CHICKEN KEEPING AND MANAGEMENT

A Self Reliant Learning Course

Training at Pwani University Farm

Acknowledgements

Course Team

This course was drafted workshops at Pwani University, Kenya in September 2018 The participants were Choice Humanitarian Kenya farmer groups who worked with William Loughmiller and Geoffrey Kashindi to test the rapid course development model. This was after William recommended training as a very important component of empowering homesteads that were to be assisted with chicken packages as a business Subsequent work was done on the materials by the team leader. This resource material is available in two e-versions: Broiler chicken for meat and layer chicken for egg production. This manual is therefore a trainer's guide for both types of chickens

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Course Overview

Introduction

Welcome to our course on Chicken Production. Keeping chickens is one of the most popular forms of businesses among small-scale farmers. This is because rearing chickens as a business requires little capital and chickens are easy to rear and easy to manage due to the different types. Chicken Production thus provides farmers with a great opportunity to start an income generating activity. The aim of this course is to provide you with all the knowledge and skills you need to raise chickens for meat and eggs and manage a small-scale commercial chicken business. This course was designed to be taken in conjunction with a basic small business course. This Chicken Keeping and Management course focuses mainly on chicken husbandry principals and strategies necessary to successfully raise chickens. We recommend participants first take a basic small business course focusing on business principals and strategies needed to successfully start and run a small business. Combining both together, the participant will be successful in starting a small-scale commercial chicken enterprise. There are many types of chicken but in this course, we shall concentrate on layers and broilers. We will start by looking at the economics of production so the participant can make an informed decision about which type of chicken business they wish to start. Then we shall discuss the various essential aspects of chicken farming such as housing, breeds of chickens, brooding, feed management, health management, and marketing your chicken production.

Course Objectives

By the end of this course, you should be able to:

- Explain the economic importance of chicken farming
- Determine the best housing design for your chicken project
- Identify a suitable breed for your chicken project
- Determine the best chicken management system to use for your project
- Choose the correct feed rations based on the nutrient requirements of your chickens
- Implement routine chicken management practices such as, brooding chicks, feeding, basic chicken hygiene, vaccinations, pasting and detoeing etc.
- Identify chicken diseases and the necessary control measures
- Prepare your chicken products for the market
- Keep records all your activities to help you manage your flock.

Course Content

This course is divided into the following 9 units:

- Unit 1: Introduction to Chicken Keeping
- Unit 2: Chicken Housing
- Unit 3: Breeds of Chicken
- Unit 4: Chicken management systems
- Unit 5: Feed management
- Unit 6: Routine chicken management practices
- Unit 7: Health management
- Unit 8: Record Keeping

To help you acquire practical skills, you will be expected to attend these chicken management classes, all demonstration seminars and the *Starting My Business* self-reliance class. The entire combined course will take 8-10 weeks to complete, during which time you will build your first chicken coop, receive basic chicken supplies and begin raising 15-35 birds, depending on your desires.

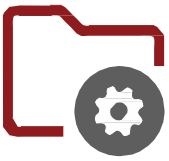
Icons Used in the Units

In the margin of these units, you will find the following icons which tell you what to do:

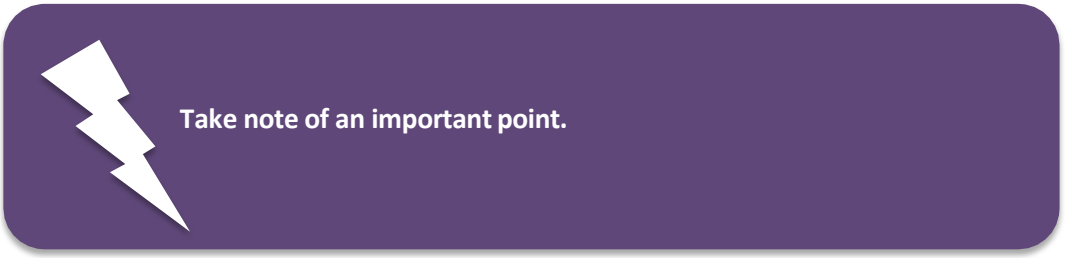
Read the objectives of the unit.

Key Terms and Definitions

Complete the Activity. Activities help you to process and apply what you are learning.



Read the summary of what you have covered in the unit.



Key Resources for Your Success

Throughout this training, you will learn many concepts, principals and practices that will likely be new and challenging. When you complete this course, you are not expected to "know everything" about chicken farming nor be an expert. You are learning. You will need help!. You will benefit greatly by seeking help and advice from others with more experience. Below create your own contact list of trusted advisors who you can call for advice and help.

Resource	Name	Contact Information
My local Chicken mentor		
My SMB mentor		
My local Veterinarian		
My Certified Chick supplier		
My Certified Feed Supplier		
University Ag Extension Hot Line		

Unit 1
Introduction to Chicken Production

Welcome to the first unit in our course on chicken farming. In this unit you will learn about the advantages and disadvantages of chicken farming, the economics of chicken keeping and what motivates farmers to keep chickens. We shall also give you a summary of the cost of chicken production to help you assess if the business is profitable.

Let us start by reviewing our objectives for this unit.

Unit Objectives

By the end of this unit you should be able to:

- Explain the advantages and disadvantages of chicken keeping.
- Assess the viability of your chicken business.

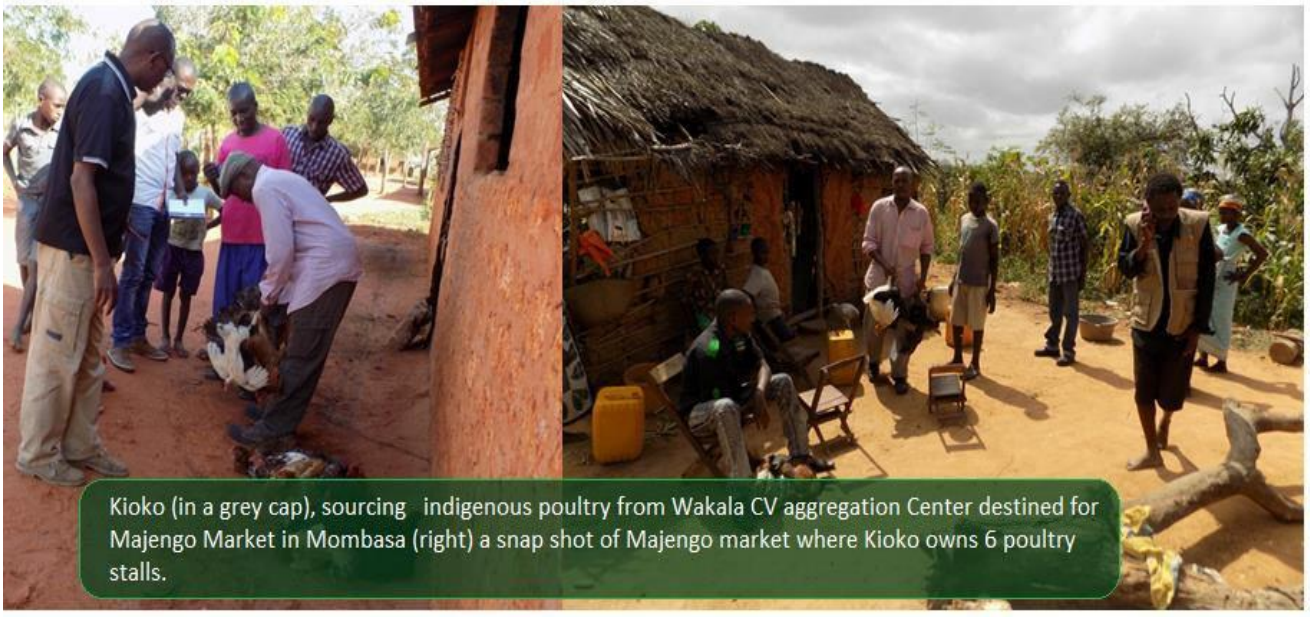
Section 1.1: Advantages and Disadvantages of raising Chickens

As you well know, chickens are kept in many rural and semi-urban homes in Kenya either for domestic or commercial purposes. In this section we shall discuss the advantages and disadvantages of chicken keeping.

Small-scale chicken farming is one of the fastest growing Small Medium Enterprise (SME sectors in Africa. It is estimated that approximately 1 in 4 households are engaged in some form of chicken production. Furthermore, stringent bio-security measures have ensured the country remains free of the world's worst avian diseases. Kenya's relative disease-free and favorable climate are the cornerstones of the chicken industry's success. As a healthy and cheap source of protein, demand for chicken meat continues to grow steadily. Consumer preferences for chicken will continue to be driven by rising incomes and population growth. Furthermore, well managed birds can be ready for sale at 6-8 weeks of age. This short production cycle can generate quick returns for broiler farmers though it is a longer time investment for egg producers

Advantages of Chicken Keeping

What are the advantages of chicken keeping? Think about it for a minute and then complete the following activity.



Kioko (in a grey cap), sourcing indigenous poultry from Wakala CV aggregation Center destined for Majengo Market in Mombasa (right) a snap shot of Majengo market where Kioko owns 6 poultry stalls.

Chicken rearing is the most affordable enterprise for resource poor households in Africa and other Low Developed Countries on the globe.It is the most impactful intervention for lifting communities economically. However, the enterprises are not organized and lack knowledge, skills andcapacities to access markets and are exploited by middlemen as shown in the caption above in Mombasa, Kenya.This manual is to improve the value chain byorganizing it to markets.

Activity 1.1

Advantages of Poultry Keeping (*Time: 5 mins)*
Write down at least 3 advantages of poultry keeping?

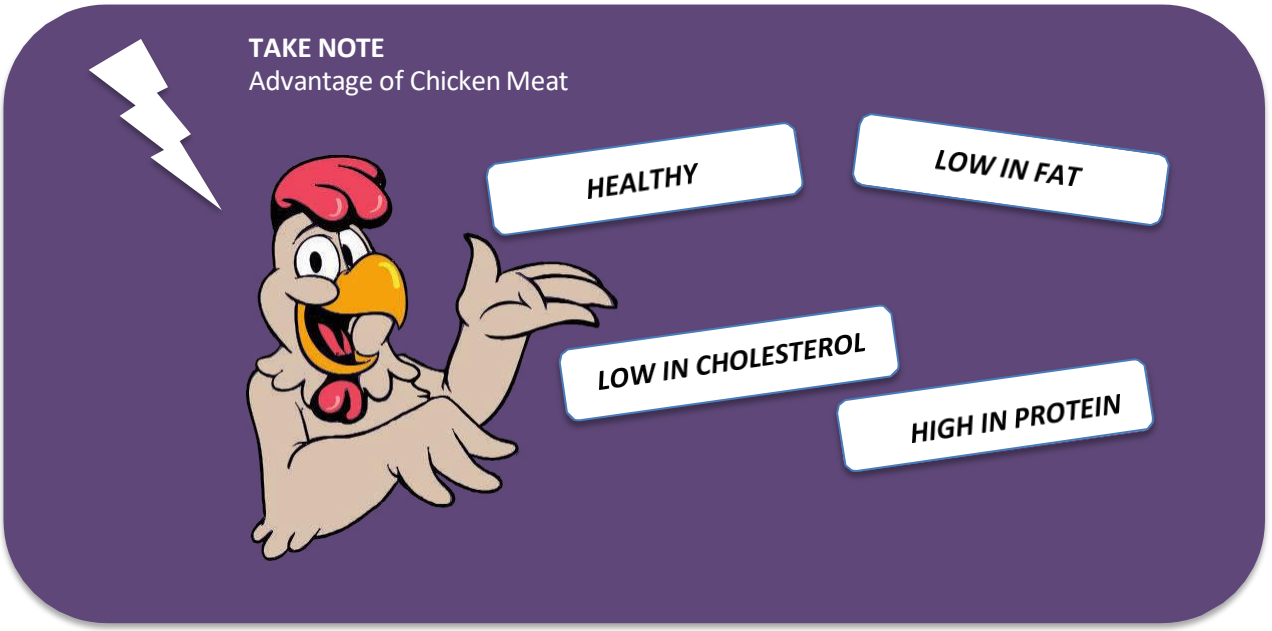
1._

2._

3_

Your list probably included the following advantages of chicken keeping:

- Chickens can be reared in a small space
- The materials needed to start a chicken business are readily available
- Chickens can be reared throughout the year
- A "short" time to see a return on investment
- Many people prefer to eat chicken compared to other sources of protein
- Chicken feed on by-products such as, maize germ, maize bran, sunflower seed cake, wheat bran and wheat pollard
- The market for chicken meat is broad and lucrative
- Growing customer base does not require much advertisement
- Chicken meat is perceived a healthy, low fat and low in cholesterol



You now know the advantages of chicken keeping; let us look at the disadvantages.

Disadvantages of Chicken Keeping

The disadvantages of chickens are not many and include the following:

- Raising chickens is time consuming and hard work.
- Some chicken diseases can affect humans e.g Avian Flu
- Chicken can die of preventable diseases like New Castle, Gumboro, Fowl Typhoid, Cholera and Cholera Pox
- If not well protected, chicken can be eaten by a host of predators, like mongoose, eagles, cats and snakes

Section 1.2 KEY factors for successfully raising chickens

The following are the essential, non-negotiable factors for successfully raising chickens. Without commitment to following these essential factors, you cannot complete this course or receive your birds.

1. You must have a completely SECURE ENCLOSED PEN. That means NO foreign birds or animals of any kind can enter. Why? Most chicken diseases come from outside carriers. It is very difficult to keep chickens healthy when they run "free range" or are in contact with ANY foreign birds or animals. In this manual, you will receive instructions on the correct size and how to construct your fully enclosed coop.

2. You must must choose to raise the CORRECT BREED of birds. Local breeds are not as efficient and profitable producers of quality meat and eggs. We recommend the improved European Broiler and the Improved Dual-Purpose Layer.

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2. You must must choose to raise the CORRECT BREED of birds. Local breeds are not as efficient and profitable producers of quality meat and eggs. We recommend the improved European Broiler and the Improved Dual-Purpose Layer.

3. Your chickens must be VACCINATED. When you buy chicks, they must come vaccinated. You will be required to give additional doses of vaccine regularly to your birds. This is not difficult. It is normally administered in their water. The section on vaccines will explain what, how and when to vaccinate.

4. You must use CERTIFIED FEED. The quality of the feed is what makes your birds grow and produce more. Low quality feed always results in low quality production (of meat or eggs) and poor business results.

5. You must have a reliable source of CLEAN potable water. Your chickens should never run out of clean drinking water.

6. HARD WORK. Raising chickens is hard work. You should consider involving and training your immediate family.
   - Your chickens must always have access to clean feed and clean water. That's 24 hours a day, 7 days a week. This is the key to their rapid growth and maturity.
   - Pens need to be cleaned daily. This includes turning soiled litter and bird droppings 3 times per day for the first 8 weeks of your chicken farm.
   - For Layers, eggs need to be collected 2 times per day. They should be sold within 3-5 days. The fresher your eggs, the higher the sales price.
   - For broilers, birds should be achieving recommended live weights within 28 days so that by 35 days, the flock is ready to be transported to the buyer. Weekly weights of representative birds will be recorded alongside weekly feed taken.

7. LOCATION: T h e coop should be placed on the property where you live. This should not be outside town. If you don't have a suitable location, please reconsider your decision to raise chickens.

Activity: Discuss ?????

Advantages of Poultry Keeping (*Time: 5 mins)*

Write down at least 3 advantages of poultry keeping?

1.

2.

3.

Section 1.2 Things you should consider BEFORE you jump in?

- Are you READY, DETERMINED, and PHYSICALLY ABLE to commit to the **hard work, the personal growth and change** necessary to successfully run a small business? Running any business is hard and a chicken business is no exception. The "good news" is that you will decide the size and scope of the business you create. You will "Start small and think big.

- Raising Chickens for commercial or home use is very time intensive. You will monitor new chicks 24 hours a day for the first 5 days. Then as they grow, you will monitor them 2-3 times per day and at least 1-2 times during the night to make certain they have ample feed and water. Failure to do so results in lower production yields and poor business results.

- We recommend the serious participant take basic small business training prior to enrolling in this Chicken Management course. As part of that basic business training, you will be taught how to create a simple business plan. You should plan on presenting your business plan to respected advisors or mentors.

- Unless you have access to State or local business grants, you will need to personally finance your chicken business. Your plan will help you determine the materials you need to start. Remember START small first. Create a plan of bare essentials needed to get started. Your plan should detail essential items like animals, feed, and materials needed to build housing. You will be required to produce, buy or borrow some equipment, some materials, etc. Things like shovels, rakes, wheel barrows, thermometers, lights, cords, etc. You will need to contribute KSH _____ of your own money towards the purchase of your materials. Do you have the money? If not, what might you sell to raise the capital?

- Chickens eat more, grow faster and lay more eggs when they have extended daylight hours and ample clean water. That means artificial light in their feeding and laying areas. Do you have access to utilities like electricity for light and sufficient clean water? If not, what are your options and solutions?

- Do you have a place to dispose of chicken waste? Can you and your family deal with the odor and smell?! It will be strong and persistent. And there will be flies!

- How might your neighbors react to the odor and smell? You do not want neighbors raising complaints AFTER you have started a chicken business. Please refer to the PI Manual for Black soldier fly rearing should you find this a sustainable and profitable way of odorless waste management

- How close do you live to potential market places? Access and transportation to local markets is essential for your business success. Please refer to the PI Manual for a simple and safe live bird transportation coop.

Section 1.3 The Objectives for this course:

The Church of Jesus Christ of Latter-Day Saints has agreed to help you learn to commercially raise chickens for two very important reasons:

- **FIRST,** and most important, to help you provide full-time income (if you choose to raise chickens as a full time activity) or supplemental income (if you choose to raise chickens as a part-time business). The Church wants to help YOU help your family become more self reliant.
- **SECOND,** raising chickens can also help supplement your family's diet with highly nutritious eggs or meat.

To accomplish these two objectives, you will need to 1) decide on the type and size of Chicken Business you wish to create and 2) understand the rules about consuming your own egg and meat production.

1. **Type and Size of Chicken Business** - You get to choose the type and size of the Chicken business you wish to create. If you do not know exactly what you want to create, thats OK. It is **always** best to "start small and think big". There are two basic types of chicken businesses you can create.
    a. **Type of business:** You can raise chickens for their meat, called a Broiler Business or you can raise chickens for their eggs, called a Layer Business. You could try to do both, but NOT for this course. That is something you can choose to do in the future. For this class, you will need to choose either Broilers or Layers. The decision of which type of business you wish is a personal and family decision. It is completely your choice.
    b. **Size of the business:** You can choose to create a large commercial farming business for the future, or you can choose to create a smaller cottage business you can run from home while you raise your children or maintian your current employment. A large commercial farming business would raise between 200 -1000 or more birds. A small cottage business would raise only 50-100 birds. A even smaller home based business would raise just 10-20 birds. Each size of business has different demands and meets different objectives as described below:
        - A large commercial farm raising 200-1000 or more birds. This enterprise is a full time 80 hours per week job producing multiple incomes for you and additional family members or friends.
        - A smaller cottage business raising between 50-100 birds. This enterprise could be either a full time or part-time job. It will certainly involve multiple family members or friends and will provide a full time income for one and supplemental income for others in the family.
        - A very small cottage business raising just 10-20 birds. This business seeks primarily to improve your family diet with eggs and protein, as well as generate a small supplemental income from the sale of eggs or meat.

You can choose to create the type and size of business you want in the future. Most of you will say, "right now, today I am really uncertain about what type of business I want or what size of business I want." Thats OK. That is why your here in this class, to learn! The purpose of this class is to help each participant LEARN how to successfully raise chickens and to LEARN what type and size of business they want to build in the future! In this course, no matter what your future goals are, EVERYONE will start small.

Unless you already know that you only want the very small business raising between 10-20 birds, all others will be raising between 35-40 birds. Why? Because it is a "practice" business. Once you "experience" what it is like raising chickens and running your own small business, you will then decide what you will grow and how fast you will grow. It is all up to you!

2. **The rules about consuming your eggs and meat production.** - This purpose of this class is to teach how to raise chickens for a CHICKEN BUSINESS. The eggs and meat produced are to be sold to customers. In this way, you generate the capital (money) needed to replenish your flock, their feed etc., to sustain your business into the future. Eating your production will destroy your business and is not sustainable. The meat and eggs you produce are NOT for you or your family to eat!

   However, not everything produced is suitable for sale. The following provisions are included for consuming your low quality production:

   a. Those raising Layer hens are allowed to consume 6 eggs per week. The eggs consumed should be "seconds", the term used for those eggs that are smaller, mis-shaped, cracked or otherwise considered less than sales-quality or even unsellable.

   b. Those raising Broiler birds are allowed to consume only 1 bird per eight week growing cycle. The bird should be healthy but unsellable due to it's size, weight, deformity, appearance, age, behavior, etc.

   c. IF you want or need to consume more than is allowed, you may do so IF you purchase the production from your business at the full selling price. Sales and Growing records will be checked.

When you complete these two courses, basic small business training and this manual on Chicken Management, you will be on your way towards becoming a real chicken farmer and towards greater self-reliance. Your business will generate the cash you need to replace your birds, their feed, etc. PLUS it will generate the capital needed to grow. But, YOU MUST SAVE the money you earn. If you don't save, you will NOT have the money to sustain your business. With the savings, you can both finance your own growth PLUS use your business and savings track record to borrow money for expansion.

Activity 1.1 ????

Advantages of Poultry Keeping (*Time: 5 mins)*
Write down at least 3 advantages of poultry keeping?

1.

2.

3

Unit 2
Economics of Raising and Selling Chicken's

In this unit you will learn about the advantages and disadvantages of chicken farming, the economics of chicken keeping and what motivates farmers to keep chickens. We shall also give you a summary of the cost of chicken production to help you assess the type and size of the chicken farm you may wish to build.

Let us start by reviewing our objectives for this unit.

Unit Objectives

By the end of this unit you should be able to:

- Explain the advantages and disadvantages of chicken keeping.
- Assess the viability of your chicken business.

Key Terms and Definitions

Sales Plan: a document defining your sales strategies, goals, and plan.

Bisimillah /Kosher: Religious laws that dictate how to slaughter and prepare animals for consumption.

Discounts: any reduction of the usual selling price for an product or service.

Sales: Money collected from selling goods or services. Sales = the price you charge for a product X the number of units sold.

Price: The amount of money charged for a product. The price of a product includes within it all of the costs associated with the purchasing, production and distribution of a product PLUS a profit margin.

Cost of Production: Costs of raw materials, labor and distirbution of a product. For a Chicken business, these will include: chicks, feed, housing, vaccinations, employee labor, your salary, packaging, transportation, etc.

Your Salary: the amount of money you choose to pay yourself for operating your business. This is money is yours spend for personal and family living expenses.

Profit: Money left over AFTER paying all of the costs of production which includes your salary. Profits can be used to grow the business or distributed back to family expenses toi improve self-reliance.

Seconds: Products of low or inferior quality which cannot be sold at the regular retail price. These products should be sold at a reduced yet profitable price. They can also be used in promotional strategies. (ie buy a dozen, get 1 or 2 eggs free)

Section 2.1 Economics of Raising Chickens

Before you start a chicken business, it is important to find out if it makes economic sense. In this section we shall look at the economic value of chicken and how to cost your chicken project.

Economic Value of raising Chickens

A chicken business provides an important supplement to income from crops and livestock. It can also provide supplemental income for those not living on a farm. Chicken farming helps to reduce over dependence on traditional commodities whose prices are not stable. Before you continue reading, complete the following activity.

Activity 2.1

Economic Value of Poultry (Time: 20 mins)

A. Write three reasons why chicken keeping is an important economic activity.

1. _
2. _
3. _

B. Use the space provided below to write down one compelling reason why you are interested in chicken farming.

Compare your answers with the information given in the following section.

As we mentioned earlier, chicken farming produces a number of salable or consumable products for the public. These are:

- Eggs;
- Meat; and
- Feathers. (depending on local market conditions)

The economic value of chickens is one of the reasons why people take an interest in chicken farming. The following is the economic value of chicken keeping:

- Provides income from the sale of chicks, meat and fertilized and unfertilized eggs;
- The feathers may be used to make stuffing for pillows, mattresses and quilts
- It supplements other incomes from farming or other employment.
- Chicken droppings are used as livestock (ruminant) feed, as it is a rich source of non-protein nitrogen and provides protein
- Chicken manure increase soil fertility and can be sold as fertilizer
- Chicken droppings make excellent slurry for biogas production plants
- The by-products of a hatchery are used to make livestock protein supplements.
- Used for recreation and also in chicken competitions and shows. In some communities they are kept for their crowing ability.
- Use in special festivals, traditional ceremonies, as a gifts, and in traditional medicine.

Activity:2.2

Preparing poultry eggs and meat for the market ***(****Time: 15 mins****)***
Write at least 3 steps you would follow to prepare poultry eggs and meat for the market.

Eggs
1.
2.
3.
Meat
1.
2.
3.

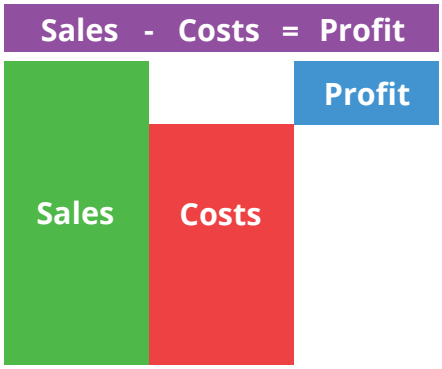
Now compare your answer with the information in our discussion below.

Section 2.1 Selling your chicken production

Before you get your chickens, you will create and present your basic Business Plan which includes a simple Sales Plan.. You cannot wait for customers to come to you...you must have a plan! Do you understand your costs and profitability well enough to sell effectively? If you are not careful or uninformed, you can loose all your profit on your total production with just a few bad sales!

From Chapter 1, Section 3 from the Starting My Business Self-Reliance Manual from the Church of Jesus Christ of Latter-day Saints . The path to achieving profits and having a successful business follows this simple formula:

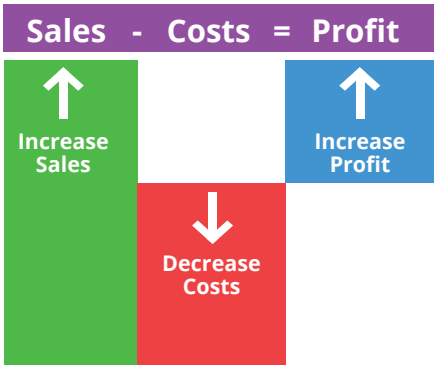
THE BUSINESS SUCCESS MAP

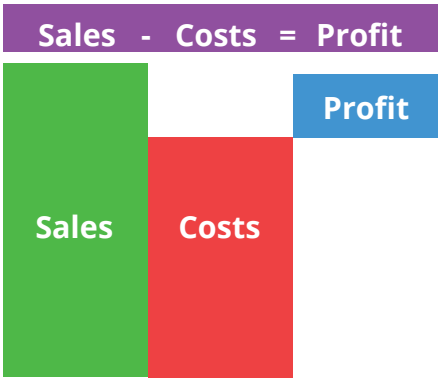


Sales - Costs = Profit

The main objective of a business is to generate profits. If a business has profits, it means that money is left over after having covered all costs (including your salary.) The money left over can be used to grow the business, save for a business emergency, or improve your level of self-reliance. This formula means that if you take all the money received from sales, subtract the costs to buy, make, and sell my product or service (including your salary), then the money left over is your profit.

A good business owner constantly seeks ways to increase profits. The formula to increase profits is very simple. To increase profits, you must increase sales and/or decrease costs. By doing so, the amount you have left over increases and your business is more profitable. Understanding how to increase sales and decrease costs will be something you will need to learn and discover as you run your business over time.





If you spend the the SALES money you earn in the green box on your family or for something other than your business, you will NOT have money to pay the COSTS in the red box. Those costs include money too replace the birds, the feed, the vaccines, the housing, etc. that produce the meat or the eggs you sell. **Spending all of your SALES money on anything other than your business will destroy your business.**

What can you spend? Remember the formula:

SALES - COSTS = PROFIT

You can spend the salary you pay yourself and your family (already included inside the costs and as much of the profit as you want or need. But remember, the more you spend of the profit on personal items, the less funds you have to GROW your business in the future. **You cannot spend all of the SALES money without destroying your business.** YOU must replace your chickens, the feed, the vaccines, etc. once they are sold or consumed. You are responsible to save the SALES money and replace your chickens. That is how you become more self-reliant.

For Layers: Preparing Eggs for sale

You should collect eggs at least twice a day from the nests. Once this is done, you should then prepare them as follows:

- Start by selecting and isolating eggs which are broken, deformed, soiled ones, and those with blood stains;
- If the eggs are dirty, clean them 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 to the egg.
- Those that are deformed, too small or of low quality for whatever reason should be sold as "seconds" (unable to command a full price), used in selling strategies (i.e. buy a dozen eggs, get one additional egg free), or consumed by your immediate family. NOTE: try and sell your "seconds" for at least the cost of production.
- Sell-able eggs of different sizes are put in different traps, cartons or trays with the sharp ends facing down, so that the air space faces upward;
- Eggs should then be delivered to the consumers as soon as possible.

For Layers: Selling Eggs

Know your customer. In many markets, people are accustomed to and prefer buying eggs in trays of 12 or 24. Some will buy only 6 and may take them in a small plastic bag. Selling individual eggs or smaller quantities, like 1/2 dozen should usually have a higher price. Know your customers and their preferences.

Pricing- Perhaps the most important decision you will make is your selling price. Review the discussion in Chapter 3 of the Starting My Business course on selecting a sales price. Be careful to NOT allow the competition to set your price. Always take into account your unique product advantages, like size, color, location, quality, convenience, etc.

"Seconds" - There will always be a good market for seconds. Avoid giving seconds away free. Always sell for a profit OR use them a promotional item...ie. buy a "good dozen" get one or two "seconds" free, etc. Those you cannot sell; you can use for home consumption.

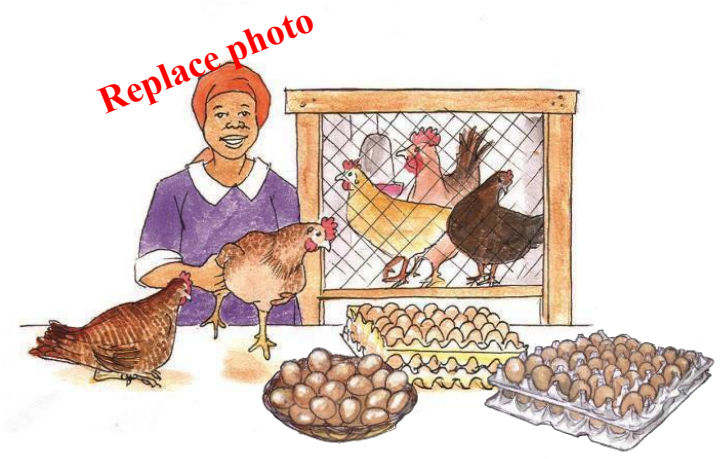
Seasonality - The highest food consumption sales periods are always during State and Religious holidays. This is when families are gathering and celebrating with food. Think Christmas. Even weekends will have higher demand than week days. Plan your sales cycles to coincide with these high demand times. During these periods, you should never have to discount. You will always sell your inventory for the highest prices.

Potential Markets

- Roadside or local merchants' shops - these will want to buy at the farm gate price or less to re-sell fresh. they will buy flats of 12 or 24.
- Establish your own "Roadside Market". Since normal street vendors will want to buy at the farm gate price (15) and re-sell at retail (20) you should always attempt to sell as close to retail (20) as possible.
- Street Vendors who cook or use eggs as ingredients - These will buy your "seconds". They will want to buy below the farm gate price. Avoid discounting below your cost of production.
- Local restaurants who cook or use eggs as ingredients - These will also buy your "seconds". They will want to buy below the farm gate price. Avoid discounting below your cost of production.
- Local Super Markets - Generally only buy from large commercial operations. Always sell at farm gate price or higher.
- Family, neighbors, friends - These will come to your home location and buy direct. If they buy in quantity, sell them at farm gate price. Otherwise, try and sell at between the farm gate price (15) and street retail (20).
- ANYONE for any reason that buys less than 6 eggs or one or two individual eggs should always pay retail (20)

CAUTIONS:

- Avoid giving any egg away FREE. Except for "seconds", your best discount is farm gate price (15 KSH)
- If you buy eggs from your business, charge yourself farm gate price (15 KSH).



Selling broilers

Know your customer. You can sell your birds slaughtered or alive. Birds professionally slaughtered and cut in pieces command higher prices but require extra time and/or extra cost. In many locations, local slaughter houses fulfill those requirements for a fee. This is due to local religious or sanitary slaughtering requirements (bisimilah or kosher). For that reason, in most markets, restaurant, re-sale buyers and most retail consumers will prefer to buy live birds vs. slaughtered birds.

Selling broilers

Pricing- Perhaps the most important decision you will make is your selling price. Review the discussion in Chapter 3 of the Starting My Business course on
selecting a sales price. Be careful to NOT allow the competition to set your price. Always take into account your unique product advantages, like variety, size, color, location, quality, convenience, etc.

Live birds are generally sold by "size" which is actually an estimate of their weight. In most markets you will not be required to actually "weigh" the bird. Until you become skilled at estimating the weights, you should weigh your birds at the farm so you have a good idea of the weight to size profile.

You should consider 3 or 4 size-price categories: Extra large, Large, Medium, and Small. The average price for a 2.5 kilo bird is 550 Schillings. Price each size accordingly. Save the largest birds for sale at retail direct to consumers. The medium and smaller birds go to those who slaughter and cook the birds.

Seasonality - The highest food consumption sales periods are always during State and Religious holidays. This is when families are gathering and celebrating with food. Think Christmas. Even weekends will have higher demand than week days. Plan your growing and sales cycles to coincide with these high demand holidays. During these periods, you should never have to discount. You will always sell your inventory for the highest prices.

Potential Markets

- Roadside or local merchants - These are large markets with high demand. They will buy live birds for re-sale. They will want the heavier and best birds. Charge appropriately.
- Establish your own "Roadside Market". Since normal roadside or local merchants want to buy at the farm gate price (550) and re-sell at retail (600 or 650), you should always attempt to sell as close to retail (600) as possible.
- Street Vendors who cook and sell bird pieces - These are large markets with high demand. They want steady reliable supply. These will buy live birds and slaughter themselves. They seek to buy below the farm gate price. Instead of discounting, sell them the smaller birds.
- Local restaurants cook and sell broilers as meals - These are large markets with high demand. They value reliability, trust and quality. These will also buy your medium sized and smaller birds. Avoid discounting . Charge for quality and service. Once you have their trust, they will pay more for slaughtered birds.
- Local Super Markets - Generally only buy from large commercial slaughter houses.
- Slaughter Houses - There are mobile and fixed. They want to buy at a low price, slaughter and cut into pieces, and sell for high prices. Avoid discounting.
- Family, neighbors, friends - These will come to your home location and buy direct. Sell the smaller, harder to sell birds. Sell them at farm gate prices (550 or higher)

CAUTIONS:

- Avoid giving any bird away FREE. At 550 schillings per bird, you will loose much of your crop's profit giving away birds.
- Save your smallest birds for bargaining, for sale to family or friends, or for home consumption.
- If you buy any bird from your business for home consumption, charge yourself farm gate price (550).

Activity

Preparing poultry eggs and meat for the market ***(****Time: 15 mins****)***
Write at least 3 steps you would follow to prepare poultry eggs and meat for the market.

Eggs
1.
2.
3.
Meat
1.
2.
3.

Section 2.2: Costs of Chicken Production

Before you start a chicken business, it is important to determine whether it is profitable and sustainable. There are two costs of production that you should take into consideration. These are:

- One-time Costs (Usually referred to as Fixed costs)
- Repetitive Costs (Usually referred to as Variable costs)

Your profits will be greatest if you are able to keep your repetitive costs to a minimum. Let us look at each type of cost in further detail.

One-time Costs (Fixed)

These are the costs that remain constant throughout the management of one flock and are spread out over multiple growing cycles. These include the following:

- Cost to purchase day – old chicks (approximately one tenth)
- Housing wear and tear i.e. the cost of your chicken house spread out over multiple growing cycles, not just a one-time expense
- Wear and tear on equipment i.e. the cost of your equipment spread out over multiple growing cycles, not just a one-time expense
- Vaccinations - Chicks come pre-vaccinated for Mareck and Typhoid but you will need to supplement vaccinations
- Aging of birds (laying birds) this does not apply to broilers.
- Miscellaneous e.g. insurance, buildings and equipment considered for a period of 12 months

Repetitive Costs (Variable)
These are repeated in each and every growth cycle. These are those costs that vary depending on the number of chickens you have. They include the following:

- Feed costs – account for 70 portions out of 100 or more of total cost of your business. It is considered the major expense
- Labor cost – It is assumed that at your scale, you will provide labor for the enterprise. However, 7. portions of 100 of cost of production is accounted for as labor should you engage a waged help or as the business expands.
- Mortality – 5 portions of 100 is the agreed loss throughout the growing period
- Fuel for brooding and litter constitute 2 portions of 100 of cost of production
- Veterinary and pharmaceutical costs – 3. portions of 100 of cost of production
- Transport and marketing costs – 10. portions of 100 of cost of production

Below find a basic economic analysis for the production of 100 Broiler birds and 100 Layers. This will give you an idea of the production and profit potential for for each type of business. Of course during this "practice phase" of your training, you will be raising only 35-40 birds, not 100. Therefore, the profit potential will be smaller. These are examples for you to consider as you choose the type and size of the business you want to create.

Profit & Loss projection for 100 Broiler Birds				
		8 weeks	Annual	
			6.5	production cycles
# birds	100	100	650	
Loss mortality	5.0%	5	33	
Loss to consumption	3.0%	3	20	feed your family ONLY 3 birds each 8 weeks.
Net birds		92	598	
Sales price KSH	550	50,600	328,900	
Cost of Sales KSH	Cost / bird			
One-time (fixed)	13.86	1,386	9,011	to replace coop and hard assets every 5.1 years
Repetitive (Variable) Feed	233.61	23,361	151,847	replace feed every 2 mo (8 weeks)
Repetitive (Variable) Birds	100.00	10,000	65,000	replace birds every 2 mo (8 weeks)
Repetitive (Variable) All Othe	10.00	1,000	6,500	Vet, Vitamins, pkg, etc
Repetitive: Labor	30.00	3,000	19,500	pay family every 8 weeks
Repetitive: YOUR SALARY	60.00	6,000	39,000	pay YOURSELF every 8 weeks
Total Cost of Sales	447.47	44,747	290,858	
Gross Profit KSH		5,853	38,042	
GP margin		12%	12%	
Net Profit KSH		5,853	38,042	Money used to GROW your business
Net Profit Margin		12%	12%	

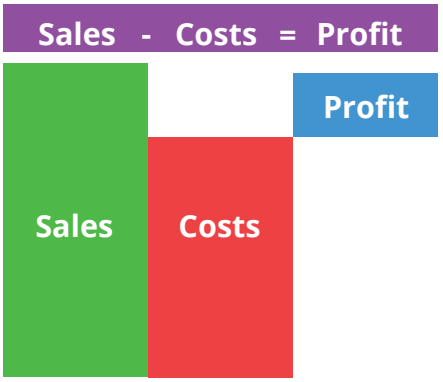
Raising 100 Broilers every 8 weeks, should provide a decent income your family and a salary for yourself, plus your family can consume 3 birds every 8 weeks.

Now review the profit statement for 100 Layers

Profit & Loss projection for 100 Layer Hens							
		Monthly	Annual	18 month cycle	Consumption	Retirement	Grand Totals
			12	18		Sell Spent birds	
Egg production		2,527	30,319	45,478		$ 550.00	
Sellable eggs (with loss)	1.0%	2,501	30,016	45,024	455	Feed your family 6 eggs per week	
Sales price KSH	15.00	37,520	450,235	675,353		53,900	729,253
Cost of Sales KSH	Cost / egg						
One-time (fixed)	0.58	1,468	17,611	26,416	to replace coop and hard assets every 6 years		
Repetitive (Variable) Feed	11.20	28,296	339,557	509,336	replace feed every 20 months		
Repetitive (Variable) Birds	1.76	4,444	53,333	80,000	replace birds every 18 months		
Repetitive: Labor	0.28	700	8,400	12,600	Pay your child each month		
Repetitive : Other (Vet)	0.09	222	2,667	4,000			
Repetitive: YOUR SALARY	0.55	1,389	16,667	25,000			
Total Cost of Sales	14.45	36,520	438,235	657,352			657,352
Gross Profit KSH		1,000	12,000	18,001		53,900	71,901
GP margin		3%	3%	3%			10%
Net Profit KSH		1,000	12,000		Money to invest in expansion etc.		
Net Profit Margin		3%	3%				

Note that raising 100 Layers is a very different business. It also should provide a decent income for your family and a salary for yourself, plus your family is allowed to consume 6 eggs every week.

In both examples, always remember and keep in mind the BUSINESS SUCCESS MAP.



REMEMBER: If you spend the the SALES money you earn in the green box on your family or for something other than your business, you will NOT have money to pay the COSTS in the red box. Those costs include money too replace the birds, the feed, the vaccines, the housing, etc. that produce the meat or the eggs you sell. You will be "eating your chickens!" **Spending all of your SALES money on anything other than your business will destroy your business.**

What can you spend? Remember the formula:

SALES - COSTS = PROFIT

You can ONLY spend your salary and the profit. But remember, the more you spend of the profit, the less you have to GROW your business in the future. YOU must replace your chickens, the feed, the vaccines, etc. once they are sold or consumed. You are responsible to SAVE the sales money and replace your chickens.

In addition to costing your project you should keep the following points in mind:

- To succeed in chicken farming, you must make decisions based on sound economic principles.
- To achieve a good profit in broilers each bird should attain a weight of 1.2kg dressed weight (X.X live weight) at five (5) weeks when sold.
- In both broiler and egg production you should keep the mortality of birds as low as possible.
- You should organize and manage your labor well in order to achieve the highest possible income returns since the size of the flock is small.

Activity

Preparing poultry eggs and meat for the market ***(****Time: 15 mins****)***
Write at least 3 steps you would follow to prepare poultry eggs and meat for the market.

Eggs
1.
2.
3.
Meat
1.
2.
3.

You have now come to the end of this introductory unit. We hope you now understand the advantages, disadvantages and economic value of chicken farming.

Unit Summary

In this unit we have learned that chicken keeping has many advantages. We saw that chicken keeping requires a low investment, does not require a big space and has good returns on investment. We also considered the disadvantages of chicken keeping which included the risk of diseases and predators. Lastly, we looked at the economic value of chicken farming and noted that it includes income from the eggs, meat, feathers and chicken droppings, among others. We also looked at the costing of a chicken project. Total estimates for the Broiler chickens are included in the Appendix for comparison.

In the next unit we shall discuss chicken housing.

Unit 3
Chicken Housing

Introduction

Chicken housing is a very important part of your chicken farm as it protects the birds from predators and rough weather conditions. A comfortable chicken house is also important for efficient production and convenience of the chicken farmer. In the last unit you learned about the advantages, disadvantages and economic value of chicken keeping. In this unit you will learn the requirements of a good chicken house, how to identify a suitable location for a chicken house, and the different types of chicken house systems that you can adopt.

Unit Objectives

By the end of this unit, you should be able to:

- Describe the requirements of a good chicken house;
- Identify a suitable size for a chicken house and a good site for construction
- Determine the most suitable chicken production system for your project.

Key Terms and Definitions

A perch: an object on which a bird alights or roosts, typically a branch or horizontal bar

A fold: system whereby a small portable house where chickens occupy a run during the day and the house at night.

Disinfectant: Any substance or process that is used primarily on non-living objects to kill germs, such as viruses, bacteria, and other microorganisms that can cause infection and disease.

Off-cuts: Trimmings off timber during framing

Deep Litter: system in which a number of hens are housed in one covered enclosure, within which they can move about freely, on a layer of straw or wood shavings several inches deep

Slatted floor: system in which a number of hens are housed on raised floor

Run System: an enclosed yard for keeping poultry.

Foot bath: A container placed at chicken house entry for disinfection

Predator: Any animal that may prey on the chickens

Manual drinker: a container that provides water for chickens. Manual drinkers must be refilled by hand.

Automatic drinker: A container that provides water for chickens. Automatic drinkers are connected to an outside water source and automatically refill, reducing labor.

Section 3.1: Requirements of a Good Chicken House

The following are the requirements for a good chicken house:

a) **Complete Enclosure, Protection:** ensure that the chicken is protected from extreme weather conditions, such as, high winds and drafts. Ensure that no foreign birds of any kind enter or mingle with the flock. Also protection from predators, e.g. hawks, owls, mongoose, wild cats, snakes, etc.

b) **Good Ventilation**: the house should have good ventilation, that is, able to supply oxygen and remove carbon dioxide and dampness. A damp atmosphere favors the development of pathogen and retards the activity of the birds. High temperatures may cause deaths or drop in egg production, low shell quality, and reduced weight gain. A combination of high temperatures and high humidity may kill young chicks. To protect birds from the cold, you can use old feed bags as curtains to cover the chicken wire at night.

c) **Ease of cleaning:** it should be easy to clean and facilitate parasite and disease control. All the interior fittings should be removable or easy to clean.

d) **Sunlight:** this is in order to maintain the heat of the flock. The sun also has disinfecting value and is important to the birds.

e) **Economical construction**: it should use cheap, durable and locally available materials.

f) **Accessibility**: the house should be convenient in relation to other buildings in the surrounding area. It should be tall enough for a grown-up person to comfortably work inside.

g) **Spacious:** always ensure that your chicken have enough space to run around. Table 2.1 in this Unit gives the space requirements for the different types of chickens. This will help you to avoid frequent loss of your birds due to suffocation and contamination.

h) **Safe:** ensure that your chicken house does not have sharp edges that can injure the birds;

i) **Floor:** Dirt floors are recommended as they are easier to maintain and disinfect. Cement floors are also acceptable.

j) **Disinfection:** a disinfectant foot dip for humans should be placed at the door of each house to prevent entry of diseases agents into the flock house; regular disinfecting of walls and floors is recommended. The same for feeders and waterers.

k) **Storage:** a separate room should be constructed to keep feeds and other equipment in a safe place protected from weather and contamination by humans and rodents.

Perches

Perches are timber frames on which birds perch for rest. They are important for chickens to rest on during the night. It is the natural behavior of chicken, such as layers and indigenous table birds to sleep above the ground in trees. A one-meter perch can roost five adult birds. The perches should be removable to facilitate cleaning. Perches are best made of bamboo or round sticks to accommodate for the size and structure of the birds' feet. If the sticks are too big or too small, the birds may fall. Perches can also be square and flat: 5-10 cm broad. Figure 1.1 below shows a picture of a perch.

Figure 1.1: Chicken perch

Nesting Boxes

Chicken need areas where they can lay their eggs. You should allow one nesting box for 4-5 hens. The nests should be large enough to make the birds comfortable. They should be placed in a dark and private place in order to discourage egg eating and cannibalism. The floor of the nest should be covered with soft dry grass or wood shavings to prevent egg breakage. The average nest measurements should be 30cm wide, 30-35cm high & 30-36cm deep. An entrance opening 20cm by 20 cm improves appearance of the nest.

The advantages of laying nests are:

- Eggs laid in the nest boxes are cleaner
- It reduces the problem of egg breakage
- Egg eating by the hens is reduced
- Removal of eggs by the farmer is easy and time saving.

The nests for brooding must be individual and should be placed in a dark and quiet place. They should also be easily removable. Figure 1.2 shows an example of nests.

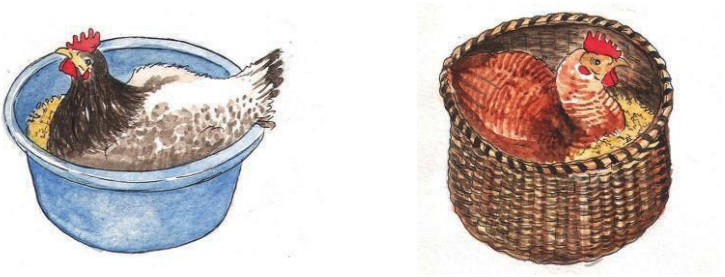


Figure 1.2: Nests for laying and brooding

Refer to the PI Manual for guidance on recommended perches, how to construct perches and the recommended dimensions for chickens nests.

Innovate used plastic that can be used as both a drinker and a feeder at the same time

Homemade manual drinker

This is attached to overlying pipe with running water

You are making very good progress! Before you continue, review what you have learned by completing the following activity.

Activity 3.1

Qualities of a good poultry house

Which of the following are NOT good qualities of a chicken house? Identify them with a circle.

- Well ventilated house
- Dark and damp
- Easy to clean
- Difficult to access
- Economical to construct
- Leaking roof with big open cracks in the walls

Compare your answers with those given at the end of this unit.

You now know the requirements of a good chicken house. Next, we shall look at sizing and location of a chicken house.

Section 3.2: Sizing and Location of a Chicken House

Sizing a Chicken House

The size of a chicken house is very important as it helps you to avoid overcrowding. Overcrowding results in vices such as cannibalism and stress due to discomfort. An ideal chicken house is open-sided to allow natural ventilation and has an east-west orientation to minimize the amount of sunlight directly entering the house. The house should be rectangular in shape and the walls not higher than three feet (3ft). The walls of a chicken house can be made of off-cuts, iron sheets or bricks. The windows should be covered with wire mesh or chicken wire. To reduce the risk of rodents gaining entry into the chicken or flock house, you should clear all the vegetation around the flock house. Below is an example

Figure 2.3: A model chicken house for 300 chickens

The house should provide adequate height 12 ft, Wire mesh windows, a waterproof iron sheet roofing and a foot bath are necessary considerations. The ideal stocking density is one square foot per bird. When calculating the floor space, consider the internal fittings such as the dropping boards, perches, nest- boxes, feeding troughs, etc. Table 2.1 below gives you the minimum floor space per bird.

Table 2.1: Minimum floor space per bird as guidance to various chicken coops

Number in flock	Light breeds	Heavy Breeds
10 – 50	4 Sq. ft	5 sq.ft
50-100	3 ½ sq.ft	4 ½ sq.ft
100-150	3	4
150 and over	2 ½	3 ½
Broilers	1sq.ft/bird	1sq.ft/bird
NB: The larger the flock the less is the relative space requirement per bird.		

In many areas you can find abandoned buildings or previously used chicken coops that can be cleaned or refurbished for use. Refer to the PI Manual for examples of abandoned chicken coops that are acceptable with proper cleaning etc. Also find instructions for creating a make shift coop.

Location of a Chicken House

Your chicken coop must be located on or extremely close to your living quarters because you will be checking your birds multiple times throughout the day, every day. A chicken coop should be located on well drained land and should also be protected from high winds.

Reflecting on what you have just learned, complete the following activity.

Activity 3.2

Sizing a Poultry House *(Time: 10mins)*
The floor space of a poultry house should allow 2 sq feet per bird. If you want to keep 100 birds, how much floor space would you allow in your design?

Compare your answer with the one given in the PI Manual.

You have come to the end of this section on chicken house sizing and location. In the next section we shall discuss chicken management systems.

Section 3.3: Common Chicken Housing Systems

1. Standard chicken house for beginners: Recommended

This is where you will start. This is the simplest and most affordable method of rearing chickens with the ***Start your Business Manual***. You will start with a 10 x 12 coop which will house 100 broilers or 35 layers plus nests. Birds are screened from predators in a prefabricated structure on earthed ground. This provides shelter at night, see figure 2.4. We recommend covering the floor with 1-3 inches (2.5-7.5 cm) of litter, such as shavings or saw dust. The feed and water troughs are placed inside under the roof. The roof must be waterproof so no rain enters the coop. The enclosure must be fully screened.

Figure 2.4: Prefab broiler system by W. LoughMiller(2017) under construction

The system is expandable. Adding 35 additional Layers requires only additional nesting boxes housed within the original structure plus the addition of a secure, fully enclosed chicken run 6 x 8 ft or 10x12 ft. This same style coop can even be placed on the roof of a house or apartment buildings in populated cities. Be sure to first check city regulations before any construction.

A. Approximate cost the build a standard 10 x 12 ft House for 100 Broilers

Below are estimated costs if you purchase all the materials rather than use or re-purpose materials that you already own: Note: Instructions and a purchasing lists can be found in the PI manual.

- Materials: wood, chicken wire, nails, etc. about 40,500 KSH
  Costs will be lower if refurbishing an existing facility.
- Litter (wood shavings) to cover the dirt floor: about 1,500 KSH
- Feeders (2) about 1,000 KSH
- automatic water dispensers (2) about 1750 KSH
- labor to build the coop: You and your family, friends, etc.

B. Approximate cost the build a standard 10 x 12 ft House and an 8X10 run for 100 Layers

Below are estimated costs if you purchase all the materials rather than use or re-purpose materials that you already own: Note: Instructions and purchasing lists can be found in the PI manual.

- Materials: wood, chicken wire, nails, etc. about 55,500 KSH
  Costs will be lower if refurbishing an existing facility.
- Litter (wood shavings) to cover the dirt floor: about 1,500 KSH
- Nests (6) about 20,000 KSH
- Feeders (2) about 1,000 KSH
- Automatic water dispensers (1) about 1,750 KSH
- Labor to build the coop: You and your family, friends, etc.

2. Free Range vs Enclosed coops and runs

We do **NOT** recommend allowing chickens to run Free Range for the following reasons:

- Significant increase in exposure to and death from disease. Most chicken diseases are spread by contact with wild birds and animals. Keeping them enclosed and out of contact with other birds and animals is one of your key strategies for keeping your flock healthy.
- Significant increase in death from predators. i.e. cats, dogs, snakes, rats, hawks, etc.
- Stolen or "lost" birds - you may not believe it can happen, BUT it will.
- Increased heat stress
- Inefficient meat and egg production (slower growth rates, lower meat and egg production)

3. Commercial Systems

In this system, large flocks (greater than 200 birds) are kept inside the house entirely with no access to the land outside. There are two types of intensive systems: the deep litter and battery system. The battery system is expensive and more common in large commercial operations.

1. Deep Litter Systems

In this system, birds are kept in large pens and on floors covered with litters like straws or saw dust up to a depth of 3-5 inches. This system is suitable for egg producing layers and for raising chicks and broilers, see Figure 2.5 below.

Figure 2.5: A deep litter housing system.

House: *the roof should be leak- proof, made of corrugated iron sheets, the wall on the leeward side should be open from 60-90cm above for proper ventilation, the floor is covered with litter, such as, saw dust, wood shaving or sand,* ***Feeders and waterers*** *should be clean and well distributed to avoid uneven growth, provide timber frames on which the bird perch as well as adequate nest for the laying birds*

Advantages of Deep Litter System

- Many birds can be kept in a small area (high stocking rates);
- Labor requirement is low as one person can care for many birds;
- The system can be used to rear breeding stock;
- Birds are safe from predators and thieves;
- There is fast accumulation of manure;
- Less loss of eggs as in free range;
- Ammonia produced by decomposing organic matter in the litters acts as a disinfectant against coccodiosis.

Disadvantages of Deep Litter System

- Incidences of pecking, egg eating, cannibalism, feather plucking are high;
- There is an accumulation of pests and pathogens in the litter. Dry litter causes respiratory problems/ wet ammonia accumulation.
- It is difficult to know a poor layer as birds lay eggs in common nests;
- Eggs may become dirty especially if laid on the floor/broilers develop ascites;
- Litter may be difficult to find/expensive in some areas.

2. Battery Cage System

This system highly efficient and is used primarily for large producers with more than 200 birds. In this system, birds are confined entirely in cages throughout their laying period. The cages are made of wire mesh. In each cage 1-3 birds are kept; for broilers it is different. The cages are arranged in rows which are then arranged in tiers, that is, a row is built over another. Cages have tiers varying from 3-6 in numbers with slanting floors to allow the eggs roll easily into the tray. In some countries, animal welfare regulations may exist.

Complete & on slatted floor

Advantages of Battery System

- Used by large producers with more than 200 birds.
- More efficient feed distribution; 20%-30% lower feed loss.
- Higher egg production due to less energy wastage by birds;
- approximately 1% less egg breakage
- Accurate egg records can be kept because it is easy to know which bird has laid;
- Cannibalism and egg eating are minimized;
- Eggs are clean because the hens do not step on them;
- Less labour is needed especially where mechanization is practiced
- It is easy to identify sick birds quickly;
- Birds do not contaminate food and water thus there is no re-infection with worms and coccodiosis;
- Culling or handling is easy as hens are restricted to a small place;
- Broodiness is discouraged as the birds are not able to reach eggs;
- A large number of birds can be kept in a small place;
- There is greater efficiency in the control of diseases and parasites.

Disadvantages of Battery System

- A high initial capital is required in addition to the house;
- It requires increased level of management;
- In case of a disease outbreak, it can spread very fast;
- Poor birds' welfare: develop bruises on combs, breast and toes.

4. Small or Semi Intensive System

The semi-intensive system is used for those raising a small number of chickens, between 8-50 birds. There are two basic designs: the fold system and the house and run method.

1. The Fold system

In this system, birds are confined in small structures called an ark or fold. This is enough to hold 10 to 15 hens.
One third of the fold is roofed to provide shelter. The rest of the fold is left open but it is enclosed with wire mesh. The un-roofed part is used for sunning and exercise. The folds should be moved daily to a fresh ground to reduce buildu p of diseases, provide fresh grass, avoid accumulation of droppings and also to spread the manure. See figure 2.6 for an illustration of the fold system.

Figure 2.6: The fold system with wheels

This can also be placed on roof of house or apartment building with permission from city laws.

Design Characteristics:

A fold measures 3.5M long, 1.5M wide and 1.5M height. See the PI manual for construction instructions

- 1/3 of the fold is roofed while the rest is enclosed with wire mesh.
- Birds get plenty of sunlight.
- Birds get fresh grass as the fold is moved to new grounds.

Advantage of the fold system

- Ideal for those raising small numbers of chickens primarily for personal consumption (eggs and meat)
- Ideal for those wanting to "experiment" with raising chickens so they learn what is involved (as well as improve their diet)
- Chicken manure is spread uniformly in the field.
- Birds will enhance their diet by eating grass.
- This system reduces build-up of parasites and diseases.

Disadvantages of the fold system

- Few birds are kept per fold. Where many birds are kept, many folds will be required and this is very expensive
- It is labor intensive in that folds have to be moved from one place to the other.
- Individual egg production record is difficult to keep.

1A. Approximate cost the build a Fold house with wheels for 10-15 birds

Below are estimated costs if you purchase all the materials rather than use or re-purpose materials that you already own: Note: Instructions and purchasing lists can be found in the PI manual.

- Materials: wood, chicken wire, nails, etc. about 5,000 KSH
  Costs will be lower if refurbishing an existing facility.
- Litter (wood shavings) to cover the dirt floor: about 500 KSH
- Nests (1) (if Layers) about 3,000 KSH
- Feeders (1) about 500 KSH
- Manual water dispenser (1) about 450 KSH
- Labor to build the coop: You and your family, friends, etc.

2. Smaller House- Run System

This is housing system is very similar to the Standard House described in section 1 of this chapter. The difference is the size of the house. This smaller house is 6 X 8 ft. and is more useful for keeping smaller populations of between 20-50 birds. It consists of solid roofed 6 X 8 ft house with 3 nests (for Layers) which is used for keeping birds at night, laying eggs and roosting. Birds are allowed to run freely during the day within a 8 X 10 run that is completely enclosed with chicken wire. It is desirable to provide two runs (Run A and B) for alternating use to avoid buildup of diseases and parasites. As Run A is being used for chickens, Run B can rest under a cultivated vegetable crop. Birds should be rotated between Runs A & B after every 6 months or one year in order to give ample time for the parasites, worms and disease pathogens to die off. See figure 2.7 for an illustration of this system. This system is very suitable in the countryside where you have the ground. See the PI manual for construction instructions for both the house and the run.

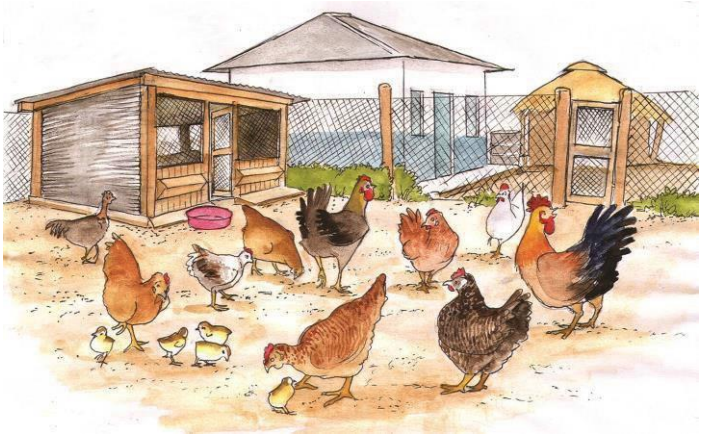


Figure 2.7: House and run housing system

Advantages of the house and run method

- It facilitates the rearing of about 20-50 birds as a side dwelling
- Security for the birds especially at night is good since the building is usually a permanent house.

2A. Approximate cost the build a smaller house and run for 20-50 birds

Below are estimated costs if you purchase all the materials rather than use or re-purpose materials that you already own: Note: Instructions and purchasing lists can be found in the PI manual.

• Materials: wood, chicken wire, nails, etc. Costs will be lower if refurbishing an existing facility.	about	25,000 KSH
• Litter (wood shavings) to cover the dirt floor:	about	1,500 KSH
• Nests (2) (if Layers)	about	6,000 KSH
• Feeders (2)	about	1.000 KSH
• Manual water dispenser (1)	about	450 KSH
• Labor to build the coop:	You and your family, friends, etc.	

That brings us to the end of this section on chicken housing management systems. We hope you now understand the different systems and are able to pick one for your chicken project. Before you continue, review what you have just learned by completing the following activity

Activity 3.3

Poultry Housing Management Systems *(Time: 15 minutes)*

Draw a line to connect a poultry housing management system with its unique feature.

Housing management system	Features
Extensive or free range system	Birds confined in arks or folds which are moved daily to fresh ground
Battery cage system	House surrounded by a wire mesh enclosure that allows birds to run freely during the day.
Fold system	Birds confined in a building and stay in doors for the whole of their life
House and run system	Birds are kept inside a cage throughout their laying period
Deep litter system	Birds roam freely in fenced ground with a simple house to provide shelter at night

You have now come to the end of our second unit on chicken housing. Let us review what you have learnt.

Unit Summary

In this unit we have discussed described the requirements for a good chicken house. We noted that these include good ventilation, enough space, and protection from weather elements and predators. Next, we looked at how to design a chicken house. We hope you still remember that you need to allow 4-5sq feet per bird when designing the size of your chicken house. Lastly, we considered the various chicken production systems used by farmers. These were broadly divided into three main categories, namely, the extensive or free-range system, the intensive system such as the deep litter system; and the semi-intensive system such as the fold system. We hope you are now able to make an informed decision when choosing a housing system for your chicken project.

In the next unit you will learn about chicken breeds.

Unit 4
Chicken Breeds and Selection

Introduction

In the last unit we learned about the qualities of a good chicken house, how to estimate the size of a chicken house and the different housing systems used by farmers. In this unit we shall look at the common chicken breeds found in Kenya. We shall also discuss both natural and artificial incubation practices. Let's start with our unit objectives. Commercial poultry production in Kenya dates back to 1970s. It is estimated that the poultry population stands at 80 million, with 70 per cent being indigenous backyard flock. The driving factors for this industry have been linked to rapid urbanization, growth of the middle-class citizens, rise in quick service restaurants like KFC, Nando's and Chicken-Inn, and the demand for affordable source of proteins. Here are the most common breeds of chickens, their strengths and weaknesses and how they are reared.

Unit Objectives

By the end of this unit, you should be able to:

- Identify the common chicken breeds found in Kenya;
- Apply the appropriate incubation practices in the hatching of chicks

Key Terms and Definitions

Incubation:	putting an egg the right conditions for embryonic development so that a chick is ultimately hatched from the egg. There are two types: natural or artificial. For chicken eggs, these conditions must be provided for 21 days.
Disinfectant:	Any substance or process that is used primarily on non-living objects to kill germs, such as viruses, bacteria, and other microorganisms that can cause infection and disease.
Layer:	A mature hen that lays eggs. Layers mature between 5-6 months old. They will lay eggs for about 18 months when they will moult.
Pullets:	Young chickens that are less than one year of age. Order sexed pullet chicks when purchasing layers
Parent stock:	Parent stock refers to the breeders that produce the end-product birds (commercial birds) that go to the smallholder farmers.
Kari Breed:	An improved chicken developed by the Kenya Agricultural and Livestock Research Organization (Kalro) in Kenya

Section 4.1: Common Chicken Breeds

The term chicken refers to domesticated birds kept for meat, eggs and feather production. There are different species of chicken which are kept by Kenyan farmers. These are:

- Parent- stock Breeding stock lines
- Broilers
- Layers
- Dual Purpose Breed
- Improved local breeds

Improved breeds dominate the chicken business as one of the species that is reared by a majority of farmers but in unorganized systems on the farmland. In this section we shall discuss common chicken breeds found in Kenya. However, we recommend the Improved European breeds of broilers and layers. They are proven to be much more efficient and more productive.

Chicken Breeds

There are three breeds of chickens found in Kenya. These are:

- Improved chicken
- Exotic layers
- Broiler chicken

Let us examine each breed in further detail starting with improved chicken.

1. Parent- stock Breeding lines

Big breeding companies globally are Cobb-Vantress, Hendrix and Aviagen. These companies stock pedigree lines and sell Parent-stock. In Kenya, top breeding companies stock Parent-stock breeders. These are elite birds, very expensive and have great genetic potential for high egg production, fast meat conversion, high egg quality, good fertility and hatchability.
Their population is about 500,000. The major broiler breeders in Kenya are Cobb-500, Arbo Acres, Hubbard and Ross 308 while the layer breeder stocks are ISA Brown, Hy-line, Lohmann and Shaver. Although these types of birds are great, they require intensive management system because they are sensitive to extreme weather changes, diseases, poor bio-security and variable feed quality. They require to be reared in isolated sites away from local poultry, slaughter houses, high traffic, water pans and urban centers.

2. White Commercial Broiler meat chicken

We recommend these birds for broiler production. These types of birds are reared by our farmers and sold as fresh or frozen capons, bone-in, boneless and cut-ups. The main breeds are Cobb-500, Arbor-Acre, Ross 308 and Hubbard sold by the main hatcheries in Kenya. These birds are reared in open sided units with some degree of bio-security imposed on them. Most farmers keep between 500 and 1,000 birds. The current population is about 6 million chicks. The flock have livability of 93 per cent, slaughtered at 33-37 days and weighing on average 1.75kg live. The main challenge is poor bio-security, high feed cost and limited market opportunity.

3. Commercial Layer breed (Sometime referred to as Cambridge)

We recommend these birds for egg production. The most common breeds here include ISA Brown, Hy-line, Lohmann and Shavers. They are brown shell egg producers. The main advantage of these breeds is the high peak egg production, prolonged production period, good egg quality, high livability and efficient feed conversion. They are however prone to infectious respiratory diseases, cannibalism, worm infestation and highly irritable and will drop egg production at slightest change in environment. We have a population of eight million birds.

4. European Dual-Purpose Breeds

Dual purpose means these birds are both good layers and good for broilers (meat). They are not readily available in country and are mainly used as breeding stock.

Light Breeds

These are called "light" because they mature early and get into production earlier than the heavy breeds and have a lower incidence of brooding. They are smaller in body hence cheaper to maintain but the carcass is smaller and inferior. They tend to be more nervous than the heavy breeds and are easily upset by sudden and quick movements. You should therefore avoid sudden appearances as this frightens them. Light laying breeds include the White Leghorn, Brown Leghorn and Black Leghorn and the Black Minorca.

The most common of these breeds are described below:

- White Leghorn
- Black Leghorn
- Brown Leghorn

Heavy Breeds

These are called "heavy" because they mature late and weight more than "light" birds, making them good as broilers. Heavy Breeds are quieter, eat more, and in most cases go ‘broody’ (i.e. try to incubate their own eggs). Examples of heavy breeds are:

- Rhode Island Red
- Light Sussex
- Plymouth rock, (dual purpose)
- Barred Rock (dual purpose)
- New Hampshire red.

Many of them are dual purpose, meaning that they are both good layers as well as broilers.

5. Improved chickens in Kenya

Improved local varieties are the most common chickens found in country. **We do not recommend these breeds as they are highly inefficient.** They mature late, they eat a lot but do not convert that feed into meat or eggs, they weigh less when mature (broilers), the Layers are 6-8 weeks late coming into laying and then lay only about 50% of the eggs of commercial breeds. They are preferred because they are cheap, readily available and more disease resistant.

Kenbro

This is a red feathered bird with broiler and layer characteristics. This bird is robust, disease resistant and possesses a very rounded conformation which results in a presentable, well finished chicken with excellent taste. When managed as a meat bird with high quality feed, it can achieve a live weight of 1.5kg in seven weeks. This bird is ideal for live market sale and easily replaces indigenous chickens. As a layer with regulated body weights, this bird will come into point of lay at 22-24 weeks and produce 200 eggs/hen per annum.

Sasso slow growing exotic lines

This is a dual-purpose slow growing breed that comes from Hubbard in France and produced here by Western seed company. It can produce 150-200 eggs/hen per year depending on management system. It is mostly sold for meat. It is disease resistant and can be released into the field to scavenge with minimal supplementation. The advantages and challenges are similar to Kenbros.

Kuroiler

The Kuroiler chicken is a dual-purpose hybrid breed developed in India. The Kuroiler chickens are dual purpose breed suitable for meat and egg production. They are economical breed and can live eating the kitchen and agricultural waste. Native Indian hens lay only about 40 eggs/hen per year. Whereas the Kuroiler hens can produce around 150 eggs per year by consuming agricultural and kitchen waste, Kuroiler chickens need to feed continuously and they are fast growing chicken breed. The hens are not broody.

Rainbow rooster

Rainbow rooster is a fast-growing Indian chicken breed. It is bred by Indbro Research and breeding farms in India. It is multicolored cross breed, suitable for backyard rearing and organic chicken production. It lays more eggs than the indigenous chicken.

Kari Breed

Developed by the Kenya Agricultural and Livestock Research Organization (Kalro). Naivasha Poultry Development Institute, the new breed known as kienyeji chicken, achieves a weight of 1.5 kg in five months. According to Kalro, the new breed is resistant to diseases and parasites and is better suited for local climatic conditions.

Kuroilers are mixed colored birds originally from India.

Reflecting on what you have just learned, complete the following activity.

Activity 4.1

1. The following birds are all chicken breeds except:
   a) Quail
   b) ISA Brown
   c) Kuroiler
   d) Cobb 500
   e) Brown Leghorn

2. Which of the following characteristics are true of light poultry breeds? Tick the correct ones.
   a) Nervous and get upset by sudden movements
   b) They eat more,
   c) Mature early and get into production earlier
   d) They go 'broody' or try to incubate their own eggs
   e) Are smaller in body hence cheaper to maintain
   f) They have an inferior carcass
   g) They are quieter

Compare your answers with those given at the end of this unit.

You now know the various chicken breeds available in Kenya and their characteristics. Next we shall discuss best practices while stocking your farm.

Section 4.2: Acquiring Chickens for Production

Acquiring your Chickens- three basic options:

(a) Broilers: Buy your chicks at day one - Strongly Recommended for beginners, small farmers (10-200 birds); buy as healthy chicks from a certified hatchery and raise to maturity; Broilers can be sold in weeks 5-6 depending on size and weight.

(b) Layers: Buy healthy chicks 1-3 days old from a certified hatchery and raise to maturity (20 weeks old); You will be investing time and feed for 5 months with no production, as they mature. They generally start laying between 20-26 weeks.

(c) Layer pullets: buy maturing layer pullets from between 8 weeks old to 20 weeks old. Pullets generally begin laying eggs at 20-26 weeks. These will cost more than chicks but you avoid the cost, time and mortality risk of raising them to maturity plus you get into egg production much faster.

Caution: Very important you choose a certified hatchery. Make sure they have "good genetics" and that chicks are vaccinated, well fed and healthy. Be careful about buying chicks from friends or family. Verify health, vaccinations, and genetics FIRST.

Disadvantages of hatching on the farm: Difficult, risky, high mortality, contamination to other birds. Sexing may not be accurate leading to lowered efficiency in the enterprise. The Mareks disease vaccine is very crucial yet expensive Only certified hatcheries can afford this.

How to recognize and select a healthy day old chick

- Healthy chicks are alert and active – they may be cheeping softly, looking for food, and will move away from you when approached. Chicks that aren't well will appear lethargic and constantly sleepy, and may not try to move away when approached.
- Healthy chicks are hungry and eating. Unhealthy chicks lose their appetite. Chicks that lay around while others are eating are likely unhealthy.
- If chicks are happy, healthy and warm, they won't huddle together when awake.
- Bright-eyed – chicks with a blank stare, crusted eyes or always sleepy may not be healthy.
- Look for a beak that is not crossed over or broken – birds with beak issues will have problems eating and drinking
- Healthy feathers – unless you're buying an older chicken during molt, chickens and chicks shouldn't be missing feathers.
- Straight legs, feet and toes – an unhealthy chick may have difficulty standing, walking or have poor posture with its neck retracted into its body.
- If a bird is acting dull, withdrawn or hunched over, it likely is unhealthy.

Selecting older pullets and good Layers; they usually:

- Have clean-cut, strong, refined heads.
- Have large, bright, prominent eyes
- Show refinement-in comb, wattles, legs, and skin
- Are active, alert, and healthy.
- Have flattened (or triangular) lean shanks
- Lose the yellow color from their beak and shanks. (Applies only to yellow shanked breeds.)
- Are deep-chested and slab-sided.
- Have worn, weather-beaten plumage from spring until they molt in the fall.
- Have pointed flexible lay-bones (or pubic bones), which are on each side of the vent.
- Have broad, flat backs.
- Molt late
- Molt rapidly---dropping great number s of feathers at one time.
  Note: Please refer to the next section for a comparison between a good and a poor layer

Activity 4.2

XXXXXXXXXXXXXXX *(Time: 15 minutes)*

1. Which of the following sign tells you that you have selected a good layer Tick the correct answer.

- Flat lean shanks
- Red upright combs
- Lose the yellow clor in shanks

2. What is the difference between a pullet and a cockerel? Write your answer in the space provided below.

_____

_____

_____

You have now come to the end of this unit on chicken breeds and incubation. It's now time for you to review what you have learnt.

Unit Summary

In this unit we have discussed the various chicken breeds found in Kenya. We noted that there are mainly three types, that is, Dual purpose, indigenous chicken, exotic layers and broilers and hybrid chicken. The breeders give rise to the hybrid chickens- both broilers and layers. We also looked at improved Kenyan breeds- Kenbro. Sasso, Kuroiler and Kari that are not part of this project.

Unit 5
Chicken Management

Introduction

Welcome to the fourth unit in our course on chicken management. In the last unit you learned about the different chicken breeds available in Kenya and the three chicken production systems used by farmers. In this course we shall discuss chicken management. We shall look at the various methods of brooding chickens, the requirements of an artificial brooder and how to rear pullets, layers and table birds.

Unit Objectives

By the end of this unit you should be able to:

- Describe the methods of brooding chickens
- Describe the general broader management of chicks
- Apply the appropriate brooder management practices for pullets, layers and table birds
- Conduct routine chicken management activities, such as cleaning and disinfection, debeaking, pasting, detoeing, vaccination and culling.

Key Terms and Definitions

An Incubator: an insulated enclosure in which temperature, humidity, and other environmental conditions can be regulated at levels optimal for growth, hatching, or reproduction.

A brooder: a structure in the chicken coop used to keep the chicks warm during this crucial time.

glucose: refined dextrose sometimes mixed with vitamins to give baby chicks a good start to feed.

paraffin: is a clear, flammable liquid distilled from petroleum that fires lanterns used to give small numbers of chicks both heat and light in the brooder

mash: a balanced formulated mixture of grains, cereal by products and protein concentrate used to feed chickens at different stages

Table bird: fryers, broilers, meat birds or roasters

moulting: lose feathers or skin hair as a natural process at a particular time of year so that new feathers, skin, or hair can grow

Section 5.1 Brooding Chickens

In this section we shall discuss the meaning of brooding and the methods of brooding chicken. Before we start, think about the meaning of brooding and then complete the following activity.

Activity 5.1

Meaning of Brooding

Write down the meaning of brooding in the space provided below

Compare your answer with what you read in the following section.

Brooding is the rearing of chicks from 1 day old till the time they are ready to leave the brooder at 8 weeks. Chicks are precocial, that is, they are able to walk and feed themselves within hours of hatching. However, their bodies are not able to regulate temperature properly for the first two weeks of life. Brooding provides chicks with the necessary warmth, food and water and helps to prevent chick mortality and achieve maximum growth. There are two main methods used for brooding. These are:

- Natural brooding
- Artificial brooding.

1. Why Do Chickens Need a Brooder?

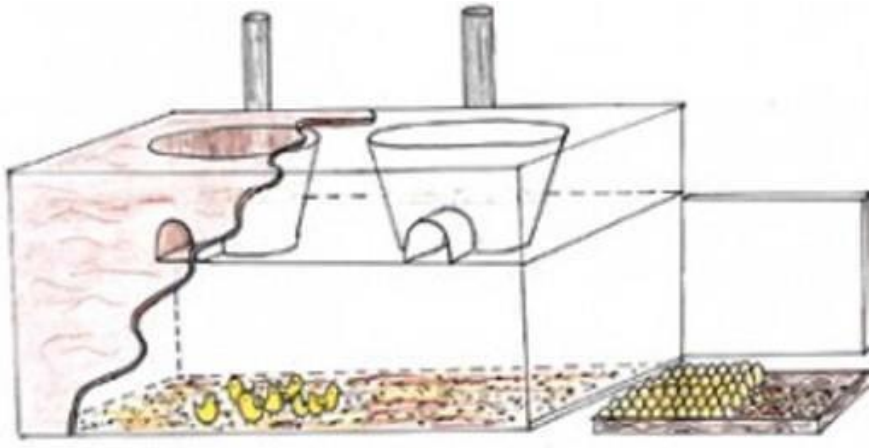
Chickens need a brooder for several vital reasons:

1. Temperature Regulation: Chicks are fragile and cannot regulate their body temperature effectively. A brooder provides a consistent and warm environment, typically maintained at around 95-100°F (35-38°C) during the first week and gradually reduced over time.
2. Protection: Brooders keep chicks safe from predators, disease, and harsh weather conditions, ensuring their early survival.
3. Comfort: A brooder provides a comfortable space with easy access to food and water, encouraging healthy growth.

2. Types of Brooders

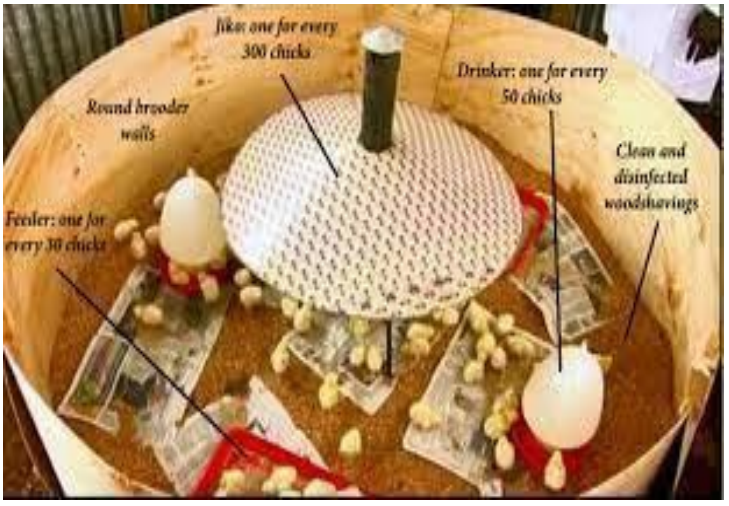
There are various types of brooders available, each with its advantages and disadvantages:

1. Heat Lamps: Heat lamps are a popular choice and provide overhead warmth. However, they can pose fire hazards and require careful monitoring.
2. Heat Plates: Heat plates mimic a mother hen's warmth, making them safer and more energy-efficient than heat lamps.
3. Brooding bulbs: These brooders emit radiant heat, creating a warm zone for chicks to huddle under. They are energy-efficient and safe.
4. Gas Brooders: Gas brooders, powered by either LPG (liquefied petroleum gas) or biogas, are highly efficient and cost-effective options for large-scale poultry operations.
5. Clay brooders: earthen pots are highly efficient and cost-effective options to supplement the other brooding systems as a cost cutting measure



An improvised kitchen-side brooder for rural homesteads

Although a brooder can be improvised from many used materials in the home, the standard brooder is represented below:



Requirements for an Artificial Brooder

The following are the requirements for an artificial brooder.

1. ***Litter:*** this is usually in the form of wood shavings. It should be spread on the brooder's floor and be able to maintain warmth and absorb moisture.
2. ***Fresh air***: Holes for ventilation should be made on the walls of the brooder to allow gaseous exchange. However the holes should not allow drafting air into the brooder.
3. ***Heat source:*** You can provide heat from an electric bulb, charcoal burner, lantern or a gas burner. When using a charcoal burner, lantern or gas burner, you should place a wire guard around the heat source to prevent the chicks from burning when they crowd around it.
   You should ensure that the brooder maintains the following temperature:
   - 1st week – 32° C – 35°
   - 2nd week – 29.7 °C – 32.2°
   - 3rd week – 26.6 °C – 29.7 °C

Maintain the temperature above the floor at 32° C for the first week and then lower it by 4° C every week up to the fourth week. If the heat is withdrawn at once the chicks overcrowd at one point of the brooder and this results in several chicks dying. Check the temperature using a thermometer and observe the reaction of the chicks to the heat. Figure 4.1 below shows the behaviour of chicks under different brooder conditions.

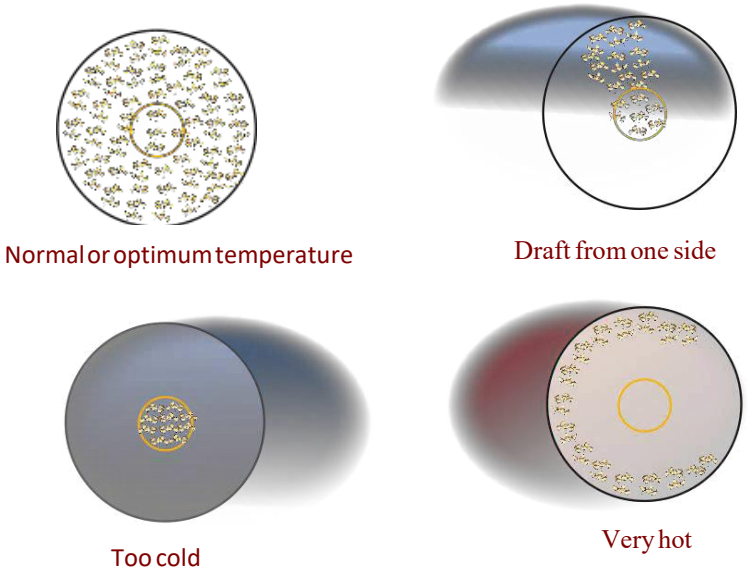


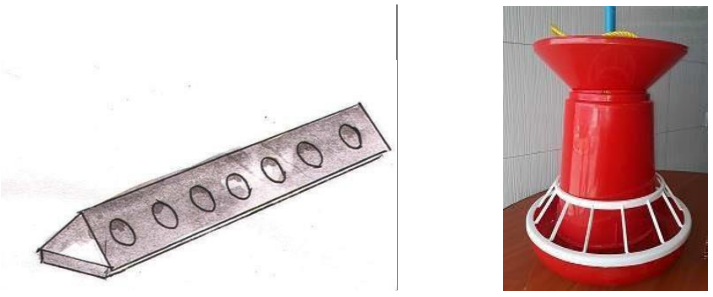
Figure 4.1: Behaviour of chicks under different brooder conditions

As you can see in Figure 4.1 the chicks respond to changes in temperature and drafts in the following ways:

- At high temperature the chicks move away from heat source
- At low temperature the chicks crowd around the heat source
- At normal or correct temperature, the chicks are evenly spread in the brooder
- If there is draft from one side the chicks crowd in one corner.

***4. Light*:** the brooder should have enough light to allow chicks to see food and water. You should use a dim or dull light as bright lights can cause blindness in the chicks and influence toe pecking.

5. Feeders: make sure you have a sufficient number of feeders so that the chicks can feed without overcrowding. Clean them every morning before feeding the chicks to avoid infection. The design of the feeders should ensure that the chicks do not contaminate the feed with their droppings. The various types of feeders are shown in figure 4.2 below.



Linear chick feeder Tube feeder

Figure 4.2: Types of feeder.

6. Drinkers or Waterers: provide the chicks with clean and safe water and ensure that they do not step on the drinker or defecate in the water. The watering containers should have pointed tops to discourage the chicks from perching on top. Figure 4.3 below shows a variety of drinkers used in the brooder.

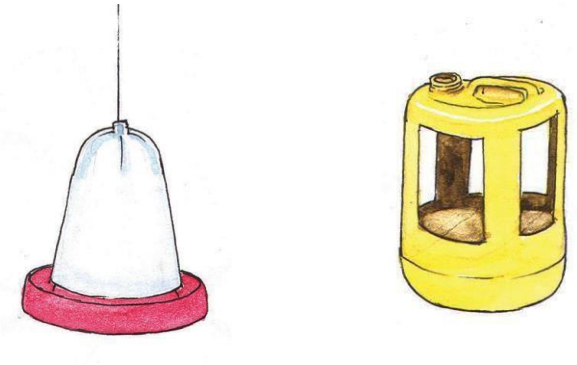


Figure 4.3: Waterer/Drinker

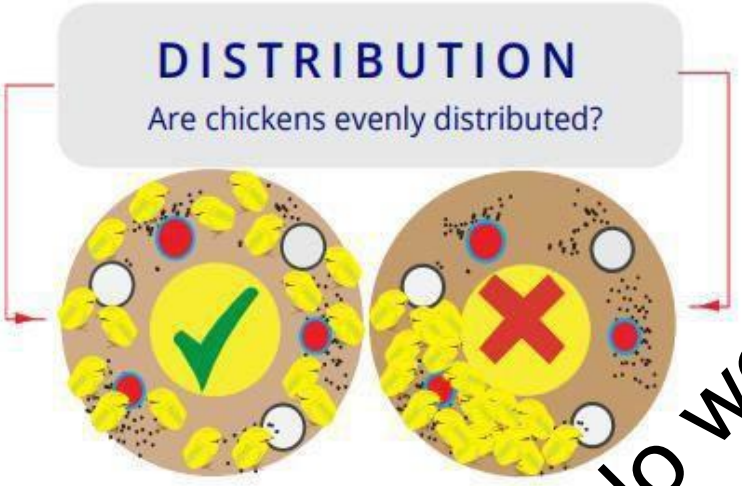
7. Corners*:* most brooders are round so that there are no sharp corners. Corners encourage overcrowding and suffocation. If your brooder has sharp corners, you should fit cardboards at each corner to round it up.

We hope you now understand the two brooding methods used by farmers. Next let us look at the general management of a brooder.

A clay incubator- this is a rural technology in Chyulu, Eastern Kenya that is adaptable and effective. Hot coals inside the clay pot heat the space.

An improvised brooder made from timber

A charcoal brooder made from tin. This is very common in Kenya



Where do we put this photo? or do we need it?

5.2 General Brooder Management

1. How Many Chickens Should Be in a Brooder?

The number of chicks in a brooder depends on its size and capacity. It's essential not to overcrowd the space to maintain proper ventilation and prevent stress-related issues. As a general guideline, allow about 0.5 to 1 square foot of space per chick during the first few weeks, gradually increasing it as they grow. Maintaining a successful brooding environment goes beyond choosing the right brooder type and understanding its advantages.

Additional tips

1. Proper Ventilation: Adequate ventilation is crucial to maintaining air quality within the brooder. Fresh air helps prevent the buildup of harmful gases and moisture. Ensure that the brooder has adjustable vents or openings to regulate airflow.

2. Cleanliness: Keep the brooder clean and dry. Regularly remove droppings and replace bedding material to prevent the growth of harmful bacteria. A clean environment promotes healthy chick development.

3. Access to Food and Water: Chicks should have easy access to fresh water and high-quality chick starter feed. Use shallow containers for water to prevent drowning accidents.

4. Monitoring Temperature: Continuously monitor the brooder's temperature using a thermometer placed at chick level. Adjust the heat source accordingly to maintain the recommended temperature gradient.

5. Social Interaction: Chicks are social animals and benefit from the presence of other chicks. Avoid isolating individual chicks, as this can lead to stress and poor growth.

6. Health Observations: Regularly check your chicks for signs of illness, injury, or stress. Promptly address any issues to prevent the spread of disease within the brooder.

7. Gradual Temperature Reduction: As chicks grow, reduce the brooder's temperature gradually to mimic natural conditions. This encourages feather growth and prepares them for the transition to outdoor life.

8. Transition to the Coop: When your chicks are fully feathered (around 6-8 weeks old), they can b moved to an outdoor coop. Ensure the coop is fully enclosed and predator-proof and provides adequate shelter from the elements.

Refer to the PI Manual for more different types of Brooders and perhaps how to make one? Explanation on the function, the fuel, the hazards, how long they will use it.

NOTE: You may choose to convert a small room in the house into a temporary brooder room. Refer to the practical manual for guide on risk management protocols e.g. Carbon monoxide poisoning if done in a house?

In this section we shall discuss what you need to do before and after the chicks arrive. We shall start by looking at the preparations you should make before the chicks arrive.

2. Preparation Before Chicks Arrive

If you adopt artificial brooding method, you should make the following preparation before your chicks arrive:

- Prepare the brooder 2-3 days before chicks arrive;
- Ensure the brooder and all equipment are clean and well disinfected;
- Examine the heating equipment and test to make sure it is functioning properly;
- Spread 100-125mm litter which has been sterilized in the sun over the floor to act as insulation and to absorb moisture from droppings. The litter can be made of sawdust, wood shaving, groundnut shells, broken maize cobs etc.;
- Spread burlap gunny bag on the floor of the broods. This prevents the chicks from eating saw dust (litter);
- Spread some food on the burlap gunny bag and some placed in the feeders. This helps the chicks to know where the feed is after they eat up all the feed on the floor.
- When chicks have learned where to eat from the gunny bag, it is removed.
- Warm the brooder to a temperature of 32-35^{0}C some 24 hrs before the arrival of the chicks.
- On collecting the chicks, inspect them to ensure that:
  - the chicks are uniform
  - the chicks are alert
  - the chicks have no deformities
  - the chicks do not have any sign of infection.
- Transport the chicks in well-ventilated boxes without direct exposure to sunlight, wind or rain.

1. General Brooder Management for Broiler Chicks

Once the chicks arrive in the brooder, you should ensure the following:

- Start by giving them wholesome drinking water, vitamins, glucose and liquid paraffin. This provides the chicks with energy and helps them to overcome the stress caused by traveling. Liquid paraffin assists in the passage of feces and prevents pasting.
- Feed them on broiler starter pellets for the first 2 weeks. Broiler starter has 20 _23% digestible crude protein and vitamin s for faster growth. We recommend buying feed certified by your Department of Agriculture as to ingredient contents.
- Check on the chicks regularly for the 1st five days. By the tenth day provision of a heat source maybe stopped
- Follow a regular vaccination program, that is, vaccinate against new castle and Infectious bursal disease also known as Gumboro. Refer to PIM for details.
- Ensure the temperature is well regulated at all times. Chicks should not be chilled or overheated, since this may result in increased mortality, dehydration, and retarded growth.

2. General Brooder Management after for Layer Chicks

- Start by giving them wholesome drinking water, vitamins, glucose and liquid paraffin. This provides the chicks with energy and helps them to overcome the stress caused by traveling. Liquid paraffin assists in the passage of feces and prevents pasting.
- Feed them chick mash for the first 8 weeks. Chick mash has 20 % digestible crude protein and Vitamin s for faster growth.
- Check on the chicks regularly for the 1st two weeks. Heat provision will be discontinued by the end of the 6th week.
- Follow a regular vaccination program , that is, vaccinate against new castle ,Gumboro, Fowl Typhoid and Fowl Pox. Refer to lesson 6 for details detail.
- Ensure the temperature is well regulated at all times. Chicks should not be chilled or overheated, since this may result in increased mortality, dehydration, and retarded growth.
- Dust the chicks with an appropriate insecticide to control parasites.
- Control coccidiosis by giving coccidiostat to chicks through water or feed.
- In the 6th week, introduce perches for the chicks to perch on.
- Introduce grit (sand) in the brooder to help in the digestion of the feed.
- Introduce Growers Mash in the 7th week. This should be introduced gradually with a ration of ¼ growers mash mixed with a ¾ ration of the chick mash. By the 9th week the chicks should be feeding on growers mash only.
- Provide security against thieves and pests e.g. cats and dogs that eat chicks.
- Remove the chicks from the brooder when they are 8 weeks old. At this time they are big enough to be taken to the main chicken house.

Perches introduced in a layer type brooder at 6 weeks of age

We hope you now understand how to prepare the brooder to receive chicks and how to take care of the chicks during artificial brooding. Before you proceed to the next section complete the following activity to remind yourself of the important points.

Activity 5.2

Broader management

1. List 4 things you should check in the brooder before the chicks arrive.
   - i There is enough light
   - ii The temperature is at least 32° to 35° C
   - iii There are sufficient feeders and drinkers for the number of chicks
   - iv The litter is warm and it has absorbent qualities

2. List 4 things you should check when collecting chicks:
   - i.
   - ii.
   - iii.
   - iv.

3. Write down four things you should do to ensure that chicks are comfortable in the brooder.
   - i.
   - ii
   - iii
   - iv.

In the next section we shall look at the specific management of pullets, layers and broilers.

5.3 Management of Pullets, Layers and Broilers

Once chicks leave the brooder they are taken to the chicken house. Their subsequent management depends of the type of chicken, that is, whether they are pullets, layers or table birds. We will discuss at the management of each type individually.

1. Management of Pullets

A pullet is a female which is one year of age or younger and has not yet laid eggs. Pullets can be reared under free range, deep litter or battery systems. We do not recommend

Before their arrival, the chicken house should be properly cleaned and disinfected.

If the pullets are reared under the deep litter system, you should spread clean and dry litter 1-3 inches (2.5-7.5cm) on the floor. Spread the litter evenly avoiding the corners in order to prevent the pullets from crowding in the corners at night. Crowding as we mentioned before causes death due to suffocation or crushing.

If the pullets are reared in a free-range system (not recommended), they only need shelter or housing at night, when it is raining or when it is too hot.

Factors to observe in pullet management
You should observe the following factors when managing pullets:

- Do not expose pullets to increasing day lengths between 8-20 weeks of age as this can stimulate the pullets to start laying eggs at prematurely
- Ask for a vaccination certificate or record from your supplier. apply any vaccinations that are deficient. Isolate or cull abnormal or sick birds that have poor development of feathers and vaccinate.
- Visit the pullets often for close supervision and identification of diseases which need immediate attention.
- Where possible, construct roosts either along the sides of the house walls or in the middle of the house to reduce soiling of the litter
- Feed the birds on growers mash which contain 16-17% digestible crude protein.
- Green vegetation (vegetable remains or hydroponic fodder) which growers can peck to keep themselves busy is hanged at various points in the coop. Refer to the PI Manual on the topic: Supplementation of greens to chickens.
- Soluble grit (oyster shells) should be provided towards the end of grower's stage, when they are + 16 weeks old.

2. Management of Layers

Layers are birds which are kept for eggs. They can start laying eggs at the age of 20-21 weeks. In the first 1-2 weeks the eggs produced are very small in size but they normalize from the third week onwards. You should manage them as follows:

- Vaccinate every six months against new castle and fowl typhoid.
- Provide enough floor space, roosts, feeders and drinkers.
- Always keep the feeders full of feed. Do not let it run out. Ensure each hen receives 120gms of layers mash feed per day. Low feed intake means low egg production.
- At all times, your birds must have abundant clean water. Do not let it run out. Low water intake means low egg production.
- Keep the litter as dry as possible especially if you practice the deep litter system;
- Collect eggs twice a day at noon and in the evening
- Determine egg laying indicating the number that are in lay daily on the egg template. See record keeping templates.
- Hang green leaves in the chicken house to keep the birds busy and prevent cannibalism. If your experiencing cannibalism, review your feed quality.
- Pullets that delay in coming to lay will be naturally poor layers and will soon burn out. These should be quickly replaced and culled from the flock.

- Cull the hens which do not lay or which have cannibalistic behavior. Note: they may be sold or consumed.
- Handle birds gently. Excitement due to rough handling or fear from any external causes are detrimental to egg production. When handling or moving birds, hold them gently beneath the breast.
- Entrance of visitors, animals, or the introduction of foreign objects like rakes, sticks, etc. will cause a disturbance and should be kept at a minimum.
- Enter the pen as quietly as possible. Avoid making sudden motions, calling loudly, or otherwise startling the hens.
- If necessary, let the birds know you are coming by a recognizable, non-offensive noise like a low whistle.
- Hens become accustomed to their quarters. Avoid changes or moving them unnecessarily.

3. Management of layers during moulting

Moulting is the process of shedding and renewing feathers. During the moult the reproductive physiology of the bird is allowed a complete rest from laying and the bird builds up its body reserves of nutrients.

- **Pullets (immature hens)**

The chick goes through one complete and three partial moults during its growth to point of laying, after which the mature bird normally undergoes one complete moult a year, usually in autumn although this depends on the time of the year at which the bird commenced laying. Generally complete moulting occurs from 1-6 weeks and partial moulting at 7-9 weeks, 12-16 weeks and 20-22 weeks, and during this latter moult the stiff tail feathers are grown.

- **Mature laying hens**

Once the pullet reaches maturity and begins laying eggs, natural moulting usually begins sometime 18-20 months later, when egg production recommences. The three main factors which bring about moulting are:

- physical exhaustion and fatigue
- completion of the laying cycle. Birds only lay eggs for a certain period of time
- reduction of day length, resulting in reduced feeding time, and consequent loss of bodyweight.

Stress factors and moulting

Natural moults can occur any time of the year due to birds being subjected to stress. A bird is stressed when its environment or management present a challenge to which the bird cannot respond, suffering a harmful effect. Common stress factors which can induce irregular moulting are:

- Lighting- decreasing daylight or artificial light
- Loss of bodyweight
- Disease or internal parasites
- Climate- excessive colds or heat waves
- Feed, feeding and feedstuffs- deficient, irregular or insufficient.
- Predators e.g. cats and dogs
- Fright - wild birds and children
- Peck order - low vitality
- Prolonged broodiness
- Mismanagement: overcrowding, movement to another house, water deprivation, insufficient feed and water space, faulty ventilation, wet litter, debeaking, vaccinations, exposed housing, etc.

4. Management of Broilers or Table Birds

These are birds which are raised for meat. There are three types of table birds, that is:

- ***Broilers*** : these are raised for meat and are marketed when they reach a live weight of between 1.45 -2.75kg depending on the most profitable time of production. Broilers normally convert food into meat at a ratio of about 2:1. They are sold to the market as from 5 weeks of age.
- ***Capons***: these are cocks which are castrated at about 110-150 days. They weigh between 3-3.5kg live weights.
- ***Roosters***: these are chicks which are slaughtered when they are between 90-150 days old

The management practice of table birds is similar to that of pullets and it includes:

- From the age of 4 weeks you should give them finisher mash. This feed is a high energy food that promotes rapid growth.
- Plan to sell after 5 weeks, as soon as they achieve an average live weight of 2.5 kilos. Feeding them any longer generally means more food cost for marginal lower returns.
- Do not use hooks to catch table birds due to their great weight
- Give anticoccidial drugs to avoid economic losses by coccidiosis
- Apply disease prevention and control programmes and monitor your flock closely.

SUMMARY: POINTS TO ALWAYS CONSIDER

That brings us to the end of this section on chicken management. As a way of reflecting on what you have learned, complete the following activity:

Activity 5.3

Management of Pullets, Layers and Broilers (*Time: 20 mins)*
List at least 3 differences between layers and table birds.

Type of Chicken	Main Differences Between Layers and Broilers
Layers	1. 2. 3.
Broilers	1. 2. 3.

Compare your answers with those given at the end of this unit.

In the next and last section of this unit we shall discuss routine chicken management practices.

5.4 Routine Chicken Management Practices

As a chicken farmer, you will need to perform certain routine management activities to keep your chicken healthy and safe. These activities are:

- Chicken hygiene
- Debeaking
- Pasting
- De-toeing
- Vaccination (see Unit 7)
- Culling.

Let us discuss each activity in turn starting with chicken hygiene

1. Basic Hygiene or Disinfecting Protocol

Chicken housing (coops) must be sterilized: 1) before a new replacement flock of birds arrive OR 2) after a disease occurrence. Broilers mature and are sold every 6-8 weeks, thus the coop will be cleaned and sterilized before reintroducing a new flock. Layers are sold at about 18 months, when they begin their adult molt. Thus the layer coop will be cleaned only about every 18 months. The following are the directions for cleaning and disinfecting your chicken house:

- Remove all portable equipment;
- Remove litter and sterilize or discard. Do not discard litter near the laying house; manure can be used or sold for gardening.
- Thoroughly sweep down all dust and cob webs;
- Wash all the equipment and the lower walls and floor;
- Scrub with 5% hot washing soda or 0.3% hypochlorite solution;
- Treat earth floors with Norocleanse (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v) or other comparable disinfectant recommended by your chicken mentor. Make sure you soak the floor thoroughly
- Keep house empty for at least 2 weeks before restocking.

Sterilizing Used Litter

- If the litter is highly soiled and unusable, do not bother to sterilize. It should be immediately discarded and used or sold as garden manure.
- If the litter is re-usable, follow these directions to sterilize:
    1. In a large open space, sun-dry the litter. Turn the litter to insure it is thoroughly dry.
    2. Spray the dry litter with Norocleanse (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v) or another comparable recommended disinfectant. Turn the liter and spray again. Allow the litter to completely sun-dry.
    3. Rest the litter for 1 week before re-introducing birds. Sterilized litter can be stored in gunny bags or returned back on the floor or the cleaned, sterilized coop. Be sure the sterilized floor is thoroughly clean and dry before laying the **litter**. Refer to the PI Manual

2. Daily and Weekly Hygiene and Disinfecting Protocol

Common Practices for both Broilers and Layers:

- **Maintain and use a disinfectant foot bath.** No one, family, neighbors or employees enter the coop without first standing in the foot bath. The foot bath is a shallow rectangular plastic container big enough for one person to stand with both shoes in the bath. The bath contains Norocleanse disinfectant (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v) The fluid level of the disinfectant is deep enough to completely cover the soles of the shoes but not the uppers or tops of the shoes.
- **Bare feet are highly discouraged.** If you are bare foot, always use sandals that are kept inside the coop.

Specifically for Broilers:

- **Daily check the health of each bird f**ollowing the Bird Health Checklist found in the PI manual.
- **Isolate and immediately treat any sick birds.**
- **Sell the flock in weeks 5-6,** once they achieve 2.0 -2.5 kilos live weight.
- **Waterers or drinkers: Clean twice (2X) daily.** Drain the water from the waterer OUTSIDE the coop. Wipe down the waterer with Norocleanse disinfectant (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v). Always be sure to use the manufacturer recommended dilutions.
- **Feeders:** Clean weekly. Wipe down the feeder with Norocleanse disinfectant (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v). Always be sure to use the manufacturer recommended dilutions.

Specifically for Layers:

- **Daily monitor the health of each bird** following the Bird Health Checklist found in the PI manual.
- **Isolate and immediately treat any sick birds.**
- **Beginning in week 9, weekly dust each bird** with insecticide powder (**Carbaryl 7.5**%) to control mites, lice and fleas. Use the following protocol:
    - use plastic gloves and a face mask cover
    - dust each bird one-by-one.
    - separate the selected bird using a large cardboard box.
    - rub the powdered dust inside the feathers next to the skin.
    - avoid getting the dust in the birds eyes.
- Waterers or drinkers: Clean once daily. Drain the water from the waterer OUTSIDE the coop. Wipe down the waterer with Norocleanse disinfectant (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v). Always be sure to use the manufacturer recommended dilutions.
- Feeders: Clean weekly. Wipe down the feeder with Norocleanse disinfectant (Glutaraldehyde 15% w/V and coco-benzy-dimethyl ammonium chloride 10w/v).. Always be sure to use the manufacturer recommended dilutions.

Refer to the PI Manual for detailed instructions

Sevin Dudu Dust

3. Daily and Weekly Litter Protocol

For Broilers:

- Turn fresh litter three times (3X) per day each day until sale or slaughter.
- Once your Broiler crop is sold, usually between week 5 and 6, follow the coop and litter disinfecting protocols described in this Chapter 4.4 before re-introducing a new flock of birds.

For Layers:

Your crop of layer birds will usually be sold between 18 and 20 months, depending upon when the birds begin their adult molt. The litter in the coop will be used for the full 18-20 months they live in the pen. When the birds are sold, the litter will be discarded. Strictly follow the instructions below for the litter maintenance:

- Turn fresh litter three times (3X) per day each day for the first eight (8) weeks.
- After 8 weeks, the litter will establish a natural barrier and cycle. The top layer of the litter will accumulate fresh feces. Underneath this top layer, a middle layer of litter + feces will decompose, naturally generating heat. Underneath the middle layer, a third or bottom layer of microbes will grow as they digest the decomposing feces. This natural cycle will control most of the smell and flies.
- After 8 weeks, NO LONGER turn the litter, unless there has been a spillage of water. **Caution:** If you have water spillage from a leaking waterer or a leaky roof, remove and replace the wet litter in the affected area with fresh litter. Turn the fresh litter only in the affected area 3X per day for 8 weeks. After 8 weeks, NO LONGER turn the litter.
- The chickens themselves will naturally turn the top layer of the litter as they walk about and scratch.
- Once the spent birds are sold in about 18-20 months, discard the used litter and follow the coop and litter disinfecting and sterilizing protocols described above in this Chapter 5.4 before re-introducing a new flock of birds. Again, do not re-use the litter.

4. Debeaking

Debeaking is the partial removal of the beak of chicken. It involves shortening the upper beak which is used for pecking and breaking eggs. It is done at the age of 6-9 days and not later than 10-14 days in pullets. Debeaking helps to control cannibalism and egg eating and may not be necessary in small flocks less than 50. Consult your local mentor and Vet for information or help.

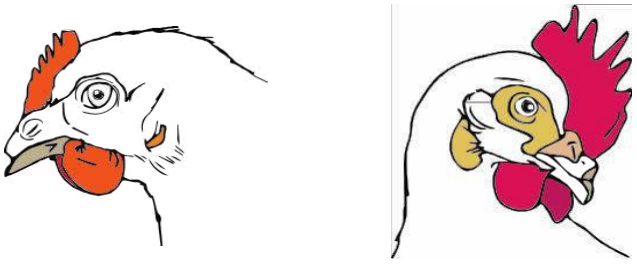


Figure 4.4: Debeaked chicken

5. Pasting

This is when feces accumulates and blocks the vent of a chicken. It is caused by:

- Poor nutrition;
- Drafts resulting from poor ventilation.
- Diseases that affect the normal functioning of the digestive track;
- Very high or very low temperature in the house;
- Depriving chicks of water between hatching and installation in the brooder.

You can treat pasting by softening the feces with warm water and then removing it very gently. One important step in preventing pasting is making sure that the chicks in the brooder drink water before they start eating food. As each bird goes into the brooder, dip the beak into the drinker so they can get a small drink and also learn where their water source is. Other preventive measures include improving the brooder conditions such as temperature, ventilation, and feed.

6. De-toeing

This is the removal of the inside and back toe of cockerels or roosters at the outer joint. It is done using a hot blade to cut off and cauterize the toe. De-toeing of cockerels helps to prevent injury to the hens when the cock jumps and bushes on her with his feet astride during mating. If cocks have not been de-toed, the nails should be blunted before allowing them to stay with the hens. By raising improved broilers, you will not have roosters in the chicken house. This activity will therefore not be necessary.

7. Vaccination Methods and Proceedures (see Unit 7)

8. Culling

Culling is the removal of unproductive birds from the flock. Such controls improve the flock; Poor (inconsistent) layers consume feed without laying and therefore they are uneconomical. It is better to have some selection system than to have none at all. The factors that necessitate culling of birds are:

- Birds that come into laying later than the rest of the flock or are poor layers (inconsistent) .
- Poor growth (stunted);
- Chronic diseases that render birds unproductive (injures may be included);
- Old age, such birds have low production;
- Vices such as egg eating and cannibalism.

External and physical appearance is used in the culling process of layers. What characteristics should you look for in a layer in order to select it for culling? The following table compares the characteristics of good and bad layers to help you identify birds for culling. The table below will help you identify birds that might need to be culled.

Table 5.1: Characteristics of good and bad layers

Good Layer	Poor Layer
Combs and wattles are large, warm, waxy and red	The comb is small or shrunken, dry, scaly, pale and cold
Eyes – Bright orange and alert	Eyes – Dull and pale yellow
Beak – pale	Beak – yellowish in colour
The vent is oval (increscent) Moist, reddish in colour and active	The vent is round, dry and pale in colour it is less active
Abdomen is soft, pliable and wide	Abdomen hard and sometimes full
The space between keel and pelvic bone is wide and can fit 3-4 fingers	The space between keel and pelvic bones is small and can only fit 1-2 fingers
Temperament. Alert and active	Temperature: Lazy and dull
Plumage : Dry and rugged feathers appear worn out due to frequenting the nest	Plumage: preened and glossy. Feathers are beautiful and smooth
Molting starts late	Molting starts early
Shanks are pale	Shanks are yellowish
Broodiness is rare	Broodiness is common

What do you do with culls?

- If they are sickly, destroy them.
- If they are healthy and big enough to eat, eat them. They will be a good source of protein for your family.
- DO NOT eat your healthy producing layers!

5.6 Available resources for help and advice

Where do you find help and advice when you encounter a health or maintenance problem with your chickens that you don't know how to solve? You actually have several resources you can use. At the very start of this manual on page x you created a key contact list. These are people with experience who can help you...BUT, you must ASK for their help. And, some may require you pay them. Consider the following individuals for help and advice:

- Regular visits from your "local" expert/ chicken mentor.
    - Schedule regular visits (weekly or every other week)
    - Ask lots of questions.... keep a list of questions you will ask when they visit.
    - Ask for help reviewing any sections of this manual that may be unclear or you would like a review.
- Veterinarians - good source of technical help but they will generally charge for a visit.
    - always engage them when we need to apply injections
- University Ag Extension Hot line- this will share a live hot line and chat contact at no cost
- Your commercial chick supplier -they will provide technical advice at no charge.
- Your Certified Feed supplier- for technical advice on feed, health, etc at no cost.

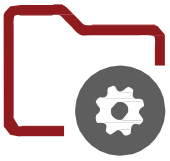
Congratulations! You have come to the end of this section. Find out how much you still remember by doing the following activity:

Activity 5.4

Broader management

1. List 4 ways of vaccine administration that you have learned
   .i _
   ii _
   iii _
   iv _

2. Describe how you prepare a vial of NSD vaccine for water administration
3. Write down four things you should avoid ensure that chickens/ the vaccine is effective.



Unit Summary

In this unit you have learned about the meaning of the term ‘brooding’ and the two methods of brooding, namely, the natural and artificial method. You have also learned about the general management of chickens in the brooder, and especially how to prepare the brooder before the chicks arrive as well as how to manage the chicks in the brooder. You practiced vaccines administered during the brooding period Lastly, you have learned how to manage pullets, layers and broilers once they graduate from the brooder to the chicken house.

In the next unit you will learn about chicken feed management.

Unit 6
Chicken Nutrition and Feeding

Introduction

Congratulations for coming this far! In the last unit you learned how to manage chickens during the brooding phase and after they graduate to the chicken house. In this unit we shall discuss chicken nutrition and feeding. We shall discuss the nutritional requirements of chickens, the classification of feed ingredients, feed formulation and lastly the various systems of chicken feeding.

Unit Objectives

By the end of this unit, you should be able to:

- Explain the nutritional requirements of chicken;
- Formulate chicken feed;
- Describe the different chicken feeding systems.

Key Terms and Definitions

Ingredient: A feed stuff included in the feed
DCP: Digestible Crude Protein
Vitamins and Minerals: micro-nutrients required by the body to carry out a range of normal bodily functions.
A ration: the amount of feed an animal receives in a 24-hour period.
Crude Protein: a chemical analysis of the food whereby the amount of nitrogen present is used to estimate the amount of protein in the food.
Metabolizable Energy : the amount of energy available to the body rom food after accounting for the obligatory energy losses, mostly in stool and urine. Most dietary energy comes from dietary fat, protein, and carbohydrate.

Mash: a balanced formulated mixture of grains, cereal by products and protein concentrate used to feed chickens at different stages

6.1 Nutritional requirements of Chicken

Feed is the most important input in chicken production. The quality and amount of feed you give your flock will directly impact your flock's productivity and profitability. Do not skip or cut corners. Chickens need a balanced diet in order to produce eggs, meat and develop resistance to diseases. The nutritional requirements of chickens depend on their stage of development. As mentioned before, your birds will eat more and produce more if they have extended daylight hours using artificial light.

There are 3 stages in the life of a laying bird for which food requirements are different. These are:

- The starting and early growth stage
- The pullet stage
- The laying or egg production stage.

In the case of broilers, their food requirements differ at the starting and early growth stage, since they are expected to grow into soft, matures birds, in 3 months or less.

To provide a balanced diet, chicken feed must contain all the necessary nutrients. Which nutrients do you think are required by chickens? Think about it for 2 minutes and then complete the following activity:

Comparison of feeds for broilers versus layers

Stage of development	**Broiler**	**Layer**
The starting and early growth stage	Broiler Starter and Broiler Finisher	Chick and Duck Mush
The pullet stage	-	Growers Mash
The laying or egg production stage.	-	Layers Mash

Note: The broiler chicken is ready for the market at 5-6 weeks of age and thus both feeds are consumed in the starting and early growth stage

Activity 6.1

Poultry nutritional requirements ***(****Time: 10 mins.)*
List down at least 4 nutrients that poultry require for normal growth and development

1. _
2. _
3. _
4. _

Your answer should have included the following nutrients:

- Protein
- Energy
- Minerals
- Vitamins.

Let us briefly discuss each type of nutrient in turn starting with protein.

- **Protein**
  Chicken require protein for growth and development of muscles and feathers. Normally 15-20% of chicken feed should be made up of protein. Protein requirements are high during the moulting and growing stage as young chicks continuously produce new feathers. Laying hens moult (lose feathers) after the first laying season and so require a diet high in protein to grow new feathers. Protein is also required for the synthesis of egg protein. There are two primary sources of protein for chicken feed. The first is vegetable protein such as groundnut, soybean cake, and maize glutens. The second is animal protein sources such as fishmeal, skim milk powder, and liver meal.

- **Energy**
  As a rule, 60-80% of chicken feed should contain foods high in energy. Energy foods are important for the maintenance of body temperature, vital functions and for exercise. High energy foods can be easily formulated using cereals such as, maize meal, oats, barley, rice bran and wheat.

- **Minerals**
  Minerals are important for bone formation, eggshell formation and for optimal health status. The most important minerals are calcium and phosphorous. Examples of sources for minerals are: bone meal, limestone and burned eggshells.

- **Vitamins**
  Chicken require Vitamins A, B2, and D3 for normal growth and development. In birds under free range management, sunlight and green grass or green fodder normally provide Vitamin A and D, whereas Vitamin B may come from fresh cow dung. In birds under intensive management, multivitamins should be added to their feeds.

- **Clean Water**
  Clean water plays a very important role in chicken nutrition. It is needed by the bird for digestion of feed, absorption of nutrients, and excretion of waste products and regulation of body temperature.

In addition to these nutrients, chicken feeds also contain salt and non-nutrient feed additives such as antibiotic, anticoccidials.

6.2: Chicken Feed Formulation and Ration

Whenever available, we recommend that you choose feed certified by your Ministry of Agriculture. Always check the label to ensure the feed is produced by a certified manufacturer. If not available, make sure your feed meets the following requirements listed below:

1. Principles of Chicken Feed Formulation

When formulating chicken feeds, you should be guided by the following principles:

1. Feeds must contain all essential nutrients in the right amount and proportion needed to meet the requirements of your chicken; Always check the label.
2. Chickens of different ages require different level of nutrients. Therefore, when formulating feeds, you should be guided by the acceptable standards for the particular age of the bird;
3. The ingredients chosen for the preparation of chicken mashes must be palatable;
4. When selecting ingredients for preparation of chicken mashes, you should consider the nutritional value of each ingredient vis-à-vis the costs;
5. Chickens have no teeth to grind grains or oil cakes, hence all the ingredients should be crushed into the appropriate sizes in keeping with the age of chicken;
6. Micro nutrients and non-nutrient feed additives should be chosen carefully and be mixed up well for effective results;
7. While selecting an ingredient you should judge the optimum amount to include as some of the ingredients may be dangerous at higher levels;
8. Always avoid fungal infested ingredients;
9. Ensure that your feed has the correct carbohydrates /protein ratio required for the age of the bird. For example, chicks from the age of 0-8 weeks require a higher percentage of protein than that of carbohydrates. Birds from the age of 9-20 weeks on the other hand require a higher ratio of carbohydrate in order to provide them with energy;

If certified feed is unavailable, you should first determine the nutritional requirements of the bird so that you can select the ingredients that provide those nutrients. Table 5.1 below gives information on what should be included in your feeds.

Table 5.1: Methods of formulating layers mash

Method 1	**Method 2**
1. Protein rich supplement: • Vegetable portion supplement 15-20% • Animal portion supplement 65-80% 2. Energy rich supplement cereals, millets 60-80% 3. Mineral supplement: • Calcium 5% • Standard mineral mixture 4. Vitamin supplement: • Standard vitamin A, B_2,D_3	1. Maize - 46 parts 2. Wheat - 20 parts 3. Fish meal – 6 Part 4. Ground nut cake – 15 parts 5. Sunflower cake – 5 parts 6. Calcite – 5 parts 7. Any standard mineral mix – 2.5 8. Dicalcium phosphate /bone meal-0.5 9. Rovimix (vitamin A,B_2,D_3) @ 25.8gm/qH 10. Rovibe (B complex) @ 20gm /qH

Take Note:
Before you buy commercial feeds, you should calculate whether it is profitable based on the market price for eggs or meat/live birds. If the product selling price is lower than the price of feed consumed by the birds to produce it, it is not economical to offer commercial feeds.

2. Types of Rations

When calculating the rations for chicken feed you should consider the following two things:

- the quantity needed for the birds maintenance requirements;
- the quantity needed for the birds production requirements, that is, are the birds for egg or meat production?

The following are the feed rations for different chicken birds:

For Broilers

- **Chick starter mash** contains 21-22% digestible protein. It is fed to broiler chicks starting week 0-6 weeks in age.
- **Broiler finisher mash** has 19-20% digestible protein. It is fed to broilers in weeks
  7-8. It also contain more fat and xanthophylls pigments that aids in the development of the uniform yellow skin color;

For Layers

- **Chick starter mash** contains 21-22% digestible protein. It is given to layers from 0-6 weeks in age;
- **Grower's mash** contains 15-16% digestible protein. It is fed to layers of 6-19 weeks in age;
- **Layers mash** contain 17-18% digestible protein. It is given to layers from 19 weeks and during the laying period. Each bird should receive 113g per day.

3. Guidelines on feeding Broilers:

How much water do broiler chicks need?

Make sure your chicken always have water. Rather than specify an exact amount per bird, it is easier to say: **never let the water run out.** Without enough water they will not grow well. For each 1g of feed, your chicks need 2 g of water. For the first 35 days, add to the water:

- liquid glucose for energy
- 1 drop of liquid paraffin for digestion-this is glycerine not petroleum
- Vitamins to help with stress.

Clean the drinkers twice (2x) day.

Feeding guide for broilers
In order to have a healthy and strong flock of broilers, make sure you follow this feeding guide using certified feeds:

- Days 1 – 21 : Starter Mash. Each chick will eat 1 kg in 21 days.
- Days 21 – 35: Finisher Mash. Each chicken will eat 2 kg in 14 days. Change feed slowly:
    - Day 20: 75% Starter Mash and 25% Finisher Mash
    - Day 21: 50% Starter Mash and 50% Finisher Mash
    - Day 22: 25% Starter Mash and 75% Finisher Mash
- Days 35 – 42: 100% Finisher Mash. Each chicken will eat an extra 1 kg in 7 days.

When chicks are out of the brooder, remove feeding trays. Hang the feeders from the roof at back level. This stops the chickens wasting food.

Your broilers should be ready to sell at 35-42 days at 1.5 kg.

Table 5.1: The amount of feed in grams at different ages of the commercial Broiler.

Plan to sell the Broiler birds between week 5-6, as soon as they reach 2.5 kilos or more live weight. Keeping them longer means feeding them more. You generally will NOT re-capture the cost of the feed by selling the bird for a higher price.

Age	Intake/Day/Bird
1 Week	12-15 gms
2 Weeks	15-20 gms
3 Weeks	20-35 gms
4-6 Weeks	35-50gms
7-8 Weeks	55-60gms
9-15 Weeks	62-67 gms
16-27 Weeks	68-80 gms
Above 28 Weeks	120-140 gms

4. Guidelines on feeding Layers:

Table 5.2: The amount of feed in grams at different ages of the commercial layer.

Age (wks)	Intake /bird/day(g) dry weight)	Average intake bird /day(g) dry weight)
1 week	12-15	13.5
2 weeks	15-21	18
3 weeks	21-35	28
4 – 6 weeks	35-50	42.5
7-15 weeks	55-60	57.5
16-27 weeks	68-80	74
28 weeks	100	100

In addition, take note of the following feeding best practices:

- Provide fresh feeds two times daily. We recommend using self-feeders thus feed will be available all day.
- Provide clean water available to the birds 24 hrs. a day. Never let it run out.
- For bright yellow egg yolks, give layers some greens every day. This may be grass, legumes, vegetable wastes etc.;
- Laying hens also need calcium to produce eggshells. Therefore, ensure that the certified feeds have some limestone, crushed eggshells, bone meal, or fishmeal;
- When introducing new feed rations, mix the two to ensure there is a gradual transition. Administer vitamins at this stage to reduce any stress on the birds that results from introduction of a new ration;
- Avoid variations in what you feed your chicken since this may ultimately affect the final product;
- Establish a certified, reputable and dependable feed miller who can provide you with certified chicken feed of high quality.
- Always read the labels to verify certification and ingredients

It's now time for you to review what you have just learned. To help you do this, complete the following activity.

Activity: 6.2

Poultry Feed Formulation ***(Time: 15 mins)***

Tick whether the following statements about feed formulation and rations are True (T) or False (F)

	True	False
1. Vary the feeds you give to chicken as much as possible		
2. Provide fresh feeds and water only once a day		
3. Always avoid fungal infested ingredients		
4. For bright yellow egg yolks, give layers some greens everyday		
5. Introduce new feeds suddenly as need arises		
6. Give broiler finisher to chicks of 1-3 months		
7. Chickens of different ages require different level of nutrients		

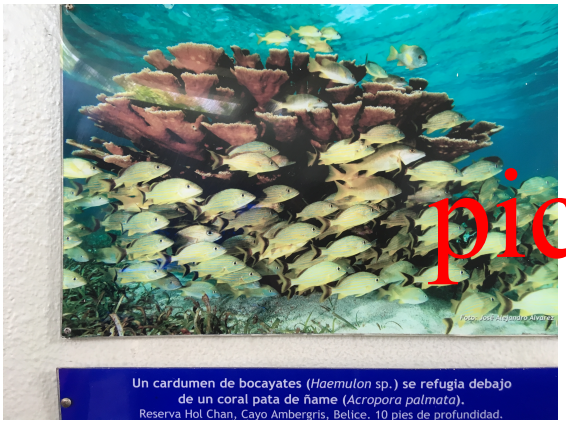
Check your answers with those at the end of the course material.

Section 6.3 Chicken Feeding Systems

There are various chicken feeding systems used by farmers. In this section we shall describe each system in turn and consider its advantages and disadvantage.

The following are the main systems of feeding chicken used by farmers:

- **Wet – mash system**: in this system the ration is mixed with a little clean water and fed to birds. We recommend using the dry mash system.
  *Advantage**:*** it reduces wastage of feed
- **Dry – all – mash system**: This system is best for layers. In this system all the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture.
- **Pellet or crumbles system:** This system is highly recommended for broilers. Feeds are given in the form of pellets or crumbles. These greatly reduce unnecessary wastage. Highly recommended for broilers
- **Dry-mash with scratch grain system/mash +grain:** ONLY allowed for layers. birds are allowed to get dry mash from troughs and grains are thrown on the ground to mix into the litter.
  *Advantage***:** keeps birds busy scratching the litter in search of grains thus reducing bad vices like cannibalism. It is mostly practiced in deep litter systems.
- **Green food system:** birds are fed with green crops such as cabbages, kale, lucerne etc. Not recommended due to possibility of introducing diseases. *Advantage: it* provides important vitamins and minerals and reduces the farmer's expenses for the purchase of vitamin supplements.
  Disadvantage: possibility of introducing chicken diseases caused by contaminated greens from stray bird droppings on the green feed from where it was grown.
- **Restricted or controlled feeding:** it involves restriction in feeding pullets of age 6-20weeks, by feeding the birds twice per day normally at 10.00am and at 4.00pm instead of providing the feed throughout the day.
  Advantages: reduction in feed cost; delayed sexual maturity but improved egg production.



Dry Mash

Pellets or Crumbles

pictures

You have come to the end of this section on chicken feeding systems. To review what you have just learned complete the following activity.

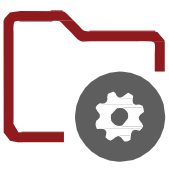
Activity 6.3

Poultry feeding Systems (*Time: 15 mins*)

1. Draw a line to match a poultry feeding system in Column A with its correct description in Column B.

Column A	Column B
1. Wet – mash system	• All the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture.
2. Dry –all-mash system	• Birds are fed with green crops such as cabbages, kale,
3. Pellet or crumbles system	• The ration is mixed with a little clean water and fed to birds.
4. Dry-mash with scratch grain system/mash	• Birds are allowed to get dry mash from troughs and grains from scratching the litter.
5. Green food system	• Feeds are given in the form of pellets or crumbles which greatly reduce unnecessary wastages.

That brings you to the end of this unit. Let us now review what you have learned.



Unit Summary

In this section we learned that feed and clean water are the MOST important ingredients in a chicken's diet. It is the part of the program that will have the GREATEST impact on success and profitability.

Unit 7
Chicken Health Management

Introduction

Welcome to this unit on health management. In the last unit you learned about chicken nutrition and feeding. We hope you noted the relationship between proper feeding, good health and optimal production. In this unit we shall discuss common chicken diseases and their management. We shall also look at the measures you can take to prevent and control these chicken diseases.

Unit Objectives

By the end of this unit, you should be able to:

- Recognize the symptoms of chicken diseases in your flock;
- Take the necessary preventive and control measures to protect your birds.

1. Chicken Diseases

Chicken and especially chicks are at risk of getting diseases and infection from parasites. The following table gives you a list of chicken diseases and their symptoms and control. Refer to the Vaccination section of the PI Manual for detailed instructions and amounts of vaccines.

Table 6.1: Common Chicken Diseases

Disease	General	Symptoms	Control
New castle	• A highly contagious and infectious disease of chicken caused by a virus. • The disease is endemic in Africa and is a killer sweeping unvaccinated chicken over large areas. However routine vaccination controls it effectively	• A watery yellowish white diarrhea with an offensive smell. • Thick mucus discharge from mouth and difficult breathing. • Nervous symptoms of staggering with drooping wings and bending of neck. • Acute cases die suddenly	• No treatment • Kill the whole flock and disinfect the house. • Follow brooding instructions then • Vaccinate birds every six months • vaccine in both in drinking water and subcutaneous membrane drops

Fowl pox	• A contagious and infectious disease of chicken caused by a virus • Another killer disease. However routine vaccinations and strict hygiene controls it easily	• Vesicles (tiny wounds) on wattle, comb and wing web. • Ulcers in the mouth • Excessive discharge from eyes and nostrils. The eyes get sleepy and stuck. • Difficult breathing	• No treatment • Kill all the affected birds. • Vaccinate at 6 weeks (repeater annually) • Wash and disinfect whole house and observe strict hygiene.
Fowl typhoid and bacillary white diarrhea	• There are highly infectious diseases of chicken caused by bacteria of the Salmonella group. • The two diseases show nearly the same symptoms. • The disease is transmitted to chicks from carrier hens through the egg, so testing and eliminating carriers is important or else the whole flock is sold off for eating. • Salmonellosis also affects human being and it is dangerous to eat raw eggs.	• White yellowish or green yellowish diarrhea • Respiratory distress and dullness with dropping wings and sleepy eyes • Anemia – combs and wattles get shrunken and pale yellow • Sudden deaths are usual	• Usually there is poor response to treatments although furazolidone and tetracycline antibiotics have been tried with some success. • Testing and killing affected birds. • Vaccination at 12 weeks repeated every 6 months. • Keep chicken houses clean, dry and well ventilated.
Coccidiosis	• It is a protozoan disease of chicken, calves, rabbits, kids and lambs. • It is caused by organisms of the Eimeria spp. • it comes from contaminated water or contaminated green feed. • The organism attacks the linings of the alimentary tract (small and large intestines and liver)	• Diarrhea, dysentery and emaciation in all animal species. • Rough feathers, dullness and drooping wings in chicken. • Sudden deaths in rabbits and kids. • Apart from these, the symptoms are vague and general	• There are many types of drugs (coccidiostats) available for treatment and prevention. • For prevention these drugs are often given in drinking water or feed for chicken and rabbits.

Marek	A highly contagious viral disease readily transmitted among chicken. It spreads quickly from bird to bird.	Enlarged feather follicles (leukosis). High mortality rate. Gross lesion in affected birds.	Regulatory and mandatory vaccination at hatchery.

We hope you are now able to identify chicken diseases from their symptoms and take action to control the diseases. As a way of reminding yourself what you have learned please complete the following activity:

Activity: 7.1

Poultry Diseases *(Time: 20 mins)*

Draw a line to match the diseases in the column A with their symptoms in Column B.

Column A	Column B
Coccidiosis	Viral disease that causes tiny wounds on the wattle and comb and ulcers in the mouth
Fowl typhoid	Viral disease that causes bird to have thick mucus discharge from mouth and difficult breathing
Fowl pox	Bacterial infection that causes anaemia, respiratory distress and sudden death.
New Castle	Protozoa disease that affects the linings of the alimentary canal and causes diarrhoea

Check your answers with those at the end of the course material.

2. Vaccination Methods and Proceedures

All chicken should be vaccinated against the most common diseases in your area. When you buy chicks from a reputable supplier, they come vaccinated for New Castle and Marek diseases. You will need to re-vaccinate to insure their health. Table 4.1 below shows the vaccination regime and other health measures for chickens. Refer to PI

Table 4.1: Chicken vaccination regime for Layers

Days old	Mareks	Mode of administration	Mainly for commercial
Day 10	Gumboro (1st dose)	Drinking water	Both
Day 18	Gumboro (2nd dose)	Drinking water	Both
3 weeks	New castle disease (1st dose)	Eye drop or drinking water	Layer
3 weeks (in hot spot areas)	Fowl pox	Wing web stab	Layer
6 weeks (other areas)	New castle disease (2nd dose)	Eye drop or drinking water	Layer
8 weeks	Fowl typhoid	Intramuscular injection	
18 weeks	New castle disease (3rd dose at point of lay	Eye drop or drinking water	Repeat every 3 months
19 weeks	De-worming	Drinking water	Repeat every 3 months

Table 4.2: Chicken vaccination regime for Broilers

AGE	DISEASE	VACCINE	APPLICATION ROUTE	REMARKS
Day 1	Newcastle Disease (Ncd), Gumboro (Ibd), Newcastle + Infectious Bronchitis (Ib)	Innovax Nd-Ibd Univax Bd Nd Clone 30+Ma5 /Nd C2 & Ib 491	Coarse Spray Coarse Spray	Administered At Hatchery
Day 21 (Optional)	Infectious Bursal Disease (Gumboro)	Univax Bd/ Ibd Mb Strain	Drinking Water	Done At the Farm
Day 40 (Optional; To Be Given If Birds Are To Be Kept Beyond 42 Days)	Newcastle Disease Infectious Bronchitis	Ncd+Ib	Drinking Water	Done At the Farm

Newcastle disease vaccination by eye drop

Fowl Pox wing stab method

Note

- avoid using antibiotics or their combinations on vaccination days. only multivitamins are recommended to be given.
- the above vaccination program can be adjusted depending on the field conditions and only after consultation with a qualified and competent personnel (veterinarian or poultry specialist) who is well aware of the area disease situation.
- vaccination does not guarantee absolute protection of birds against diseases. it is only one of the pillars to good poultry health if combined with balanced nutrition, bio-security and good management (stockmanship) on the farm

3. Preventive and Control of Chicken Diseases

It is important to institute a strict health program to keep chicken free of disease. It i s also important to note that chicken and chicken products can be a source of serious infection and even death to human beings. Before you continue reading complete the following activity:

Activity: 7.3

Poultry Diseases *(Time: 20 mins)*
What steps would you take to prevent poultry diseases in your flock? Write them down in the space provided below.

_____

_____

_____

_____

_____

Note: Veterinarians - are a good source of technical help, always engage them when we need to use injections.

Now check if your answer included the following preventive measures. **Best practices in chicken management** requires you to do the following:

- Stop chickens from getting into contact with disease causing organisms;
- Stop the spread of disease in a given flock;
- Stop the spread of disease between human beings and chicken;
- Recognize disease conditions at an early stage;
- Ensure that all food and drink containers are cleaned daily.
- Keep chicken house clean
- Regularly turn the litter in the first 8 weeks per the instructions in Unit 5, see Section 5.4.3
- Clean and disinfect any material or equipment being introduced into the chicken house following the instructions in Unit 5, Section 5.2.2
- After handling sick or dead birds, always wash and disinfect hands and feet. If possible, use and then replace protective gloves and boots.
- Ensure that layer and broiler pens are separate and not in close proximity.

You should always institute preventive measures that stop chicken from getting diseases by:

- Completely enclose the pen and secure it against entry of any foreign birds or rodents/ animals.
- Avoid overcrowding; make sure you have sufficient space per hen as defined in the Unit ?? housing section 2.2.
- Disinfect before you bring in new birds; refer to Section 4.4
- Keep your chicken sheds clean at all times;
- Use bedding/litter that is not dusty. Fine saw dust can cause respiratory infections.
- Observing foot dipping and hand washing at the point of entry into the chicken house;
- Giving regular vaccinations as required; See Section XX of this unit
- Disposing used litter away from the chicken house;
- Only if using the Battery Cage or Slatted Floor systems, avoiding any the build-up of droppings at all cost as this greatly increases the risk of disease causing organisms;
- Keeping your feed clean. Do not allow stray birds to enter feed sacks or your storage room.
- Controlling rodents by use of chemicals; secure the pen from rodents etc.
- Control mosquitoes as they can cause fowl pox.
- Put in place a quarantine system on the farm by doing the following:
    - Removing dead or ill birds immediately from the pen.
    - Avoiding the introduction of mature birds to the farm
    - Isolating any sick birds from the rest of the flock
    - Treating all birds as soon as a disease is detected.
    - Not keeping different species of chicken together in one farm/house.

Activity 5.4

Broader management

1. List 4 ways of vaccine administration that you have learned
   .i _
   ii _
   iii _
   iv _

2. Describe how you prepare a vial of NSD vaccine for water administration
3. Write down four things you should avoid ensure that chickens/ the vaccine is effective.

To detect early signs of disease in a flock, you should put in place a monitoring program, and check if the birds are healthy. Observe your chickens twice a day. When conducting a quick check on healthy birds you should look out for the following:

- Active and Alert
- No lameness
- No injuries or deformities
- No discharge from nostrils or eyes
- No stained feathers around the vent
- Have good plumage.

Isolate any bird immediately if it has any of these signs from the others for quick attention and treatment.

You have now come to the end of this unit on Chicken health management. Let us review what you have learned.

Activity: 6.3

Observe the Activity Photo below *(Time: 20 mins)* What vaccination is being carried out?

How often is this activity recommended in a flock? Write down other preventive measures for this disease in the space provided below.

Unit 8
Record Keeping

Introduction

Welcome to the last unit of this course on chicken production. In the last unit you learned about chicken health management. In this unit we shall look at how to prepare chicken products for the market and record keeping. As usual, let us start by reviewing the objectives of this unit.

Unit Objectives

By the end of this unit you should be able to determine the importance of keeping accurate records and the specific records you should keep to run a successful chicken farm and business

Farm Records

1. Bird Purchasing record (#, price, etc.) (L&B)
2. Feed Purchasing Record (type, quantity, price) (L&B)
3. Brooding mortality records (L & B)
4. Brooding Feed records (L&B)
5. Broiler Growth???weight
6. Pullet growth record (feed, mortality, laying??)
7. Layer Feed Records
8. Layer Production records
9. Health Check List (L&B)
10. Vaccination Records (L)

Capital Investment Records

1. Coop investment (cost, type : materials, .)
2. Feeders, Drinkers, (qty, cost, etc)
3. litter, equipment etc.

Sales Records

1. Eggs: Qty, price, customer
2. Broiler: Size, Qty, price,

8.1 : Record Keeping

It is very important to keep records of production and sale. Chicken records should be kept over a period of up to 20 weeks (for layers). Before you continue reading do the following activity.

Activity: 8.1

Activity: Record Keeping ***(****Time 15 mins.)*
List in the space provided below the information that you need to record in a poultry business. Check on the various templates available in the Practical Instructions Manual

_____

_____

_____

_____

_____

_____

Compare your answers with the information in our discussion below.

There are two types of records that are kept by chicken farmers. These are rearing records and laying records. Let us consider each in further detail.

a) Rearing Records

The information in rearing records should include the following:

- The number and cost of chicks purchased
- Quantity and value of chicken feed (chick, grower, layers, broilers rations, grit and grain.
- Mortality and value of birds (mortality should not exceed 5%).
- The number and value of birds sold
- Capital investment on buildings and equipment
- The quantity and value of eggs sold
- Depreciation of the buildings and equipment
- Depreciation of the birds.

These records help you to diagnose the weak areas in management which account for high costs of production.

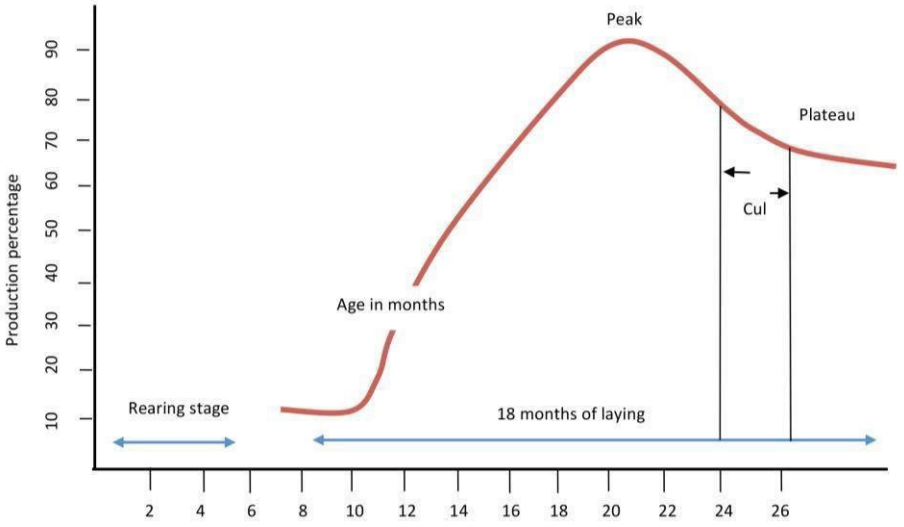
b) The Laying Records

The laying period extends from 20 weeks to the time when the flock is sold. The economic life of laying bird varies between 18 to 26 months depending on the breed, standard of management, health etc. Figure 7.1 illustrates the trend of egg production within the 18 months of laying. As you can see from this chart, egg production and quality fall with the advancing age.

It is useful to record and analyze the following parameters on the performance of the flock:

- Record egg production every week. A good layer may lay :
  - 305 eggs in 1st year
  - 130 in 2nd year for only 6 months before molting
  - By the third year they should be sold as spent chickens for meat.

Calculate the margin of eggs over feed (monthly) . You may represent this on a chart at the end of flock's production life.



NOTE: This graph is not accurate like the one you will draw from actual performance on your farm

Congratulations! You have come to the end of this unit on harvest management and record keeping. Let us review what you have learnt.

Unit Summary

In this unit we have discussed harvest management, and particularly how to prepare your eggs and meat for the market. Next we looked at the information that you should keep about your flock. We saw that the information you collect depends on whether you are rearing birds for meat or for eggs. All in all the information you collect will help you to identify weak areas and analyze the performance of your flock.

You have now come to the end of this course on chicken production. We hope you have found it interesting and informative. We wish you good luck in chicken business!

Answers to Activities

Activity 2.1

Economic Value of Chicken
Write three reasons why chicken keeping is an important economic activity :

- Provides income from the sale of chicks, meat and fertilized and unfertilized eggs;
- The feathers are used to make stuffing for pillows mattresses and quilts
- It supplement other incomes from livestock and crops
- Chicken droppings are used as livestock (ruminant) feed, as it is a rich source of non-protein nitrogen and provides protein
- Chicken manure increase soil fertility and can be sold as fertilizer
- Chicken droppings make excellent slurry for biogas production plants
- The by-products of a hatchery are used to make livestock protein supplements.
- It can generate foreign exchange earnings through the export of chicken products

Activity 3.1:

Qualities of a good chicken house
Which of the following are NOT good qualities of a chicken house? Identify them with a circle.

- Well ventilated house
- Dark and dump
- Easy to clean
- Difficult to access
- Economical to construct
- Leaking roof with big open cracks in the walls

Activity 3.2.

Sizing a Chicken House

1. The floor space of a chicken house should allow 3-4sq feet per bird. If you want to keep 1000 birds, how much floor space would you allow in your design?

   The answer is 3,000 to 4,000 sq feet.

Activity 3.3:

Chicken Housing Management System

Draw an arrow to connect a chicken housing management system with its unique feature.

Housing management system	Features
Extensive or free range system	Birds confined in arks or folds which are moved daily to fresh ground
Battery cage system	House surrounded by a wire mesh enclosure that allows birds to run freely during the day.
Fold system	Birds confined in a building and stay in doors for the whole of their life
House and run system	Birds are kept inside a cage throughout their laying period
Deep litter system	Birds roam freely in fenced ground with a simple house to provide shelter at night

Activity 4.1

Chicken Breeds

1. The following birds are all chicken breeds except?
   - RainBow
   - Kuroiler
   - Sasso
   - Bovan
   - Ducks

2. Which of the following characteristics are true of light chicken breeds? Tick the correct ones.

✓ Nervous and get upset by sudden movements
- They eat more,

✓ Mature early and get into production earlier
- They go 'broody' or try to incubate their own eggs

✓ Are smaller in body hence cheaper to maintain

✓ They have an inferior carcass
- They are quieter

Activity 4.2 NEW

XXXXXXXXXXXXXX

1. List 4 things you should check in the brooder before the chicks arrive.
   I. There is enough light
   II. The temperature is at least 32° to 35° C
   III. There are sufficient feeders and drinkers for the number of chicks
   IV. The litter is warm and it has absorbent qualities

2. List 4 things you should check when collecting chicks:
   I. That all the chicks are uniform
   II. That the chicks are alert
   III. That the chicks do not have any deformities
   IV. That the chicks do not have signs of infection

3. List four things that you should do to ensure that chicks are comfortable in the brooder.
   I. Ensure they have clean drinking water and the correct feed to eat
   II. Ensure that the temperature is well regulated and the ventilation is good
   III. Ensure that the chicks are secured from pests, cats, dogs and thieves
   IV. Ensure that they are vaccinated against diseases

Activity 5.2

Broader management

1. List 4 things you should check in the brooder before the chicks arrive.
   I. There is enough light
   II. The temperature is at least 32° to 35° C
   III. There are sufficient feeders and drinkers for the number of chicks
   IV. The litter is warm and it has absorbent qualities

2. List 4 things you should check when collecting chicks:
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   II. That the chicks are alert
   III. That the chicks do not have any deformities
   IV. That the chicks do not have signs of infection

3. List four things that you should do to ensure that chicks are comfortable in the brooder.
   I. Ensure they have clean drinking water and the correct feed to eat
   II. Ensure that the temperature is well regulated and the ventilation is good
   III. Ensure that the chicks are secured from pests, cats, dogs and thieves
   IV. Ensure that they are vaccinated against diseases

Activity 5.3

Management of Pullets, Layers and Table Birds

List at least 3 differences between layers and table birds

Type of Chicken	Main Differences Between Layers and Table Birds
Layers	Are reared for their eggs Feed on layers mash Some species make good brooders
Table Birds	Are reared for meat Feed on chick mash Can be categorized into broilers, capons and roasters

Activity 6.2

Chicken Feed Formulation

Indicate with a tick (√) whether the following statements about feed formulation and rations are True (T) or False (F)

	True	False
1. Vary the feeds you give to chicken as much as possible		√
2. Provide fresh feeds and water only once a day		√
3. Always avoid fungal infested ingredients	√	
4. For bright yellow egg yolks, give layers some greens everyday	√	
5. Introduce new feeds suddenly as need arises		√
6. Give broiler finisher to chicks of 1-3 months		√
7. Chickens of different ages require different level of nutrients	√	

Activity 6.3

Chicken feeding Systems

Draw a line to match the chicken feeding system in Column A with its correct description in Column B.

Column A	Column B
1. Wet – mash system	• All the feed ingredients are ground, mixed in the required dry proportion and fed as a single balanced mixture
2. Dry –all-mash system	• Birds are fed with green crops such as cabbages, kale,
3. Pellet or crumbles system	• The ration is mixed with a little clean water and fed to birds.
4. Dry-mash with scratch grain system/mash +grain	• Birds are allowed to get dry mash from troughs and grains from the litter.
5. Green food system	• Feeds are given in the form of pellets or crumbles which greatly reduce unnecessary wastages.

Activity 7.1

Chicken Diseases

Draw a line to match the diseases in the column A with their symptoms in Column B.

Column A	Column B
Coccidiosis	Bacterial infection that causes anaemia, respiratory distress and sudden death.
Fowl typhoid	Viral disease that causes bird to have thick mucus discharge from mouth and difficult breathing
Fowl pox	Protozoa disease that affects the linings of the alimentary canal and causes diarrhoea
New Castle	Viral disease that causes tiny wounds on the wattle and comb and ulcers in the mouth

KUROILER

The Kuroiler chicken were first introduced into East Africa through Uganda and then from Uganda into Kenya. It has good quality meat and the large number of eggs that it produces every year in local conditions . Thanks to their appetite, they put on weight very fast. The birds also have a very high survival rate compared to other exotic breeds.

Activity 7.2

Chicken vaccination and other health measures

Rearrange the column with age of birds in weeks to match with the right vaccination in the first column.

Vaccination or Health Measure	Age in weeks
Vaccination against Gumboro	10&18
Vaccination against Fowl pox,	3 weeks
Vaccination against New castle	3,6&18 weeks
Vaccination against Fowl typhoid	8 weeks
Deworming	19 weeks

NB: SALE OF BROILERS CALCULATED AT 2% - MORTALITY

Put in PI Manual

VACCINATION PROGRAMME- Commercial Layer

1.GUMBORO IBD 360/=
2.NCD IB 500/=
3.FOWL TYPHOID 580/=
4.FOWL POX 500/=
5.SOLUBLE GRIT 1500/=
6.MULTIVITS 5000/=
8.DEWORMER 500/=
9.HEATING 1000/=
10.LITTER 1500/=
11.VET SERVICES 4,000/=

Table 1.1: Estimated cost of producing 100 Commercial Layer Birds

COMMERCIAL LAYERS REARING PROJECTIONS AND COSTING.					
AGE	BODY WEIGHT	TYPE OF FEED	FEED CONSUM.	FEED INTAKE	COST OF
			WEEKLY	/ BIRD CUMM	FEEDS/WK
WEEKS	GRAMS			G/BIRD	/BIRD CUM
1	75	CHICK AND DUCK	0.11	0.77	**63.91**
2	130	CHICK AND DUCK	0.17	0.196	**16.268**
3	195	CHICK AND DUCK	0.22	0.35	**29.05**
4	275	CHICK AND DUCK	0.28	0.546	**45.318**
5	367	CHICK AND DUCK	0.35	0.791	**65.653**
6	475	CHICK AND DUCK	0.41	1.078	**89.474**
7	583	CHICK AND DUCK	0.47	1.407	**116.781**
8	685	CHICK AND DUCK	**0.51**	1.764	**146.412**

REARING 100 LAYERS CHICKS

DAY OLD PURCHASING PRICE 130/= KHS 13,000.00

CHICK AND DUCK MASH 1.764KGS = KSHS 12,322 (FOR 100 CHICKS)

9	782	GROWERS MASH	0.55	2.149	**165.473**
10	874	GROWERS MASH	0.58	2.555	**196.735**
11	961	GROWERS MASH	0.6	2.975	**229.075**
12	1043	GROWERS MASH	0.64	3.423	**263.571**
13	1123	GROWERS MASH	0.65	3.878	**298.606**
14	1197	GROWERS MASH	0.68	4.354	**335.258**
15	1264	GROWERS MASH	0.7	4.844	**372.988**
16	1330	GROWERS MASH	0.71	5.341	**411.257**
17	1400	GROWERS MASH	0.72	5.845	**450.065**
18	1475	GROWERS MASH	0.75	6.37	**490.49**
19	1555	GROWER+LM	0.81	6.937	**554.96**
20	1640	GROWER +LM	0.93	7.588	**607.04**

GROWERS MASH 5.48KGS , KSHS 317.80 (FOR 100 Pullets).

LAYERS MASH UP AS FROM 20TH WEEK (Ref to feeding)

SUB TOTAL KSHS.44,102

Table 1.1: Estimated cost of producing 100 Commercial Layer Birds

COMMERCIAL LAYERS REARING PROJECTIONS AND COSTING.					
AGE	BODY WEIGHT	TYPE OF FEED	FEED CONSUM.	FEED INTAKE	COST OF
			WEEKLY	/ BIRD CUMM	FEEDS/WK
WEEKS	GRAMS			G/BIRD	/BIRD CUM
1	75	CHICK AND DUCK	0.11	0.77	63.91
2	130	CHICK AND DUCK	0.17	0.196	16.268
3	195	CHICK AND DUCK	0.22	0.35	29.05
4	275	CHICK AND DUCK	0.28	0.546	45.318
5	367	CHICK AND DUCK	0.35	0.791	65.653
6	475	CHICK AND DUCK	0.41	1.078	89.474
7	583	CHICK AND DUCK	0.47	1.407	116.781
8	685	CHICK AND DUCK	0.51	1.764	146.412
9	782	GROWERS MASH	0.55	2.149	165.473
10	874	GROWERS MASH	0.58	2.555	196.735
11	961	GROWERS MASH	0.6	2.975	229.075
12	1043	GROWERS MASH	0.64	3.423	263.571
13	1123	GROWERS MASH	0.65	3.878	298.606
14	1197	GROWERS MASH	0.68	4.354	335.258
15	1264	GROWERS MASH	0.7	4.844	372.988
16	1330	GROWERS MASH	0.71	5.341	411.257
17	1400	GROWERS MASH	0.72	5.845	450.065
18	1475	GROWERS MASH	0.75	6.37	490.49
19	1555	GROWER+LM	0.81	6.937	554.96
20	1640	GROWER +LM	0.93	7.588	607.04

REARING 100 LAYERS CHICKS

DAY OLD PURCHASING PRICE 130/= KHS 13,000.00

CHICK AND DUCK MASH 1.764KGS = KSHS 12,322 (FOR 100 CHICKS)

EQUIPMENT REQUIREMENTS

1. FEEDERS 2PCS @ 1200
2. AUTOMATIC DRINKERS BELL SHAPED 1PC X 1750/-
3. CHICK FOUNTS 2PCS X 450/= 900
4. LABOUR 6 MONTHS, KSHS 14,000
5. MISCELLENIOUS EXPENSES 5,000/=

SUB TOTAL: **KSHS 22,850**

The total cost inclusive of labor is Kshs **95,392** for raising 100 commercial layers exclusive of the cost of the chicken coop

To help you make a comparison of the profitability of commercial layers versus broiler chicken projects, we have worked out the production cost of 100 broilers in Table 1.2 below.

Table 1.2 **COMMERCIAL BROILER PRODUCTION**

ESTIMATE COST OF 100 BROILER CHICKENS		
ITEM	QUANTITY	COST (Kshs)
Cost of Chicks	@ Ksh 100	10,000
Day 1 to (vitamins + grit + liquid + glucose)		800

Feeds

AGE IN DAYS	Average Weight /BIRD	Feed Conversion Ratio	Feed eaten cumulatively (PER BIRD)
7	193	0.76	145g
14	528	1.03	541g
21	1018	1.22	1239g

Relating the table and the pictures, **Broiler Starter feed** is used the first 3 weeks when the birds are being provided with heat. Each bird will use 1239 grams before changing to Broiler Finisher at the start of 4th week where it consumes 2160 kg upto 5 weeks when it is sold

VACCINATION PROGRAMME-Broiler

1.GUMBORO IBD 360/=0
2.NCD IB 500/=0
3.FOWL TYPHOID 580/=0
4.FOWL POX 500/=0
5.SOLUBLE GRIT 0/=
6.MULTIVITS 1000=
8. DEWORMER 500/=0
9. HEATING 1000/=1000
10. LITTER 1500/=
11. VET SERVICES 4,000/=0

AGE IN DAYS	Average Weight /BIRD	Feed Conversion Ratio	Feed eaten cumulatively (PER BIRD)	Cost/Kg OF FEED	AMOUNT for that Wk (SHS)
7	193	0.76	145g	93	**13.48**
14	528	1.03	541g	93	**50.31**
21	1018	1.22	1239g	93	**115.23**
28	1615	1.37	2209g	87	**192.18**
35	2273	1.5	**3399g**	87	**295.71**
42	2952	1.61	4760g	87	**414.12**
45	3240	1.67	5414g	87	**471.02**

Broiler Finisher at the start of 4th week where it consumes 2160 kg up to slaughter at 5 weeks. A lot of feed can be saved if birds are sold at 5 weeks when sold live to the market.

VACCINATION PROGRAMME-Commercial Layer
1.GUMBORO IBD 360/=
2.NCD IB 500/=
3.FOWL TYPHOID 580/=
4.FOWL POX 500/=
5.SOLUBLE GRIT 1500/=
6.MULTIVITS 5000/=
8.DEWORMER 500/=
9.HEATING 1000/=
10.LITTER 1500/=
11.VET SERVICES 4,000/=
SUB TOTAL = 15,440/=

Miscellaneous {Estimates}

Feeders Waterers Wood shavings Source of heat Labour Vitamins & drugs ***TOTAL COST FOR 100***		2,000
BROILERS		***38,000***

One bird (1.239 kg costing seventy (70) shillings per kilo starter and 2.16 kg consumed costing 68shillings per kilogram totaling approximately 250 shilling per bird for the whole growing period.
Purchase of baby chick Kshs 100
Allow 30 shillings minimum for vaccines and all vitamins and labor

Gross Margin/ Profit analysis

Expenditure Cost of starter feed Cost of starter Cost of day-old chicks heat Labor Vitamins & drugs ***TOTAL COST FOR 100***		38,000
BROILERS		***38,000***

Selling price for a broiler at **5 weeks** is Kshs **550**. The cost of raising the broiler is Kshs **380**. Profit is what remains after Costs are subtracted from the sales i.e. (Kshs550 minus Kshs 380). Gross profit per bird is **Kshs 170**.

Preparing Chicken Meat

The preparation of chicken meat has three main steps, namely, dressing, plucking and drawing. Let us look at each in further detail.

Dressing chicken
Once you slaughter a bird,

Plucking

- Immerse the bird in boiling water for 1 minute. Remove the bird from the water and pull the wing feathers. If you scald the bird too long, the skin will come off when you pluck. If the feathers are difficult to pluck, scald the next birds 15-300 seconds longer.
- Hold the bird firmly on a sheet of paper and pull the feathers down towards the head. Pluck 2 or 3 feathers at a time.
- Remove the feathers and hair as quickly as possible by turning with a piece of cloth or paper
- Use a piece of cloth to clean the bird.

Drawing/ Cut ups

- Lay the bird on its back and cut off the head;
- Hang the bird for approximately 10 minutes allowing the blood the drain out.
- pluck...scald
- Make a slit is along the underside of the neck and pull the skin towards the body;
- Cut off the neck close to the body;
- Remove the crop and wind pipe;
- Dislodged the entrails by pushing your fingers through the neck opening;
- Enlarge the vent with a knife and pull out the entrails;
- Remove the bitter gall bladder from the liver, and then remove and put aside the liver, heart, gizzard and neck; these are consumable and sell-able.
-
- Using a damp cloth, wipe the bird both inside and outside;
- Make a slit around each drumstick to expose the tendons, and then pulled them out;
- Cut the feet off and sell them or discard them per local customs.
- Twist and break the legs;
- The carcasses can then be sold to consumer through hotels, and supermarkets etc.

- We hope you now understand how to prepare your chicken eggs and meat for the market. Next let us look at the information you should record about your flock. A section on **Marketing /Selling broilers and Eggs** is included in the Practical Instructions Manual- food safety, refrigeration, premise sanitation requirements by Authorities and inspection processes are demonstrated in detail