and Written Exams*.
- Next proceed to *Practical Exercise Number1* and undertake the entire activities as directed.
- Continue and carry out all the assignments, exams and practical activities given under each *Learning Outcomes* in the same manner

**Module Contents** After hatching and until the chicks are old enough to be on their own, naturally the mother hen will protect the chickens from adverse weather conditions providing heat by covering them with her



wings. In the absence of mother hen, in cases where large number of chicks are incubated and hatched by machines or when farmers buy young chicks, (often called 'day old chicks'), these young birds are very vulnerable, and must be protected against cold and disease. It is expected that at the end of the module, trainees will have the knowledge and skills on basic methods and technics of management, care, nourishment, feeding and protection against cold and diseases required to grow young chickens in small scale production systems.

4. **Management of chicks:** Farmers will normally buy day-old chicks from a hatchery. These are kept in a brooding house, on bedding material known as litter, at a correct 'stocking density'. The chicks need to be kept warm and dry, for example by use of lamps or heaters, fed on a protein rich diet and have clean drinking water. They are normally kept under lights for the first few weeks, to maximize their feed intake and growth. They should be vaccinated against diseases, and protected against contamination from adult birds. Some farmers de-beak their chicks to prevent them from pecking each other. Cannibalism in chickens can be a problem, particularly in hot weather; you can observe this while caring the chicks.

When rearing chickens, either for eggs or meat, most poultry farmers buy young chicks. These young birds are very vulnerable, and must be protected against cold and disease. In particular, the chicks must be kept completely separate from adult birds on the farm, and if possible, people working with the adult birds should not enter the chicks' 'brooder house'. This will help to ensure that no diseases are transmitted to the chicks. Farmers must also pay attention to vaccination, feed and water requirements, so that the young birds grow strong and healthy chicks.

#### 4.1 Learning Outcome 1: Build brooder house for young chickens

One of the most important aspects of keeping poultry especially young chickens is providing suitable housing. A good poultry house needs to offer protection for the birds from bad weather as well as from predators. It also needs to be well ventilated and easily cleaned, to reduce the risk of disease spreading in the flock. Properly designed and built housing for village chickens protects them from bad weather

and predators, and if houses are easy to clean, diseases are less likely to occur.

Building a suitable brooding house is important for improved poultry management. Brooder house is house built for keeping and growing young chickens or day old chickens. In this house you keep and grow chicks and mother hen if chicks are naturally hatched or grow young chickens or day old chickens by providing the required heat by artificial method without mother hen.

### **Method of building brooder house**

#### **1. General design criteria**

Like other poultry houses the design of brooder house are prepared following the general design criteria as explained in module 2. During the preparation of design for building brooder house you have to consider other important criteria for caring and management needs of young chickens.

- Shape and size: The Shape and size are dependent on the number of chicks, economy, poultry type, size and technology used and your preference. Though the length is dependent on the number and type of chickens the width of any house should not be greater than 10 meter.
- Brooding house should be constructed separately away from other buildings.
- Floor can be made from compacted clay soil or made of concrete depending on the size and economy of the poultry farm
- The walls of the house should be constructed in a way that one side of the wall is opened one meter below the roof in the opposite direction of rain and covered with chicken wire mesh or by thin round sticks to permit entrance of sufficient light and insure sufficient ventilation
- In wet and rainy areas the slope of the roof should be increased to increase drainage of rain water. To protect

entrance of splashed rain water from the roof the roof should be off sated 1 meter from the wall.

- In dry and hot areas the slope of the roof should be reduced and 0.5 off set from the wall is sufficient. Increasing the height of the roof from the ground will have an advantage for good ventilation.
- If the size of the house is big, 3.7 meter height is sufficient. The roof can be constructed from different materials like iron sheet or grasses depending on the available budget.
- The house should keep out dogs, rats, snakes and other animals.

## 2. Required size and construction of brooder house

- Size of brooding house required to grow chicks following natural method by mother hens depends on their number and the chicks kept in the house. The house should be sufficient enough to keep brooding basket one for each brooding hen size (90cm x 75 cm and 60 cm height) box or triangular cage should be prepared. This brooding box or cage is sufficient enough for keep one mother hen and up to 20 chicks.
- Size of brooding house required to grow chicks by artificial method also depends on the number of chicks kept in the house. The houses must have enough space for the number of young chickens to avoid over-crowding. Area of the floor required for a chick from 0-6 week ranges from 0.06- 0.08 square meters.
- To create comforts and control heat and temperature of young chicks the floor of the house should be covered by 8-10 cm height bedding material known as litter/straw mat. Depending on age and level of development, height of bedding material can be reduced up to 3 cm above the floor level. The type of bedding litter used for house will depend on the availability and local situation; in general, grass, crop straw, cereals hay coffee seed hay etc. can be used.



### 3. Making chicks heater

Young chickens require heat and warmth from the date hatched till there body is fully covered by feather.

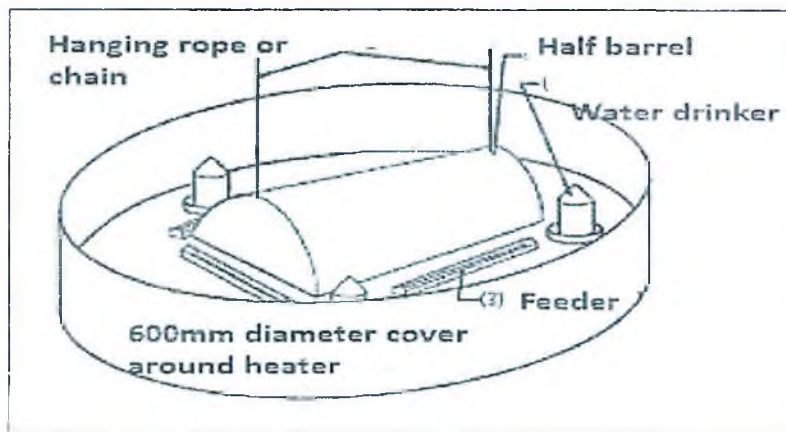


Figure 5: Chickens' heater

Although heat deliver period are variable depending on the local climate, eggs of chicks from 4 – 8 week still needed. The method of supplying heat to chicken also determined by poultry size, income and local condition. The source can be electric, gas, fuel, charcoal and other heat sources. The choice of energy source will be decided on availability, number of chicks and type of houses. Electric power sources are more suitable than other power sources. Heaters which uses charcoal and gas can be the reason for fire hazard therefore care should be taken.

In the presence of electric power sources incandescent lamps can be used as the main heat sources for chicks; incandescent lamps of 250 watts power hanged at some height above the ground can deliver sufficient heat for 100 chicks. In hot local climate, the required heat level of chicks is smaller than in cold areas therefore incandescent lamp of fewer watts can be used. The top of the lamp should be covered by strong iron sheet to reduce heat loss.

The height from the ground at which the lamp is fixed should be adjusted according to the heat requirement of chicks and local climatic condition. The need for heat gradually reduces according to

growth of chicks therefore the height of the lamp from the floor should be increased and adjusted accordingly.

- During the first two weeks, height of lamp above the floor should be 40 cm.
- From 3<sup>rd</sup> to 4<sup>th</sup> week, height of lamp above the floor should be 45 cm.
- For 5<sup>th</sup> week height of lamp above the floor should be 50 cm.

In general the temperature around chicks should be kept from 30 to 32 degree centigrade. The temperature in the house should be measured 15 cm below the top cover and 5 cm above the top of litter bedding.

#### **4. Solomon's Orphan Chicks Booming Box**

This technology is a method of growing day-old chicks brought from a hatchery by keeping inside a brooding box on a floor bedded by litter. All four sides of Solomon's box are made from timber having height of 30 cm and thickness 2 cm. The length of timber depends on the number of chicks.

Chicks brooding box is a technology that can be made at your economic level from local available materials with minimum cost. As shown in the figure the technology includes wall, door, air/ventilation hole, floor, interior circular roof and day time space the top covered by mesh wire including feeder

All sides of Solomon's box are made by assembling four timber having height of 30cm and thickness 2cm. the length of timber depends on the number of chicks. One side timber will have a door for chicks and all four side walls will be provided with four holes at the top off each side timber the diameter of this holes are 2.5 cm for ventilation. Therefore the box will have total number of 16 holes. These holes will help for circulation of heat, moisture and air in balanced and proportional manner. If these holes are not drilled chicks will die of suffocation and care should be taken. To protect chicks from direct effect of cold air and wind pressure ventilating

holes should be drilled at the top of side walls. If timber is scarce in your locality other materials like strong cartons, papers, boards, chip woods and wood sticks covered with mud or caw dunk. For details see the samples figures given below.

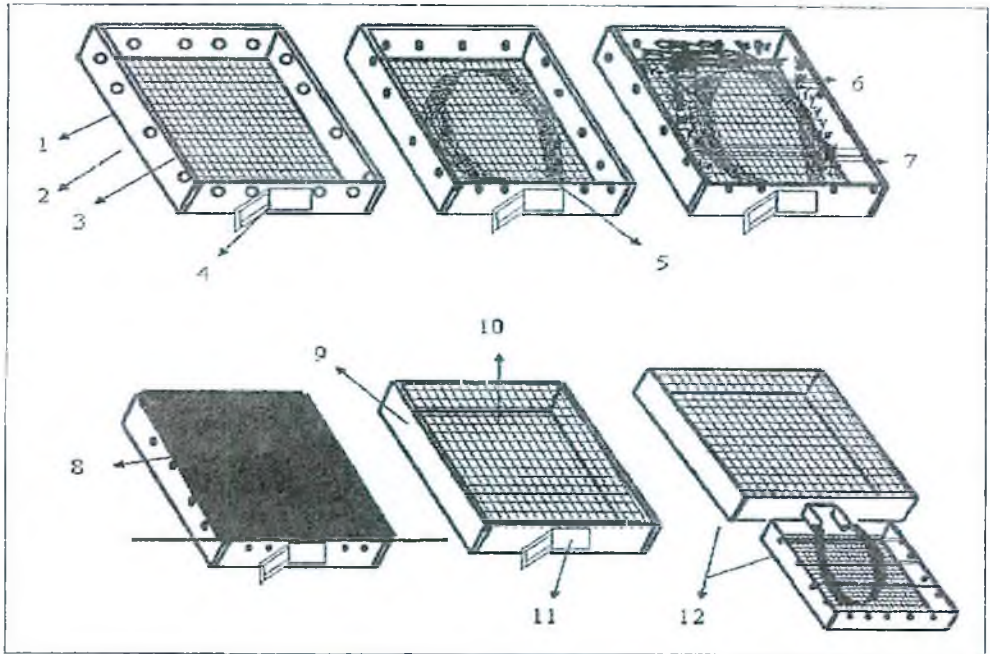


FIGURE 6: Chickens booming box technology design

#### Details of figures

1. Temperature or heat regulator box wall.
2. Air inlet holes (ventilators).
3. Temperature regulator box floor.
4. Inlet and outlet door.
5. Interior circle.
6. Litter for temperature regulation.
7. Handle bars.
8. Temperature regulator box roof or top cover.
9. Chicks run and feeding box walls.
10. Chicks run and feeding box top roof covered with wire mesh.
11. Chicks' inlet and outlet door.
12. Temperature regulator box and Chicks run and feeding box position.





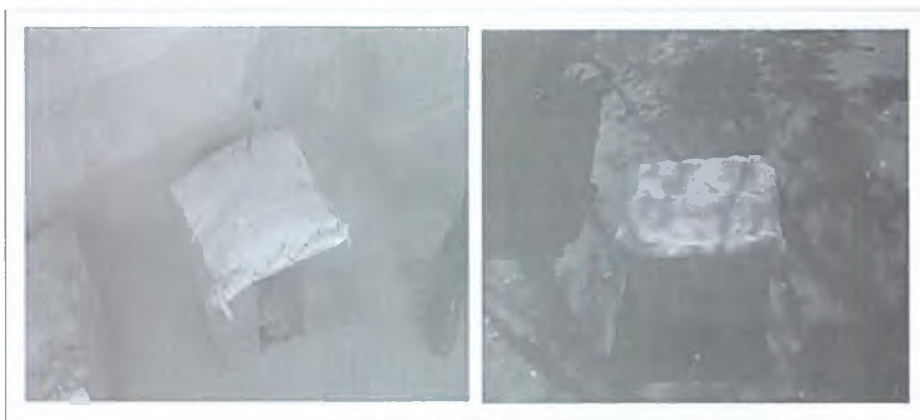
**Figure 7: Solomon's chick's heat regulator box**

Floor of the box can be made from timber, sieve/mesh wire or chip wood. If the floor is made from mesh wire, the wire should be stretched very well. Sufficient and suitable type of litters should be delivered inside the pockets to provide and control required heat to chicks, dry grass and straw can be used for this purpose. These pockets are made around Solomon's box on the interior side of timber walls. Top of the box can be covered by meshed wire and on top of it placed a sack filled by straw litter or covered by empty sacks or other suitable materials according to local situation. Box for chicks run can be also made by assembling four long size timbers having height of 30 cm and cm thickness 2. The length of timber depends on the number of chicks. Top of the box can be covered by meshed wire or by other suitable materials according to local situation but the top cover should protect chicken from attacking predators and allow passage of sun light. Temperature inside Solomon's box during first week should be kept from 30-35 degree centigrade. Gradually reduce the temperature inside the box step by step on weekly bases by removing the litter filled inside the pocket around the interior side of the box wall in the same way on weekly bases.

During the first week, chicks should go out of the box frequently for feeding and drinking purpose and kept back in to the box after feeding is completed by pushing them slowly and close the door. Starting from

the second weeks doors of both (two) boxes are left opened. After 5-6 weeks completely remove all litters filled inside the pockets and the sack placed on the top of Solomon's box.

Top of heat regulating box can be covered by empty sacks, blankets or by other suitable materials (see figure 9 for details). If the local climate is very cold, the sack used to cover top of the box should be filled by straw or other suitable litter. In areas where the local climate is hot or medium the top of the box can be covered by impiety sack or peace of blankets to regulate the temperature inside the box.



**Figure 8: Top cover made from empty sack**

In all cases which ever method is used to cover the top of the box it is very important to make sure that the roof cover should not permit rain water or water enter into it. Finally a rectangular box(chickens run and feeding box) made by assembling four timber having height of 30 cm and thickness 2 cm will be installed for Solomon's heat regulating box. The floor of the box(chickens run and feeding box) are left open and the top of the box can covered by mesh wire, bamboo, or other materials but the top cover should protect chicks from deadly attacks of predators like wild birds, cat, dogs, wolfs and other animals. Area (size) of the box (chickens run and feeding box) depends on the number of chicks kept inside the box (See Table 7 for details).

**Table: 7** Sizes of chickens run and feeding box for different number of chicks

Number of chickens	Size of small/box in cm (height x width x length)	Size of big /chickens run and feeding box in cm (height x width x length)
10	30 x 26 x 26	30 x 57 x 57
30	30 x 45 x 45	30 x 98 x 98
50	30 x 57 x 57	30 x 126 x 126
70	30 x 75 x 75	30 x 150 x 150

### Self-Assessment Questions

Self-Assessment Question 1	How much minimum space or distance should be kept between houses of chicks or chicks at different development stage or egg groups? What is the purpose of keeping this distance?
Self-Assessment Question 2	Describe the temperature essential on average to keep chicks warm and comfortable?
Self-Assessment Question 3	List the additional pointes we should take in to account during construction phase of brooder houses for safety and management of chicks?

## 4.2 Learning Outcome 2: Prepare/supply materials, tools and equipment needed for chicks house

### Types of materials and equipment

#### 1. Chicks feeders

Feeders should be suitable for feeds chicks and should not allow chicks to climb and drop faeces and pollute the feed. For the first few days feed should be delivered using flat feeders or cartons or hard papers can be used. To reduce feed wastage the height of the feeder should be from 2.5-5 cm. if hanged feeders are used the height of the feeder, it should be increased considering the growth of chicks and the height of feeder floor and adjusted to be equal to the back of the chicks.



### **Chicks feeding area requirement**

- For 0 up to 6 weeks egg chicks, 4 centimeters.
- For 6 up to 18 weeks egg chicks, 6 centimeters.

For improved poultry management refer the Table depicting feeders and drinkers requirement of chickens based on the type of breeds, age and type of productions (egg or meat).

### **2. Chicks drinkers**

Sufficient numbers of drinkers should be placed inside the cover around the heater. Due to growth of chicks, the drinkers should be changed after a week. Drinkers made from plastic materials do not rust and are more preferable than those made of metals.

#### **Average area of drinker required for chicks:**

- Layer breeds 1.5 centimeters.
- Broiler breeds female sex 1.8 centimeters.
- Broiler breeds male sex 2.5 centimeters.

### **3. Chicks cover**

Cover should be provided for chicks around the heater until chicks clearly know the location of feeders and drinkers. Fine mesh wire, hard board or paper, chip wood and iron sheet can be used for covering. Height of cover can be fixed at 50 cm from the ground floor circular cover with 2 meter diameter provided around the chicks are sufficient for 200 chicks; and the diameter of the cover should be increased starting from 3<sup>rd</sup> day on daily bases because the space requirement of chicks will increase as chicks grow; and finally remove the cover after 15 days.

### **4. Floor litter**

Floor litter is a bedding material delivered on the floor of chick's house to provide heat and comfort. Wood shavings, grass, crop straw, sawdust, or other locally available materials can be used as floor litter. Litter from 8-10 cm thick should be spread on house floors.

For chicks especially during the first 4 to 8 weeks, sufficient light should be provided contentiously. During this period light should be available for 23 hours per day. Duration of the light should be reduced equally on weekly bases for 20 weeks until it reaches natural day light hour which is 12 hour in your cases. Entry and circulation of sufficient and clean air inside chick's house is very important; therefore windows should be covered by mesh wire.

Some farmers de-beak their chicks to prevent them from pecking each other. Cannibalism in chickens can be a problem, particularly in hot weather.

Chickens at all age will display behavior of cannibalism by pecking each other mostly this happens in flocks with high density, or if the birds are kept inside houses. To protect cannibalism in the flock and prevent them from pecking each other you can de-beak their chicks. In some cases mainly for scavenging birds equally de-beak both the upper and lower pikes at equal levels are practiced. The other method mostly practiced for layer chickens reared in side poultry houses, the upper pike are de-beaked from one to two thread and the lower pike from one forth to one thread of its length are removed; for broiler breed chickens only one thread of the upper pike can be removed de-beaked.

#### **4.3 Learning outcome 3: Prepare balanced feed, feed and care management activities needed for young chicks**

##### **1. Compounding balanced feed and feeding young chicks**

Starting from the first week chicks are hatched they should be given sufficient quantity of feed in small amount every two hours.

##### **A. Composition of Feed for Broiler Chicks**

Broiler chicks should grow and reach marketable size very rapidly therefore you have to provide the required type and quantity of quality balanced feeds at all time without limitation in two developmental stages.

- 1. Starter feed:** Feed delivered to chicks from 0-4 week of age which is high in protein (>22 %) and comparatively less energy feed (2800-2900 Kcal/kg ME) content.

2. **Growers feed:** Feed delivered to growers' greater than 4 weeks of age which is high in energy content (>2900 Kcal/kg ME) and comparatively medium in protein (20%).

At this stage, you can purchase commercial premixed feeds from poultry feed producers or purchase locally available feed raw materials/ feedstuffs from market; then mix the feed that can meet the energy, protein and mineral requirements of their chicks based on alternative feed formula given in Table 4. If you need to mix balanced feed from other feedstuffs different from those listed in Table 4, you have to understand the different type of feeds and nutritional content and prepare by substitute the one listed in Table 4 with feedstuff that can fulfill the nutritional content given in the formula.

#### **B. Composition of feed for layer chicks**

For chicks in the first eight weeks, we shall give them starter feed well-balanced feed containing the required nutrients. It is high in energy, vitamin and protein, because during that time there is a very fast growth. Feed delivered should contain from 18 – 20% protein and 2900 (Kcal/kg ME) kilo calorie energy content per kilogram feed.

#### **2. Water requirement of poultry chickens**

Quantity of water consumed by chicks will vary according to their breed, growth level (age) and local climate. Therefore for proportional body growth and productivity, chicks should be provided sufficient, clean and cold water at all time.

##### **Water requirement for chicks**

- Chicks during grower stage drink from 2-2.5 grams of water for each gram of feed they consume.
- Chicks' water requirement (intake) varies depending local climate as the climate gets hotter water intake also increases.
- Water delivered to chicks should not be very cold or very hot, otherwise their consumption will decrease.



- Provide sufficient and clean water for chickens at all-time according to their development stage; give especial attention for layers.
- Water delivered for chickens should always be clean and free from pollution.

### 3. Care and management of young chickens:

You can buy day-old chicks from a hatchery which are kept in a brooding house, on bedding material known as litter, at a correct 'stocking density'. The chicks need to be kept warm and dry (for example by using lamps or heaters), fed on a protein rich diet and have clean drinking water. They are normally kept under lights for the first few weeks, to maximize their feed intake and growth. They should be vaccinated against diseases, and protected against contamination from adult birds. You may de-beak their chicks to prevent them from pecking each other. Cannibalism in chickens can be a problem, particularly in hot weather; good observation would give you more information.

There are two methods of growing chicks: natural and manmade. If chicks are naturally hatched the number of chicks hatched at a time will be small; therefore, it is more preferable to grow natural chicks by mother hen. If chicks are hatched artificially by machine, the number of the chicks will be very large, thus, you should prepare suitable place to properly rear them.

Natural method of growing chicks means growing chicks using strong broody mother hen from indigenous variety. Although dependent according to hen's body size, a hen can nourish and grow from 15 -20 chicks. If large numbers of chicks are hatched by different chickens at a time some chicks from other hens should be added limited number of hens and the rest should be shifted to egg production. To make the other hen accept chicks from different mother, it's good to place the chicks under the new mother hen during night time. From the first week chicks are hatched, they should be given sufficient quantity of feed in small amount every two hours. For the mother hen to nourish and grow chicks you

should prepare and use brooding box size (90cm x 75 cm and 60 cm height) or triangular cage. Each brooding basket is sufficient enough to keep one mother hen and up to 20 chicks.

Manmade method is a technique of growing day-old chicks from a hatchery by providing the required heat and warmth to the chicks kept in a brooding house by use of lamps or heaters. The source of heat can be electric, gas, fuel, charcoal, Solomon's orphan chicks brooding box and other heat source

#### **Preliminary preparation of brooder houses before a new flock of chicks come to the house**

Before you bring new flock of chicks, all materials inside the house, equipment and poultry compound and the area should be cleaned, disinfected properly and left to stand empty for at least two to three weeks.

#### **The Cleaning activity includes the following:**

1. Completely clear and remove old litter from all houses and dispose at a distant away from the poultry.
2. Properly clean all the houses including all the materials and dirt on the walls floor and on the roof; clear and wash with pressurized water and make sure all the dirt stacked are shaved and fully cleaned and removed.
3. Properly clean houses both internal and external surrounding and keep dry; wet floor or any pool of water should be removed.
4. Disinfect the house and spray/fumigate equipment and eggs with anti-germ medicines.
5. Clean all equipment inside poultry houses and disinfect properly with disinfectant. Remove out all materials from the house, properly clean and return back.
6. Finally cloth the house and fumigate by smoke using anti-germs or other medicines.
7. After the activity of cleaning houses is completed, clean all areas around poultry compound; grown grass, weeds and

bushes should also be removed to avoid diseases reproduction.

8. In the meantime, perform necessary maintenance activities
9. Dispose dirty materials, clear out of poultry houses far from poultry compound.

At least 3 days before new chicks are brought to a farm provide 8-10 cm thick floor litter or bedding material on the floor. Make sure that all the equipment including heaters is functioning well and are in good condition; otherwise carry out the necessary maintenance and place sufficient number of feeders and drinkers at appropriate location.

Based on chicks' growth level, the temperature around chicks should be gradually reduced 3-4 degree centigrade until the temperature is balanced with the local temperature. When the temperature around chicks is higher than they need, chicks will go away from heaters and if heat is not sufficient chicks will remain close to each other near to the heater.

**Chicks that should be culled are:**

- Disabledchicks.
- Thin and light weight chicks.
- Have different colors from the breed.
- Not appear alert, healthy, lively etc.

**Self-Assessment Questions**

Self-assessment Question1	Write the names of equipment required in chick house?
Self-Assessment Question 2	Explain the size of feeder required for chicks of age ranging from a) 0-6 week b) 6-18 week.
Self-Assessment Question 3	Chicks or (brooder) house should be built at some distance away from other houses or houses containing adult birds. Why?



Self-Assessment Question 4	Write in detail the preliminary and preparatory activities you should do in brooder houses before a new flock of chicks brought in to poultry farm?
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### 5. Module Assessment Questions

Module 7	Assessment Questions
Question 1	Why do you have to build a separate brooder house for raising young chickens?
Question 2	What is the age range of starter feed composition to deliver broiler chicks? Write the protein (in %) and energy content (in k.cal) per kilogram of feed?
Question 3	Heaters or devices used to provide heat for chicks are available in different forms based on source of power (like electric, fuel, solar or charcoal as sources of power). Based on your local context which one do you select for your poultry use? Explain your selection criteria.
Question 4	How do you know whether the heat around chicks is excess or less than required?

### 6. Practical Assignment Steps and Procedures

Module 7	Details of Practical Works
<p><b>Practical works 1</b></p> <p>Trainees are given practical work order to: - select appropriate site and prepare suitable design for construction of main house sufficient to keep 400 chicks.</p>	<p>Select appropriate site for building chicks house and management method.</p> <p>Based on what you have studied, calculate the size of brooder house that will provide adequate space for 400 chicks.</p> <p>Identify/select locally available and cost effective materials to build poultry house..</p> <p>Prepare design for building a house sufficient to keep 400 chicks.</p>

**Practical works 2**

give practical work order for trainees to calculate the size, prepare designs and make feeders to feed 400 chicks from (6-18 weeks) of age

- ☞ Calculate the required size of feeder as per the previous discussion.
- ☞ Identify the types of materials used to make feeder.
- ☞ Prepare suitable design for your feeder.
- ☞ Based on your design prepare feeders sufficient to feed 400 chicks.

## MODULE EIGHT: POULTRY HEALTH PREVENTION CONTROL AND MANAGEMENT

### 1. Module Description

The Module is about diseases which commonly affect chickens in small scale production systems. It also introduces the means of identifying supplying the required basic sanitation, medical materials tools and equipment. In addition, the Module outlines the prevention and control strategies that can be employed to address health irregularities of poultry. .

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Identify, supply and use basic hygiene/sanitation medical materials, tools and equipment.
- Recognize and undertake private poultry houses and environment hygiene and sanitation activities.
- Regularly clean and disinfect poultry feeders and drinkers.
- Recognize and regularly practice diseases and parasites prevention measures for poultry.
- Prevent poultry diseases through professional support and appropriate treatments and control methods.
- Prevent, treat and control most serious poultry diseases and parasites.

### 3. Learning Methods And Assessment Criteria

- Read and realize learning points given under *Learning Outcome1*.
- Answer all questions given under *Theoretical/Written Exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read and study points given under *Learning Outcome 1* and answer all questions given under *Self-Assessment, and Written Exams*.



- Next proceed to *Practical Exercise Number 1* and undertake the entire activities as directed.
- Continue and carry out all the assignments, exams and practical activities given under each learning outcomes in the same manner

#### 4. Module Contents

For poultry farmers, the spread of disease in their flocks is the most serious danger. You should be aware of the diseases causing death, un-thriftiness, lowered production and market value among chickens. You should also know about the recent emerging diseases, causes, clinical signs, preventive measures and control methods.

Due to different reasons, diseases can spread easily and quickly. You should do everything possible to prevent diseases entering your flocks in the first place. This requires strict management rules; for example, older and younger birds should not be kept together, visitors should not be allowed to enter the poultry houses, and sick birds should be removed immediately. Once a batch of chickens has been sold, the poultry house must be thoroughly cleaned and disinfected, and then allowed to stand empty for at least two weeks, before introducing a new batch. This helps to prevent a buildup of disease on the farm.

You should follow strict management rule and practice basic health prevention and control methods to:

- Recognize different types of diseases and cause and means of transmit ion.
- Identify internal and external parasites and health management measures to be taken to prevent and control the diseases.

The trainees should learn and identify the main diseases which commonly affect chickens in small scale production systems and methods for prevention and control. It is expected that at the end of the module, you will have a basic knowledge on the most important chicken diseases and the appropriate health management measures to be taken to prevent and control the diseases.

**4.1 Learning Outcome 1: Identify, supply and use basic hygiene/ sanitation medical materials, tools and equipment**

**Medical tools and equipment**

Types of medical tools and equipment depend on the type, size poultry farm and knowledge of the farmer. If medical treatment is given within the farm all necessary medical tools and equipment should be available. For medium and lower level medical treatments, types of medical tools and equipment depends on treatment delivered at farm level. Generally the main medical tools includes needles, syringes, medicines for different diseases, drops, tools for miner surgery's, tray (dish), hand gloves, forceps, blades, scissors, alcohol, savllon, jive .etc.

**Hygiene and sanitation tools and equipment**

Main tools and equipment required keepinghygiene/ sanitation of poultry farms includes cleaner (scopa), insecticide, towels, shovel, and wheel-barrow. etc. These tools should be available and properly used for poultry activity.

<b>4.2 Learning Outcome 2</b>	<b>Be aware of build private poultry houses and keeping environment hygiene and sanitation activities</b>
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**Keeping personal hygiene**

Poor personal hygiene particularly lack of regular washing of hands, the wearing of home clothes in the poultry house, failure to wearing gum boots and head covers leads to potential entry of disease in the flocks.

- Regularly wash your hand especially before feed preparation, feeding chickens and before entering into poultry farm or chickens house.
- Clothing and shoes should be used exclusively in the flock houses.

- Regularly wash or deep clothing and shoes in chemicals and keep clean meant for poultry purpose; especially shoes must be disinfected using footbaths on daily bases.
- Depending on poultry size, persons working all activity for different age chickens should be assigned
- Persons working full time or those who spend at least two to three continuous hours in the poultry should receive training and have the required knowledge and skills in poultry diseases and health management.
- Visitors should not be allowed to enter the farm; otherwise, they have to wear clean cloth and shoes dedicated for that purpose.

#### **Poultry houses and environment hygiene and sanitation**

Dry and clean housing is a key to prevent the transmission and spread of diseases. To keep houses clean and free from parasites and disease causing agents the following important hygiene and sanitation activities should be taken in to account:

- Clean poultry houses properly, both the inside and external areas; keep it dry; wet floor or any pool of water should be removed.
- Clean houses if possible every day or 3 to 4 times per week; disinfect the houses every three to six months or twice with lime wash after cleaning.
- Clear and remove old litter from all chickens and chick houses and provide clean and dry litter regularly.
- All equipment in side poultry houses should be cleaned and disinfected properly and regularly with disinfectant.
- Dispose dirty materials cleaned out of poultry houses far from poultry compound.
- All poultry compound including areas around the farm should be cleaned; grown grass, weeds and bushes should be removed to avoid diseases reproduction.



- Wash the floor and other washable part of the house by anti-germs or other suitable chemicals. At this time, all the birds inside the house should be kept out of the house,
- All poultry tools and equipment should be dried using air drier or sun light to kill or reduce the number of bacteria and germs.
- Clean houses weekly and apply lime wash on the floor and the walls every three to six months.
- For small scale confined production systems, make sure to leave the house empty for 2-3 weeks and disinfect the house properly between flocks.
- Provide protective fence around poultry farm.
- House and nests must be cleaned for droppings, insects etc. Fresh straw or hay should be put in the nests weekly. Adding a little ash on top can prevent parasites away; the perches, and the nests should be thoroughly cleaned and subsequently painted with lime at least twice a year, and always after serious outbreaks of diseases.

#### **4.3 Learning Outcome 3: Regularly clean and disinfect poultry feeders and drinkers**

In order to prevent, diseases, including internal and external poultry parasites, sanitation is the first key step. Thus, feeders and drinkers should always be kept clean and make sure wild birds. Domestic and other animals are kept at a distance. In relation to this, the following are some of the measures to be taken:

- Poultry feeders and drinkers should always be kept clean especially before and after feeding chickens to prevent spread of diseases
- Poultry feeders and drinkers should regularly be washed with soap or anti-germ and always be kept clean and disinfected.
- Washed feeders and drinkers should be kept exposed to sun light (sun dried) and always dry.
- Restrict access to wild birds and domestic or other animals from using poultry feeders and drinkers

**Self-Assessment Questions**

Self-Assessment Question 1	List the main tools and equipment used for keeping hygiene and sanitation of poultry farm.
Self-Assessment Question2	Write the basic activities to keep hygiene and sanitation of poultry houses and environment.
Self-Assessment Question3	What are the main duties which should be regularly practiced by poultry worker before entering into poultry farm in terms of spread of diseases?

**4.4 Learning outcome 4: Identify and practice prevention measures against poultry diseases and parasites**

It is more important and advantageous to prevent introduction of new disease in to poultry than to treat diseased chickens. This means to improve the productivity and profitability your business prevention and keeping the health of poultry flocks are your major duty.

**Poultry disease prevention**

Disease causing agents are everywhere and will infect birds of all ages, but careful management can prevent a number of diseases. Disease management and prevention is the main practice which you must develop and regularly practice to control the possibility of occurrence and decrease the risk involving the flock.

Prevention is a strategy in animal husbandry by focusing on maintaining or improving the health status of animals and preventing the appearance of disease pathogens by assessing all possible animal health risks. Among the different prevention strategies, some of them are discussed below:

**Disease prevention through vaccination**

- Vaccination is one of the most important disease prevention methods. It is given to healthy chickens/ animals to protect them from potential infection caused by disease causing agents. It is also used after the occurrence of disease, at this point those infected birds should be isolated this is done to

prevent the healthy poultry from contamination and give Vaccines only to healthy birds. If a sick bird is vaccinated it will usually kill the bird

- Vaccinate chickens against the most killer diseases and re-vaccinate if necessary and complete as per the program

#### **Other basic disease prevention methods**

- Properly clean both internal and external parts of the houses. Keep the house and the surrounding dry; wet floor or any pool of water should be removed. Dis-infect the houses every three to six months with lime wash after cleaning.
- Isolate a bird when it becomes ill (sick) in a separate house built for this purpose.
- Access poultry birds to adequate quantity and quality feed and clean water; this helps to protect chickens from nutritional diseases/disorders, in particular for small chicks.
- Avoid disease risks arising from rotten feeding moldy, wet and bad smelling feeds as well as those contaminated by fecal matter containing disease agents.
- Give chickens unlimited access to the right quantity clean water (potable water wherever possible) and protect from water borne diseases.
- Feeders and drinkers should always be kept clean and make sure that wild and domesticated birds and other animals cannot use the equipment to prevent spread of diseases
- Chickens that are very slender (thin), old, bad looking and non-productive (not laying) should be culled or slaughter as they are likely to be susceptible to diseases, and likely transmit diseases to poultry in good health.
- Check the reproduction status of each hen once a month; give right care to hens that are brooding. Kill or sell non-productive birds, i.e. cockerels and old hens that have stopped laying as they could transmit diseases.



- Sick animals should be culled in the absence of diagnosis or medication.
- It is recommended that a farmer should not buy chickens at the live bird market or from uncontrolled or unknown sources, especially not during periods when outbreaks of diseases are occurring.
- Chickens for poultry production should be bought from controlled or known sources like national indigenous poultry breeding or research stations.
- Before introducing new birds bought from live bird markets, individuals, neighbors or received as gifts from friends/relatives into a flock, the poultry need to be kept isolated and quarantined for three weeks in separate cage to make sure they are free from any diseases
- Separate chicks from adult birds with exception of the mother hen as they have less resistance and more susceptible to disease infections.
- Use a disinfectant dip at the entrance of the flock houses.
- Different species of poultry, for example hens, turkeys, should be kept separate; if your business is small scale, confined poultry farm you shouldn't keep other species other than the commercial chickens:
- Do not put too many birds together (5 -7 hens per m<sup>2</sup> in the house for layers and 10 -12 chicks/m<sup>2</sup> for broilers).
- Build houses or shelters against diseases, wind and rain;
- Make sure wild birds or other animals cannot enter the house.
- Report disease to veterinarian promptly.
- Burn or bury dead poultry due to disease. They should never be eaten.
- Clothing and shoes meant for the poultry should be used exclusively in the flock houses.
- Use the all-in-all-out concept.

**4.5 Learning outcome 5:- Prevent poultry diseases through professional support and appropriate treatments and controlling methods**

Poultry disease treatment and control includes identifying the type and cause of the diseases and curing of diseases through medical treatment given by veterinarians or by controlling the spread of diseases to poultry in good health.

**Methods of disease treatment and control**

- During disease prevalence, immediately isolate and keep sick birds in a separate house built for this purpose.
- During disease outbreak isolate sick birds immediately from poultry in good health and control the disease by providing antibiotics and vaccination to healthy chickens.
- Provide medical treatment immediately and cure sick birds or cull/kill the sick bird in the absence of a diagnosis or medication to prevent spread of disease.
- Dead birds (or parts from dead birds) should be burned or buried deep enough (about 1 m) to avoid and prevent dogs and other animals dig them out and spread the disease.
- Killed birds should never be eaten; if a bird dies, it should be burned or buried and never eaten
- Wounds resulted from chickens pecking each other should be treated immediately with wound remedies to avoid cannibalism in the flock.
- For Small scale confined production systems, make sure to leave the house empty for 2-3 weeks and disinfect the house properly between flocks.
- Simple fences such as hedges should be put in place to separate flock houses/areas.
- Visitors should not be allowed to enter the farm.

Types of diseases and possible treatments and control methods

N <sup>o</sup> .	Disease Type	Possibilities to Control or Cure
1.	Virus	Viral diseases cannot be cured, but may be prevented or controlled if the animals are vaccinated before the disease occurs in the flock. If the disease is present in the flock, vaccinations might increase the severity of the disease or even the death of the birds.
2.	Bacterial	Many bacterial diseases can be treated by use of antibiotics. It is important to diagnose the disease in order to choose the right antibiotic.
3.	Parasites	Most parasites can be treated. One can use conventional veterinary medicine (anthelmintic), and some traditional methods have also proved efficient.
4.	Fungus	Fungal diseases might be treated with antibiotics and other anti-fungal agents, but the most important is prevention by offering good quality feed.
5.	Nutritional diseases/ disorders	Nutritional diseases or disorders are caused by wrong feed compositions. Depending on the nature of the disease, it can be prevented or cured at an early stage by mixing the right feed with minerals and vitamins, or giving access to a diversity of feedstuffs from the surroundings, for example green grass and fresh cow dung.



## Self-Assessment Questions

Self-Assessment Question 1	Explain the difference between disease prevention and disease control.
Self-Assessment Question 2	Write at least six basic disease prevention methods.
Self-Assessment Question 3	What does disease prevention through vaccination mean?

#### 4.6 Learning Outcome 6: Prevent, treat and control most serious poultry diseases and parasites

Diseases are often characterized according to their etiology, such as virus, bacteria, parasites, fungi, and their causes, such as nutritional disorders. The most damaging diseases in poultry are categorized in to five (according to their cause, based on disease severity, and based on the size of production systems). Distinct features of diseases (such as the signs observed during outbreaks) and possible treatments (prevention or control) as well as the time of occurrence, are presented below:

##### 1. Major parasitic diseases prevention, treatment and control methods

###### Parasitic Diseases

Parasitic diseases affecting poultry are divided in to two main groups: internal (**endo-parasite**) and external parasites (**ecto-parasite**). Parasites share birds feed by sucking blood causing weight loss, poor health, skin irritation and death; furthermore parasites can transmit different types of diseases to chickens.

**External parasites:** They survive by sticking on the skin or hiding inside hair/feather of animals and take their feed from animals by sucking blood. External parasites may attack birds at all ages at any time, but occurs most frequently in humid chicken houses with bad hygiene. Adult birds are clearly disturbed and spend a lot of time pecking and polishing feathers. Young chicks may die from anemia. If not treated, the parasite will cause weight loss and possibly loss of feathers due to the parasites sucking blood and to skin irritation.

External parasites are divided in to two main groups namely *insects and acarians*.

- Insects include mites, lice, fleas, ticks...etc. these parasites obtain there feed from animals by sucking blood, transmit diseases from one animal to the other and also disturb animals by irritating the skin.
- Acarions are known for sucking animal blood and Couse weight loss

**Harms caused by the external parasites are:**

- Eat animals feed by sucking blood and cause weight loss.
- Result in drop or loss of animal production.
- Will cause weight loss and possibly loss of feathers due to the parasites sucking blood and to skin irritation. Transmit diseases caused by different germs and disease causing agents.
- Germs will inter through skin wounds resulting in animal sickness.
- Suck animal blood and cause anemia.
- Will causee weakness and poor health on animals.
- Damage skins and reduce the quality of animal skins and Hyde.

**Internal parasites (endo-parasites)** live inside animals satisfying their food requirement by sharing or consuming from the host animal. Internal parasites include trematodes (round worms), cestodes (tapeworms), intestinal worms, stomach worms, lung worms etc.

**Internal parasites means of transmission includes** feed or water contaminated by parasites and consumed by healthy animals.

**Damages caused by internal parasites are:**

- These parasites will cause, poor health, weight loss, and drop in egg production, bloody diarrhea, and weight loss by sharing animal food.

- Some of them cause wounds on animals' organ resulting sickness.

### **Major internal parasite diseases prevention, treatments and control methods**

Chickens can be affected by different internal parasites. These internal parasites will cause different damage on poultry animals. Some of these damages include intestinal wounds, intestinal block, and consumption of animals' food by sucking blood, loss of weight, retarded growth, and drop in production.

### **Disease clinical signs and symptoms**

Animal weakness, loss of weight, loss of right or actual color, sometimes diarrhea, drop in egg production, dragging wings, loss of feathers, and intestine blocks are the main symptoms.

### **Treatment**

The best treatment is adding and providing anthelmintic (medicines for internal parasites) in drinking water and feeds.

### **Prevention methods**

Providing anthelmintic medicines once or twice a year; proper hygienic/sanitation practices, improving feeding and poultry management will prevent heavy infections.

### **Major external parasitic diseases prevention, treatments and control methods**

External parasites live on the external skin of animals by sticking on the skin or hiding inside hair of animals so as to feed on animals by sucking blood. The most affecting external parasites are mites, lice, fleas, ticks etc.

**Ticks and fleas** suck blood and cause anemia and weight loss, bite chickens and make them irritate and restless and drop in production. Some ticks mainly bite birds feed them during night time and hide in the small holes of walls during day time; others



remain stacked on the skin and feather of birds and cause darkened and loss of feather, skin scratches and leg deformation. Fleas can be seen on the belly.

**Louse** stacked live on the skin and feather of chickens and take their feed from animals by biting and sucking blood of chickens, cause anemia and weight loss, bite chickens and make them irritate and restless, unable to sleep and eat properly and drop in egg and meat production. Louse can be seen stacked on the skin and feather of chickens by observing the body of chickens under sun light. Lice can be seen around eyes and nose.

**Scaly legs** are caused by external parasite irritating the skin on the birds' legs. The disease is common in older birds of more than 2 years of age. Legs clearly have scales and wounds and may become crippled in their appearance. The disease is treated by dipping the legs daily in kerosene, oil, or in an insecticide until the scales disappear. Old birds with crippled legs should be culled.

### **Treatments and controlling methods**

Treatment and protection is possible by regularly cleaning poultry houses and spraying or dusting birds with pesticides, dry lime, ashes, and oil. Ashes, dry lime, and sulfur powder may be used where the hens do dust bathing. Nests may be protected by putting a few tobacco leaves mixed with ashes in the nests.

### **Prevention methods**

Spraying or dusting chicks and chickens houses with pesticides or other medicines at least three times per year, regularly keeping poultry houses clean and environmental sanitation and spraying pesticide and filling cracks, holes and possible hiding places.

## **2. Most important poultry diseases prevention, treatment and control**

### **1. Bacterial Diseases**

#### **1.1 Infectious Coryza: They affect all ages of poultry.**

**Signs and Symptoms of infectious coryza are:**

- Runny or blocked nose, swollen internal part of nose and face.
- Swelling of eyes and partial or fully closed eyes.

- Drop in egg production.

**Prevention methods:**

- Isolate sick birds from healthy flock.
- Provide medical treatment before disease spreads to others.
- Properly clean all equipment's in poultry house.
- Vaccinate chickens.
- Treatment may be given by adding antibiotics in to drinking water.

**1.2 Fowl Cholera (Pasteurellosis)**

Fowl cholera may attack at any time in all age groups.

**Means of transmissions:**

- Sick and carrier birds can contaminate feed, water, soil and air and transmit disease to healthy chickens.
- Dogs, wild birds and other scavenging animals infected by eating dead birds (or parts from dead birds) body thrown out in the open spread the disease to others.

**Reasons for occurrence and aggravations**

- Luck of good hygiene.
- Nutritional deficiency.

**The clinical signs and Symptoms are**

- Loss of appetite and dizziness
- Diarrhea, faeces is liquid and turn yellow, white and green.
- Blue comb and wattles.
- Tiredness, head down and heavy breathing,
- Runny nose and mouth (saliva continuously flows out of mouth).
- Sometimes twisted head, swollen face and joints.

**Prevention methods:**

- Cull Sick or infected birds and burn or bury killed birds.
- Observe strict hygiene.
- Vaccinate birds.
- Treatment with antibiotics.

**1.3. Pullorum disease (bacillary white diarrhea)**

The disease is mostly seen in young chicks.

**Reasons for occurrence:**

- Caused by micro organic bacteria called salmonella.

**Means of transmission:**

- Disease is transmitted to chicks from the eggs of infected hens (from mother hen to eggs).
- Egg shall contaminated by feces of seek chickens.
- Feeds contaminated by feces of seek chickens.

**The clinical signs and symptoms are:**

**On grower chicks:**

- Loss of appetite and closed eyes or blindness.
- Faeces are liquid and turn white.

**On grown chickens:**

- High body temperature, anemia, dizziness and white combs and wattles.
- Faeces are liquid and turn green and yellow.

**Treatment:**

- Treatment with antibiotics is not effective in curing the disease but can reduce mortality rate.

**Prevention methods:**

- Fumigate equipment and eggs with anti-germ medicines.



- Sick and carrier birds must be isolated killed and burnt, especially during or outbreak.
- Hygiene must be strictly observed.

## 2. Viral Diseases

### 2.1 Newcastle Disease (NCD)

The disease is very common and is often seen in young chicks, but also in adults. High flock mortality, often between 30 and 100 per cent of the birds die, when the disease occurs. The disease is a virus, so there is no treatment.

#### Reasons for occurrence:

- Transmitted from exhaled breath of sick birds or through contact of sick birds with other birds.
- Feeds and water contaminated by feces and liquid fluid of sick chickens.
- Transmitted by contaminated feed and drinking water from ponds frequented by wild birds.

#### Means of transmission:

- Intermingling or mixing sick chickens with healthy ones

#### The clinical signs and Symptoms are:

- Characterized by sudden deaths, heavy breathing, and foamy fluids out of mouth and greenish droppings.
- Weak egg shell or cover and drop in egg production
- Dizziness and loss of appetite

#### Treatment:-

The disease is a virus, so there is no treatment

#### Prevention methods

- Unsold Chickens returned from market should be kept isolated or quarantined

- Peoples, vehicles and animals contacted or infected by the disease should not get near chickens or poultry houses
- Build shelter raised above the ground
- Provide supplementary feed and improve strength and resistance of chickens
- Can be prevented through vaccination of all birds including chicks from two weeks of age.

## 2.2 Infectious Bronchitis

The clinical signs and symptoms are:

**On chicks:**

- Runny nose.
- Tears on eyes.
- Loss of appetite and loss of weight.

**On growers:**

- Cough.
- Opening mouth.
- Heavy breathing.

**On grown chickens:**

- Infections on reproductive and urinary organs.
- Loss of appetite, ruffled feathers, diarrhea and shivering.

**Treatment:**

The disease is a virus, so there is no treatment

**Prevention methods:**

- Immediately isolate sick birds from healthy flock.
- Vaccinate all birds in the poultry farm or replace by vaccinated birds.

### 2.3 Infectious Saringotracciasis (Chicken Influenza)

The clinical signs and symptoms are:

**Chronic case:**

- Runny nose having liquid bloody mucus.
- Coughing.
- Darkened wattles.
- Swelling around eyes.
- Neck folding up and down during breathing.
- Pikes seen covered by bloody fluid.

**Per acute case:**

- Continues runny nose.
- Swelling around the eyes.

**Treatment:**

The disease is a virus, so there is no treatment

**Prevention methods:**

- Purchased or new chickens should be kept isolated or quarantined at least for one month.
- Isolate sick birds from healthy flock.
- Provide preventive vaccination to chickens (given to birds through eyes).

### 2.4 Fowl Pox

Fowl pox is often seen in young chicks, but also in adults, and shows as pocks (small lumps) lesions on wattles, comb, and face. Fowl pox is a viral disease and hence there is no treatment. A vaccine is available and is highly effective.

**Means of transmission:**

- Transmitted through body contact of sick birds with healthy ones through skin wounds.
- By stinging or biting insects or flees.
- Materials and Equipment's contaminated by sick chickens.



**The clinical signs and symptoms are:**

- Shows different shape pocks (small lumps) lesions on wattles, comb, head, legs, around eyes and face mainly on skins not covered by feathers.
- If lumps or lesions appear around eyes and nose it will result in runny mouth (out flow of liquid from mouth), tear drop from eyes.

**Treatment**

- Treating lesions or wounds with anti-germs to minimize aggravation of disease and also provide medicines mixed with feed and water.

**Prevention methods**

- Vaccinate chickens with fowl pox vaccine (given by injecting vaccine on wings).

**3. Protozoan Poultry Diseases**

**3.1 Coccidiosis**

The disease can attack at any time in all age groups but is very common and is often seen in young chicks especially 3-6 weeks old. The disease may occur as a chronic disease or as an acute disease. The disease is categorized among very dangerous and killer poultry diseases as it causes high flock mortality by infecting and wounding intestines of chickens caused by microscopic organisms called protozoan.

**Means of transmission:**

Disease Infection occurs through contaminated feed and drinking water by feces of sick chickens or from fecal material from healthy carriers. Water spelled pond around poultry house and on chickens run gives favorable condition for the reproduction of disease causing agent and result occurrence and dissemination of disease.

**The clinical signs and Symptoms are:**

- Un-thriftiness and head shrink or down lousiness.

- Sudden death especially chicks.
- Feces of sick birds mixed with blood and mucus.
- Bloody diarrhea mixed with mucus like liquid.
- Dizziness, loss of appetite and weight.

**Treatment;**

- Mixing and providing anti-Coccidiosis (Cocciostats) in drinking water or feeds are effective for treating the disease.

**Prevention methods:**

- Can be prevented by regular and careful cleaning and washing of feeding and drinking troughs and by cleaning and washing poultry houses with water and soap.
- Irrespective of disease occurrence regularly mix and provide anti-coccidiosis (cocciostats) in drinking water or feeds at intervals.
- The disease is prevented by applying the right stocking rate and avoid overcrowding.
- Different age groups of birds should not be mixed, as the disease may spread from adults to young chicks.

**Self-Assessment Questions**

Self-Assessment Question 1	List the names of most important diseases which affect poultry animals.
Self-Assessment Question 2	What kinds of damages internal parasites can cause on poultry animals?
Self-Assessment Question 3	How do you identify chickens affected by internal parasites? Write the main symptoms and prevention methods.
Self-Assessment Question 4	What causes Newcastle disease? Write the means and ways of transmission.

Self-Assessment Question 5	External parasites live by sticking on the external skin and take their feed from animals by sucking blood. How could we prevent these parasites?
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## 5. Module Assessment Questions

Module 8	List of Assessment Questions
Question 1	You should always keep your personal hygiene. Why? List the main hygienic precautions you should perform before entering in to poultry farm.
Question 2	Write the main causes of poultry diseases.
Question 3	What does treatment and control of poultry diseases? Explain the methods.
Question 4	What are the main risks and problems a poultry farm susceptible to potential entry and spread of different disease and parasites?
Question 5	Why viral diseases are different from other types of diseases?
Question 6	What causes Newcastle disease? Write the means of transmission and preventions?

## 6. Practical Assignment Steps and Procedures

Module 8	Details of Practical Work
<p><b>Practical exercise 1:</b> Let all trainees visit local poultry farm and farmers rearing chickens and do the following: perform</p> <ul style="list-style-type: none"> <li>☞ identify the types of diseases and parasites affecting chickens and causes of diseases</li> <li>☞ Suggest prevention and controlling methods for</li> </ul>	<p>Select one local poultry farm and two rural farmers rearing chickens</p> <p>Identify the types of poultry diseases affecting chickens and means or causes of diseases</p> <p>Suggest prevention and controlling methods for diseases and parasites identified during observation</p> <p>Prepare detailed report on your findings focusing on: (good practices/lesson to be learnt, challenges negatively affecting poultry</p>



<p>diseases and parasites identified.</p> <ul style="list-style-type: none"> <li>☞ Prepare detailed reports of findings.</li> </ul>	<p>productions, means and ways to solve the challenges, and suggestions for improvement.</p>
<p><b>Practical exercise 2:</b></p> <p>Let trainees attend local poultry farm and perform the activities mentioned in the next column.</p>	<ul style="list-style-type: none"> <li>☞ Keep your personal hygiene before entering into poultry farm.</li> <li>☞ Make sure that all tools and equipment required for keeping hygiene and sanitation of poultry are available.</li> <li>☞ Evaluate the situation and perform all the activities related to keeping poultry houses and environment clean and hygienic.</li> <li>☞ Prepare and present a report which includes your activities and evaluation outcomes.</li> </ul>

## MODULE NINE: KEEP PERSONAL AND POULTRY HYGIENE, PREVENT SPREAD OF DISEASES AND PROTECT ENVIRONMENTAL POLLUTIONS

### 1. Module Description

The Module covers the process of supporting environmental protection and bio security issues that will arise during planning and implementation of small scale poultry productions. It also deals with the following learning points: keeping personal hygiene; cleaning poultry houses; identifying, supplying and use of basic sanitation and medical materials tools and equipment; prevention and controlling spread of diseases to and from poultry; proper handling and managing poultry by-products and protecting environmental pollution.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Keep personal and poultry hygiene, identify supply and use basic sanitation and hygiene chemicals and materials.
- Prevent and control the occurrence and spread of diseases to and from poultry.
- Properly handling and managing poultry by-products and protect environmental pollution.

### 3. Learning Methods and Assessment Criteria

- Read and understand the learning points given under *Learning Outcome 1*.
- Answer all questions given under *Theoretical/Written Exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read and points given under *Learning Outcome 1* and answer all questions given in *Self-Assessment and Written Exams*.
- Next proceed to *Practical Exercise Number 1* and undertake the entire activities as directed.

- Continue and carry out all the assignments, exams and practical activities given under each *Learning Outcomes* in the same manner

#### 4. Module Contents

Biosecurity and environmental protection involves activities related to disease management. It includes aspects of housing, feeding, marketing, breed selection, and properly handling and managing poultry by-products to protect environmental pollution, among others.

Biosecurity in practical terms is a management practice which you should develop in order to decrease the risk of disease entering or leaving the flock. It is an approach to animal husbandry that focus on maintaining or improving the health status of animals and preventing the occurrence of new disease pathogens by assessing all possible risks to animal health including animal to human transmission of diseases.

Environmental protection is the process of identifying, predicting and mitigating bio-physical, social and other relevant effects of development activities aimed at protecting environmental pollutions for sustainable development.

Assessing and mitigating the possible effects of poultry production on environment. Poultry inputs and outputs mainly by-products of poultry including dry and liquid outputs from poultry should be managed and handled in such a way it does not have adverse effect on environment like pollution of water and physical environment and transmit ion of diseases from poultry to human and other effect of poultry management issues should be addressed.

<b>4.1 Learning Outcome 1</b>	<b>Keep personal and poultry hygiene, identify and use basic sanitation and hygiene chemicals and materials</b>
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#### **Keeping Personal Hygiene**

Poor personal hygiene particularly lack of regular washing of hands leads to potential entry of disease in to poultry, dissemination of diseases from



poultry to other domestic and wild animals and animal to human transmission and spread of diseases.

Consider the following important points related to personal hygiene that is essential to prevent the transmission and spread of diseases:

- Regularly wash your hand especially before feed preparation and feeding chickens and before entering into poultry farm or chickens house.
- Properly wash your hands before leaving poultry farm.
- Dedicated clothing and shoes should be used exclusively in the flock houses.
- Use of disinfectants to decontaminate personal clothes, shoes and other materials and equipment before it is re used at the farm.

### Keeping Poultry Hygiene

Improper cleaning and disinfection of houses and failure to restrict entry of visitors to the flock house expose the birds to potential infection. Other examples of risk factors are: reuse of egg trays without proper disinfection, lack of footbaths, home slaughter of chickens, and disposal of chicken manure without composting. In terms of this, consider the following:

- A chicken house/shelter should be disinfected on a regularly basis by applying lime wash on the floor, walls and perches. A rule of thumb is to apply new lime wash when the old has been worn off the walls.
- The feeders and drinkers should be cleaned and disinfected properly and regularly with an approved disinfectant.
- Any pools of water in the chicken run or compound should be removed.
- The feed should be free from fecal material from any animal.
- The feed should be kept in a clean, dry store free from rodents and insect pests.
- Keep house young chicks with their mother, away from other adults.

- Use of disinfectants to decontaminate materials and equipment that has gone to the market before it is re used at the farm;

4.2 Learning Outcome 2	Prevent and control the occurrence and spread of diseases involving poultry
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You need to be aware of the risks of diseases. You also need to know what to avoid and how you can improve your practices so that chances of bringing diseases into your flocks and/or to your neighbors is reduced. This would include:

- Identify and make all the necessary care and precautions to protect and control transmission of diseases from poultry animals to humans.
- Provide protective fence around poultry farm and prevent entrance and spread of diseases arising from contagious diseases carried on the skin and feces of wild birds or other animals entered in to poultry farm.
- Isolate a bird when it is ill in a separate house built for this purpose.
- Avoid disease risks arising from rotten feeding chickens; moldy, wet and bad smelling feeds (contaminated by fecal matter containing disease agents).
- Prevent water pollution and protect the spread of water borne diseases.
- Feeders and drinkers should always be kept clean and make sure wild birds or other animals use the equipment to prevent spread of diseases.
- Sick animals should be culled in the absence of diagnosis or medication.
- It is recommended that you should not buy animals at the live bird market or from uncontrolled/ unknown sources, especially during outbreaks of diseases. If possible you should only buy from controlled or known sources.

- Before introducing new birds bought from live bird markets, or individuals, they must be kept isolated or in quarantine for three weeks in separate cage to make sure that they are free from any diseases.
- Provide with medical treatment immediately and cure sick birds or cull/kill the sick bird, provided that there is no diagnosis or medication to prevent spread of disease.
- If a bird dies from poultry disease, or parts from dead birds, it should be burned or buried deep (about 1 m) to avoid and prevent dogs and other animals dig out and spread the disease.

#### **Transmission of Diseases from Animals to Humans**

Animal to human transmission of diseases is currently believed to occur when there is very close contact between persons and the poultry source. In particular the following persons are at risk of animal to human transmission of diseases:

- Poultry-men/women who spend at least 2 to 3 continuous hours in the poultry house giving food and water or maneuvering litter.
- Any persons travelling in the same vehicle that might be carrying infected birds inside the vehicle or in any of its carriage compartments.
- Buyers and sellers of live birds, especially when the premises are enclosed and there is accumulation of aerosols in an enclosed environment.
- Workers in the chicken abattoirs whether they use dry or wet de-feathering methods.
- Persons who may sleep in the same house with an infected chicken.
- Persons working full time in a chicken meat processing plant and handling raw chickens for a prolonged period of time.
- Any person who may be at a dry de-feathering slaughtering process and is reached by the aerosols generated from the sick birds being slaughtered.



- Any persons who may dispose slaughter waste, offal's or litter from infected premises
- Any person who may consume raw infected chicken, offal meats or undercooked meat, infected raw eggs and or products made from raw infected eggs.

### Self-Assessment Questions

Self-Assessment Question 1	Explain in detail the methods and practices used to prevent animal to human transmission of diseases.
Self-Assessment Question 2	Write the main practices that should be included under poultry and local environment hygiene.
Self-Assessment Question 3	If a bird dies of disease, it or parts of it should be burned or buried. Why? Explain the advantage.

<b>4.3 Learning Outcome 3:</b>	<b>Properly handling and managing poultry by products and protect environmental pollution</b>
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Houses are sometimes open and infections may be transmitted by the medium of wind to the flocks from other birds. Feed and water can also be contaminated. Movement of personnel close to the flock houses is often not restricted and you may use home clothes and shoes while in the poultry houses. Movement between farms is usually not restricted and neighbors visit one another even during disease. There are no footbaths in most farms, poultry manure and slaughter waste are most often disposed within the farm area and at times the manure is used as fertilizer without composting. Feeding and water equipment and empty feed bags are also disposed inside and around poultry, living rooms and on the field. All these pose disease risk and environmental pollution if they are not decontaminated or handled properly. Due to the above listed risk factors the environment is in danger of being polluted.

Poultry litter is defined as bedding material, such as wood shavings, sawdust, or straw, spread on young chickens and broiler house floors. After being used, litter consists mostly of poultry manure, along with the

original bedding, feathers, and spilled feed. The manure contains nutrients, including nitrogen (N), phosphorus (P), potassium (K), and calcium (Ca) that can be used to fertilize cropland. Excessive applications of nutrients, however, can create environmental risks to water and air resources. Litter management, therefore, becomes an important issue.

**The following very important issues related to biosecurity and environmental pollution should be addressed:**

- Do not dispose poultry manure and slaughter waste within the farm area and poultry manure should not be used or sold out to be used by neighbors as fertilizer without composting.
- Disposal of litter in the farm and selling litter to neighbors or too far off farmers creates biosecurity risks (spread of disease) and environmental pollutions. Therefore, poultry litter should be composted before disposal.
- Prepare suitable place, collect poultry by products, litter, chickens faeces and other cleaned out materials, make compost that can be used as fertilizers for crop lands.
- Identifying clean and dirty processes in the farm, sales and slaughtering processes so as to avoid contaminating clean areas.
- Different species of poultry, for example hens, turkeys, pigeons, ducks, and guinea fowls should be kept separate. You (with small scale poultry) should not keep other species other than the commercial chickens.
- Dead birds should be handled with great caution; i.e. wrapped in a plastic bag using plastic gloves or another plastic bag to keep the hands in.
- The feed gunny bags used to pack the feeds should not be recycled, and if this is done then they should be thoroughly cleaned and decontaminated.
- For commercial flocks in small scale confined systems, it is recommended that the protocols and procedures in the hatcheries are monitored regularly to ensure that healthy day-old chicks are supplied.

- The feed miller must be requested to provide a list of ingredients in their feeds and for a certificate of guarantee. For feed mills a biosecurity plan should be in place.
- Restrict human movement; provide footbaths or disinfectant dip at the entrance of the flock houses and poultry compound.
- Avoid reuse of egg trays and other equipment's brought back from poultry market without proper disinfection
- Take all the necessary precautions during transportation of live chickens to and from poultry farm. Chickens transported live on top of buses, in open pickups or on bicycles, with the risk of sick birds shedding disease agents along the transport route to the cities or the municipal chicken markets.
- To reduce the risk of disease transmission among or between birds and humans do not mix chickens bought in the market or other villages with the household flocks
- Avoid wearing of home clothes in the poultry house, not wearing gum boots and not wearing head covers as this leads to potential entry of disease in the flocks/farms.

### 5. Module Assessment Questions

Module 9	Module Assessment Questions
Question 1	How could poultry production cause pollution on environment?
Question 2	Explain the main reasons and benefits of careful handling and management of poultry by-products.
Question 3	Poultry manure contains nutrients that can be used to fertilize cropland. List the nutrients.
Question 4	List the methods used to prevent and control introduction and spread of diseases to and from poultry.
Question 5	Which groups of peoples or persons are highly at risk for animal to human transmission of diseases?
Question 6	Identify and list names of chemicals and disinfectants that can be used to clean tools, equipment and poultry houses.



## 6. Practical Assignment Steps and Procedures

Module 9	Details of Practical Work
<p><b>Practical exercise 1:</b> Let the participants make groups (each not more than five). Each group has to attend a poultry farm or related farming business firms and practically performs the activities indicated in the next column.</p>	<ul style="list-style-type: none"> <li>☞ Keep your personal hygiene before entering poultry farm.</li> <li>☞ Make sure that all the required tools, equipment and chemicals used for kipping hygiene and sanitation of poultry farm are available and properly used.</li> <li>☞ Assess hygiene and sanitation condition of the farm and perform the required activities.</li> <li>☞ Asses the possible effects of poultry by-products are managed and do not pose adverse effect on environment like pollution of water and physical environment and transmission of diseases from poultry to human/animals; undertake the activities based on the gaps identified.</li> <li>☞ Make sure poultry by products are properly handled and used for farming and other purposes.</li> <li>☞ Asses that feeders and drinkers are kept clean and make sure wild birds or other animals don't have access to them; identify and perform the remaining activities.</li> <li>☞ Prepare and present written report of your assessment result and works and corrective measures taken.</li> </ul>

## MODULE TEN: HANDLE, MANAGE, SUPPLY AND UNDERTAKE MARKETING ACTIVITIES FOR POULTRY PRODUCTS

### 1. Module Description

This Module deals with the knowledge skill and proper attitude required to handle, manage and supply poultry products to market. It also highlights appropriate equipment needed for poultry and the importance of market assessment.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Properly handle and manage poultry productions.
- Undertake market assessment on poultry productions.
- Decide on profit, fix prices and sale poultry products.

### 3. Learning Methods and Assessment Criteria

- Read and realize learning points given *Under Learning Outcome 1*.
- Answer all questions given under *Theoretical/Written Exams*.
- Submit your work to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read and points given under *Learning Outcome 1* and answer all questions given under *Self-Assessment and Written exams*.
- Next proceed to practical *Exercise Number 1* and undertake the entire activities as directed.
- Continue and carry out all the assignments, exams and practical activities given under each learning outcomes in the same manner

### 4. Module Contents

The objective of effective marketing is the same as the overall objective of any business – to decrease cost and increase profits. To get lower-cost, higher-quality chickens to the market and to reap the greatest reward, you must be “easy to buy from”. You must make it less costly and more convenient for your customers to purchase your products; you must be

able to reliably deliver products on time and at the specified quality and quantity.

Trade organizations do not exist for free-range farmers; however, middlemen do travel around to villages to buy indigenous birds for sale along the major highways or in the nearby bigger cities. Otherwise, local chickens are often mainly used for home consumption.

Small scale confined production often find the markets for eggs and broilers. Eggs are sold at the farm gate and then at the local markets and also to targeted restaurants, institutions and grocery shops where the you make contracts.

The main purpose and objective of poultry farm activity is to produce and sell birds or eggs. Therefore, it is important to know the local markets situation, that is, whether and where it is possible to sell the products. Eggs should be collected and marketed as quickly as possible to the consumers while fresh. For selling poultry products, they should be collected properly, handled and kept in a safe place to keep their quality by using appropriate tools and equipment and storage condition.

Marketing is the study of consumers (and their purchasing tendencies) and competitors.. The purpose of the study is also to understand the markets.

4.1	Learning Outcome 1:	Appropriate handling and management of poultry productions
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Supply poultry products to the market as per the requirement of the consumer. Poultry products from the date of production up to the market chain should be properly handled, stored and transported to the consumers without loss of quality or any damage.

- To protect eggs from being broken and get dirty, you should collect eggs from the nesting boxes at least once, but rather two times a day.
- Store eggs in a dark and cool place packed in boxes, egg trays, basket filled by wood shavings or straw or any other suitable package.



- Eggs should normally not be cleaned, but kept clean in the nests. If they are dirty, clean the eggs with a clean, dry sponge or cloth, and sell the eggs immediately. Cleaning eggs with water may disturb the natural protection of the shell and introduce infections into the egg.
- Chickens for sale should be carried and transported from farm to the market in clean chicken containers or locally made boxes which will allow entry and circulation of sufficient air, and also to protect them from sun heat and cold temperature.



### Equipment for handling and keeping poultry products

Boxes or egg trees which will allow entry and circulation of sufficient air should be available for collection and storage of eggs. Egg collection and storage box can be made from local fibers, cardboard, or wooden boxes by placing wood sheaving or other suitable hay or straw.

To protect birds from damage caused during transportation Chickens for sale or chickens purchased for poultry production purpose should be carried in clean chicken containers or locally made boxes which will allow entry and circulation of sufficient air and also protect chickens from sun heat and cold temperature.

### Egg Handling and storage situation

Fertile eggs selected for incubation should be cooled gradually; not be cooled very slowly or very fast. The temperature of eggs after 6 hours of production should be around 270 degree centigrade. Produced eggs should be collected and packed using appropriate equipment or boxes, egg trays, or any other suitable package made from local materials for example baskets filled by wood shavings or a pot filled by teff can be used.

**Storage temperature:** The temperature at which eggs should be stored depends on the time of storage. For eggs kept in the storage less than 4 days storage temperature from (18-240) degree centigrade is suitable temperature. For keeping eggs in the storage from 4-7 days

storage temperature should be reduced to (12-17) degree centigrade. For keeping eggs for more than 7 days storage temperature from (10-12) degree centigrade is suitable temperature.

**Storage moisture temperature:** Suitable moisture content of egg storage rooms is from 75-80%; this moisture content gives good hatchability of eggs

**Egg ventilation:** Eggs not selected for incubation should be used within 3-4 days; these eggs should be ventilated on daily bases.

**Turning eggs:** Eggs not selected for incubation if used within 3-4 days; these eggs should be switched (change positions) on daily bases.

### Self Assessment Questions

Self-Assessment Question 1	Explain egg management activities from date of production until supplied to the market required to keep the quality.
Self-Assessment Question 2	How could you protect poultry chickens from being damaged or injured during transportation and supplied to the market?

#### 4.2 Learning Outcome 2: Conduct market assessment on poultry production

Poultry products such as egg and poultry meat are the highly valued diets of Ethiopians. The demand for egg and poultry meat in our country shows variability; the demand increases sharply especially during religious festivals and holidays like Easter, Christmas and Eid Alfeter. Therefore it is important to know the local market situation very well through detailed market studies to identify pick demand seasons, adjust the production and supply timing to exploit the available market with good price.

To gain good profit from poultry business your primary focus should be to identify pick demand seasons, adjust the production timing and supply poultry products accordingly.

**NOTE:** Keeping poultry products in the farm for long time with the intention of gaining good price has its own drawbacks like high feed consumption, loss of quality, disease prevalence and deaths. Therefore thorough analysis of the situation is essential to avoid the risks.

**Helpful points during marketing poultry product**

- Sell broilers as soon as they reach big enough to be sold at the market.
- Cockerels should be sold as soon as they can fetch a good price
- Supply and sell eggs collected for market within 3 to 4 days while they are fresh.
- Excess cockerels should be sold when they reach marketable size and as soon as they can fetch a good price.
- Old hens that are no longer laying eggs should also be sold. Keeping these birds means more consumption of feed.
- During transport and at the market keep chickens under shade and provide enough feed and water to avoid physical harm and death.

**Identify main stockholders engaged in the production and marketing poultry products**

You should also identify main stockholders engaged in the production and marketing of poultry products; this will help you to identify the demand, the market centre, consumers' needs, level of competition, and the time and quantity to be supplied, among others.

**Main stockholders engaged in the production and marketing of poultry production are:**

- Smallholder farmers (backyard production).
- Small scale traders (purchasing and selling poultry products from farmers at the farm gate and supply to urban area.
- Hotels, cafeterias and other trade and business or public institutions.
- Small or large scale poultry producers or farming enterprises.



In line to this therefore, you have to identify and clearly know those stockholders supporting your poultry production. This means the major competitors, consumers, traders, and the price they offer, consumers' needs in terms of quality type, color and quality of product.

4.3 Learning outcome 3	Decides on profit fix prices and sell poultry products
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### Marketing poultry products

A well-managed production plan means selling birds at the time of the highest price, and buying feeds, new hens or inputs (such as baskets, feeders, and drinkers) at the time of the lowest price. For many poultry, this means keeping the birds in the flock until the time of festivals (like Eid festival, Christmas, Easter, or national holidays), where they may get a price often two or three times the normal price. However, it is important to stress that keeping birds in the flock means more feed and a higher risk in terms of losing birds because of predators, diseases, or theft. In general birds should be sold no later than at the age of maturity, i.e. 22-32 weeks of age.

- Time your production to coincide with seasons of higher demand (and price).
- Know the growth period and stocks accordingly, if necessary do extra feeding to speed up growth.
- To avoid likely over production by other farmers, negotiate a contract with a reputable buyer for that planned time.
- Sell broilers as soon as they reach big enough to be sold at the market.
- Supply and sell eggs collected for market within 3 to 4 days while they are fresh.
- Excess cockerels should be sold when they reach marketable size and as soon as they can fetch a good price.
- Old hens that are no longer laying eggs should also be sold. Keeping these birds means more feed.

- During transport and at the market, keep chickens under shade and provide enough feed and water to avoid physical damage and death.

#### Decide on profit and fix selling price

Study well the local egg and poultry meat market situation through detailed market studies and get reasonable and adequate answer for the following questions:

- Identify and locate poultry market and place (location) to be supplied.
- Identify the main local traders in the local poultry market.
- Identify the main suppliers of poultry products to the market (from rural, pure-urban or urban areas).
- Identify the price of poultry products (egg and live birds or meat).
- Identify the main consumers; mainly those consumers buying poultry products in large quantity on continues bases like universities, hospitals, hotels, cafeterias, restaurants and other government and private institutions and interring in to contract agreement with this institutions.
- Identify Places (location) to be supplied, consumers' needs, and competition, need of the consumers and time and quantity needed by each stockholder. Farmers may have arranged contracts with their main stockholders and supply there products dependably irrespective of the ups and downs of market price due to supply and demand fluctuations.
- Advertise your products: Use all means of advertising to promote your poultry productions, some of the methods of promotions are through written pamphlets, posters. Invite your main consumers to your poultry farm and let them know the quality quantity and dependability of your products so that they can be attracted to your products. Promotion must come from word of mouth (reputation) or advertising.



- Finally on the basis of the costs of the production, you should calculate the minimum price at which you can afford to sell poultry or eggs. Either alone or as a cooperative society, you ought to study the market and discuss prices with local chicken vendors. For this purpose see the main points listed below:
  - How much is my income in relation to my expenses?
  - How much should be fair profit margin in%?
  - Based on the market assessment at what price do others sell their product?
  - At what price can I afford to sell poultry or eggs?

**Organizations engaged in supporting small scale poultry productions are listed below:**

- Agricultural development office: Regional offices plus offices at zone, district or woreda levels provide the following supports.
  - Veterinary or health services for poultry and other animals including supply of medicines.
  - Professional support services. Agricultural development offices at all level have qualified professional staffs ready to support and provide professional or technical support to people engaged or have interest in working or investing in the sector. In addition they can supply inputs like improved poultry breeds and others.
- Farmers' association development office support individuals who like to organize themselves and form an association such as micro business associations. To produce and supply products. .
- Small Scale Business Development Office supports small scale agricultural producer's especial provision of loans (financial support).



- Non-governmental organizations engaged in rural development activities providing different supports, such as:
  - Market development.
  - Useful inputs.
  - Professional advice.
- Governmental or non-governmental institutions working in the provision of loans, credit and saving support services.
- Market development organization provides up to date market information for selling products or supplying inputs.

### Self-Assessment Questions

Self-Assessment Question 1	Explain eggs marketing situation in your locality.
Self-Assessment Question 2	What is the importance of identifying main stockholders engaged in marketing poultry productions?
Self-Assessment Question 3	Identify main stockholders engaged in marketing poultry productions in your locality.

### 5. Module Assessment Questions

Module 10	Module Assessment Questions
Question 1	Write in detail the advantages of knowing poultry production management and marketing activities?
Question 2	What is the importance and advantages of identifying main stockholders engaged in marketing poultry productions?
Question 3	Explain the relation between identification of the local poultry markets situation with poultry production and profitability.
Question 4	List the types of data needed to decide on profit and fix prices of poultry products.
Question 5	Explain in detail the production and supply timing, growth level and storage time to sell a) Broilers and b) Eggs for sell the two types.

6. Practical Assignment Steps and Procedures

Module 10	Details of Practical Work
<p><b>Practical Exercise</b></p> <p><i>Divide the trainees in groups and let them do the following:</i></p> <ol style="list-style-type: none"> <li>1. <i>Prepare suitable data collection formats for practical works.</i></li> <li>2. <i>Identify main stockholders engaged in marketing poultry productions.</i></li> <li>3. <i>Conduct assessment or detailed studies on the local poultry products markets situation.</i></li> <li>4. <i>Write and present detailed assessment report.</i></li> </ol>	<p>Prepare suitable data collection and assessment formats for practical works</p> <p>Identify main stockholders engaged in marketing poultry productions</p> <p>Conduct assessment or detailed studies on the local poultry product market situation very well</p> <p>Study and identify the maximum distance you can safely supply your productions (from your poultry farm)</p> <p>Within your supply range identify the main consumers of poultry products like local restaurants, institutions and grocery, shops, etc.</p> <p>Identify and study the demand, place (location) to be supplied, consumers' needs or preference, timing and quantity needed by each consumers and other relevant local situation should also be studied</p> <p>Properly analyze data and information collected during practical assessment;</p> <p>Write and submit the study report about your findings.</p>

## MODULE ELEVEN: RECORD, ORGANIZE AND KEEP POULTRY DATA

### 1. Module Description

This Module looks into the knowledge, skill and right attitude required to record and organize different poultry data's. The competency includes identifying the importance and benefit of recording and documenting data, keeping records and organizing data related to poultry production feed consumption and feed stocked. It also discusses recording, calculating income/expenses, and production on daily bases.

### 2. Learning Outcomes

At the end of the module the trainers will be able to:

- Recognize the importance and benefit of recording and documenting data.
- Record/ register and document regularly poultry data.
- Keep records and organize data's related to poultry production, feed supply and consumption.
- Record revenue and expenditures.
- Record poultry health data.

### 3. Learning Methods and Assessment Criteria

- Read and realize learning points given *Under Learning Outcome1*.
- Answer all questions given under *Theoretical/Written Exams*.
- Submit your assignment to your trainer for evaluation.
- If the evaluation done by your trainer is satisfactory, proceed to the next module; otherwise please read the notes given under *Learning Outcome 1* and answer all questions given under *Self-Assessment and Written Exams*.
- Next proceed to practical *exercise number 1* and undertake the entire activities as directed.
- Continue and carry out all the assignments, exams and practical activities given under each learning outcomes in the same manner.



#### 4. Module Contents

Any business person must keep records in order to know the expenses and income. The difference between expenses and income informs you what you have gained or incurred loss. You must learn from past successes and mistakes if you are to grow your business. You cannot go further unless you keep accurate records.

It is very important to spend some time each day observing the flock carefully and record your observations. In this way for example early signs of disease, malnutrition, or other problems may be discovered, and the necessary precautions taken.

This module is a brief description of main data's commonly registered in small scale production systems. It is expected that at the end of the module, trainees will have good knowledge of recording and managing most important poultry data's. Basic poultry data recording sample formats are given at the end of the module, this formats can be revised to feat the actual situation.

4.1 Learning Outcome 1	Recognize the importance and benefit of recording and documenting data
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##### Objectives of kipping records

Main objective of keeping and organizing accurate records of poultry farm is to track poultry activity, identify/know successes and problems at an early stage and take all necessary precautions. Therefore accurately recording of data will inform you about how to run your planned business.

Accurately recording poultry data has the following advantages:

- To run well managed and profitable poultry farm.
- To avoid poultry management systems that does not work well
- To select and breed improved and high yield verity chickens.
- Adapt and prepare improved poultry plan and program.
- For planning poultry feeding and health control.

- Help full to plan outflows (payments) and in flows (receipts).

Main data recorded includes:

- Poultry feed records.
- Purchased growers, hens or cocks including price and cost incurred.
- Income gained from sale of eggs and live birds.
- Egg production, broilers weight, weight increment and feed consumption.
- Poultry health and other necessary poultry records.

4.2 Learning Outcome 2	Types of poultry data recorded and documented regularly
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You need to keep records of your poultry. This will make it easy for you to know the successes and failures of production at an early stage and make corrections accordingly.

#### **Advantage of record keeping**

To manage a poultry production enterprise, you must keep detailed records on a daily or weekly basis. Accurate records are essential tools to identify/know economic feasibility, poultry profitability at an early stage and take alternate solutions to improving poultry management.

#### **Types of data registered regularly**

- Poultry Health status records.
- Records of purchased chickens (growers, hens or cocks).
- Daily eggs and live birds sales records.
- Daily records on broilers weight, egg production and feed consumption.
- Sales and income records.
- Poultry production/management records.
- Feed supply and consumption records.
- Records of equipment, tools and other consumable Items.

All the above listed data and information should be accurately recorded, well organized and handled carefully. Sample data and poultry information recording formats/tables are given at the end of the module.

### Self-Assessment Questions

Self-Assessment Question 1	Write in detail the objectives and benefits of recording and kipping poultry data.
Self-Assessment Question 2	What are the main types of data a poultry farm should record on regular bases?

4.3	<b>Learning Outcome 3</b>	<b>Keep records and organize data related to poultry production feed supply and consumption</b>
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#### 1. Poultry production records

The main purpose and objective of poultry farm activity is to produce and sell birds and/or eggs through improved management to secure efficiency and profitability. Therefore keeping detailed records of income and expenses on a daily or weekly basis are essential tools to identify/know poultry profitability or problems and take all necessary improvement.

#### Main data recorded in poultry production ledger

- Poultry egg production data registered on daily bases noting number of eggs laid, weight, egg consumed/broken number of chickens, those that do not lay eggs and other related data.
- Fertile eggs under incubation, date incubation started and development stage.
- Number of chicks hatched, date hatched, weight, daily growth and other related data.



- Layer chickens growth status, number, weight, daily growth status and other related data.
- Broiler chickens growth status, number, weight and other related data.

For properly recording and keeping the above listed poultry data, please recognize the tables prepared for recording purpose. Recording formats are attached at the end of this manual which includes the following Tables.

1. Table 7: Poultry farm chicks' development data recording format.
2. Table 8: Poultry farm broilers daily information recording format.
3. Table 9: Poultry farm layer daily information recording format.

## 2. Feed supply and consumption records

Feed is the biggest input cost for smallholder farmer or any commercial production (with 60-80% of total costs). Supplying balanced feed and properly feeding chickens are the main task of any poultry farm. Therefore, carefully recording and keeping in detail data related to feed supply, expenditure (price) and feed consumption per day for all varieties and ages is essential tool to analyses and identify feasibility, profit gained and challenges to improving management.

- Feed or feed ingredients supplied and stock balance should be registered carefully, noting quantity, type of feed, price and date of purchase.
- Feed/feed ingredients consumed including feeding methods should be registered on daily, monthly and annual bases, noting type of feed, quantity, price and date for each flock, breed or age group.

For properly recording feed supply and consumption please refer the format *Table 10: Poultry Farm feed data recording format*

attached at the end of this manual. Discuss with your trainer and learn on how to fill the formats.

<b>4.4 Learning Outcome 4</b>	<b>Record Revenue and Expenditures</b>
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Develop ledger and record all the income gained from sales on daily bases are very crucial information which will enable you to compare income with expenses and see whether the farm is profitable or not. Therefore this basic poultry data should be registered and kept carefully.

**Items included in expense ledgers**

Expense or cost is all the money you pay in relation to the poultry, that is:

- All expenditures for purchase and supply of feed or feed ingredients registered, noting quantity, feed type, price and date of purchase.
- Detailed records of all the expenses which are for buying feeders, drinkers and other equipment's registered noting quantity, type, capacity, price and date of purchase.
- Detailed records of the cost incurred for running and managing activity of poultry farm including workers salary, professional payment and administration costs.
- Detailed records of all expenses which are for buying vaccines, medicines and costs for treatment of sick chickens registered noting price, date, type and name of diseases, vaccines or medicine etc.,.
- All expenditures for purchase and transportation of different breeds of chickens (growers, hens or cocks and day old chicks) should be registered, noting variety, age, number, price and date of purchase.

**Record items included on income ledger**

The revenue or income is all the money you earn in relation to the poultry, that is:

- The revenue from sale of eggs should be registered, noting, quantity, weight, unit price and date soled and summarized on daily, monthly and annual bases.
- Income from sale of live broilers should be registered carefully, noting verity, age, number, unit weight, unit price, date of sale on daily bases and total income from sale of live broilers summarized on monthly and annual bases.
- Income from sale of live layer should be registered carefully, noting breed, age, number, unit weight, unit price and date of sale on daily bases and total income summarized on monthly and annual bases.
- The revenue from sale of live pullets, growers, chicks, cockerels and other poultry products and by products should be registered carefully, noting verity, age, quantity/number, weight, price and date of sale on daily bases and total income summarized on monthly and annual bases.
- Other income the farmer earns in relation to the poultry (for example income from sale of manure, feed or other products including the value of eggs or poultry eaten or given away) should be recorded.

<b>4.5 Learning Outcome 5</b>	<b>Record poultry health data</b>
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Types of data or information recorded under this category includes poultry health data: types of diseases, affected groups, treatments, medications, vaccinations given, chickens died from diseases, recovered chicks and appropriate health management measures taken. Other health related data's used for tracking diseases frequently interring and affecting poultry farm which is help full to improving health status of poultry animals and also preventing the introduction of new disease pathogens by assessing all possible risks.

**Record items in this category include:**

- Type of diseases, date of occurrence, number of and groups of poultry birds (layers, broilers, chicks, pullets etc.) infected by diseases.



- Treatment and type/name of medicines delivered, number, age and breed of poultry birds treated or medicated, quantity and cost of medicines and treatment etc.,.
- Type of vaccination delivered, number, breed and age of birds vaccinated, quantity and cost of vaccines, date of vaccination, name of vaccinator and all other related data.
- All the above listed poultry health or diseases and treatment data including all necessary information.

Refer and carefully understand recording *Format Table 11: Poultry Farm Vaccination Recording Format* and *Table 12: Poultry Farm Medical Information Recording Format* attached at the end of this manual.

### Self-Assessment Questions

Self-Assessment Question 1	Describe data recorded under poultry production ledger? Why is it important to keep these records?
Self-Assessment Question 2	Describe the main health related data that should be recorded for tracking, preventing and controlling diseases to improving health of poultry animals.
Self-Assessment Question 3	List record items that should be registered under <i>Poultry Income And expense Ledgers</i> ?

### 3. Module Assessment Questions

Module 11	Assessment Questions
Question 1	To manage a poultry production enterprise, the farmer must keep detailed records of his farm. Why? Describe the main advantages?
Question 2	List the types of data are recorded by small scale improved poultry farmer?
Question 3	List poultry activities or Items which incurs costs and registered under poultry Expense ledger?
Question 4	List the type of data's registered under poultry health situation records.

4. Practical Assignment Steps and Procedures

Module 11	Details of Practical Works
<p><b>Practical Exercise 1:</b>                      Divide the trainees into small groups.                      Let each group identify and attend poultry farm/ similar enterprise and perform data recording and evaluation activities detailed in the next column.                      Each group should present and discuss their assignment in class.</p>	<p>Identify types of data to be recorded based on the type of activities executed by the poultry owners/organization                      Prepare suitable recording format (feed, production, income and expense) for each data identified above.                      Record data on recording format                      Calculate feed consumption, production, income and expenses on daily and weekly bases.                      Prepare and submit your practical work out put report to your trainer for evaluation.</p>







Table 09: \_\_\_\_\_ Poultry Farm Layers Daily recording format

House number \_\_\_\_\_ Variety \_\_\_\_\_ production starting

Date \_\_\_\_\_ Month \_\_\_\_\_

Date	Eggs collected (number)				Daily sum	Broken eggs (number)	Average weight of Egg	Layer in number			Comment
	1	2	3	4				Dead birds	Shifted to others	Existing	
1											
2											
3											
4											
5											
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