

# HATCHING HOPE



TRAINING MANUAL

## Local Chicken Production



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# Introduction

## Why poultry?

Poultry is one market linkage that offers a strong potential for both economic engagement for farmers and increasing nutrition for vulnerable populations. With a growing global demand for chicken meat and eggs, there is an excellent opportunity to stimulate the supply side through appropriate interventions and support. Poultry is a great option for smallholder farmers in rural areas to increase their incomes and meet the growing demand for protein.

The opportunities associated with poultry are many: all members of the household can be engaged in production, particularly women, youth and the elderly, and because the growth cycle is relatively fast-paced, poultry can deliver quick income opportunities for households across diverse environmental landscapes. Access to chicken meat and eggs provides an excellent nutritional source particularly for children, and can rapidly help improve daily diets.

## Why Hatching Hope?

This is why Hatching Hope, an innovative initiative co-created by Cargill and Heifer Project International is grounded around both the power of poultry **and** the smallholder farmer.

Hatching Hope will:

- Introduce poultry farming to households currently not involved in the poultry value chain
- Improve production among small to medium poultry producers and other value chain actors
- Provide access to markets
- Promote the consumption of poultry and eggs by those who are most nutritionally vulnerable, especially young children and women of reproductive age

Hatching Hope targets rural agricultural households based on income and assets; level of food security and nutrition; women's economic empowerment; environmental factors and social capital.

This innovative initiative has a bold and transformative goal of **improving the nutrition and economic livelihoods of 100 million people by 2030**. *How is Hatching Hope going to reach this goal?* With inspiring, dedicated, passionate and hardworking farmers like **you**. With your partnership and drive to improve the nutrition and economic livelihoods of your family and community we will reach our goal and improve the lives of many. With this farmer manual and the in-location support from our Cargill and Heifer Project International's teams, we will continue to work with you and your community until sustainable change has been made through the production, consumption and promotion of chicken meat and eggs.

**The results:** Farmers prosper. Family nutrition improves. Communities are enriched. And business grows.

# Chicken Management Systems

## Introduction

There are three common chicken management systems practiced in villages around the world:

- Traditional free-range
- Improved free-range
- Small-scale confined

**Table 1: Characteristics of the common management systems**

Traditional free-range	Improved free-range	Small-scale confined
<ul style="list-style-type: none"><li>• 1-10 chickens</li><li>• Low input / low output</li><li>• Majority of rural families</li><li>• Owned mostly by women</li><li>• Home consumption</li><li>• Small cash income</li><li>• Social and cultural importance</li><li>• Local breeds</li><li>• Self-financed or inherited</li><li>• High mortality</li><li>• No feeding (scavengers)</li><li>• No vaccination</li><li>• No medication</li><li>• No housing</li><li>• Long broody periods with low growth rates (5-10g per day)</li></ul>	<ul style="list-style-type: none"><li>• 5-50 chickens</li><li>• Low input / low output</li><li>• Owned by women and families</li><li>• Home consumption and for sale at local markets</li><li>• Family income</li><li>• Social importance</li><li>• Local and improved breeds</li><li>• Micro credit</li><li>• Moderate mortality</li><li>• Supplementary feeding</li><li>• Newcastle Disease Vaccination or Fowl Pox</li><li>• Little medication</li><li>• Simply housing</li><li>• 50-150 eggs per hen per year</li><li>• Short broody periods</li><li>• Growth rate of 10-20g per day</li></ul>	<ul style="list-style-type: none"><li>• 50-200 chickens</li><li>• High input / high output</li><li>• Few rural families</li><li>• Business owners</li><li>• Little social importance</li><li>• Hybrid chickens</li><li>• Credit based on assets</li><li>• Low mortality</li><li>• Balanced feed</li><li>• Several vaccinations</li><li>• Complete vaccination protocol</li><li>• Deep litter, cages</li><li>• 250-300 eggs per hen per year</li><li>• No broodiness</li><li>• Growth rate 50-55g per day</li></ul>

## Free-Range Production System

### Free-Range Production System Constraints

- Low productivity (about 3-4 clutches of 10-12 eggs per year)
- Young chicks compete with adult chickens for feed
- High rates of death due to predators
- High rates of disease
- Less water provided
- No nests
- Low hatchability due to disturbances
- Long broody periods
- Local inputs often not available (feed, medication, vet services, training)

## **How to Improve Productivity of Free-Range Chickens**

- Give leftover household food, insects, and high energy-based food to free-range chickens as supplementary feed. Poor quality feed reduces chickens' fertility.
- Wean chicks (4-6 weeks) early from hens.
- Place laying nest in a dark location to enhance egg laying, and dust the nest periodically.
- Provide ad libitum amounts of drinking water.
- Regularly dewormed against parasites and vaccinated against Newcastle Disease and Fowl Pox.
- Provide good and appropriate housing.

# Nutrition

## Do's and Don'ts

### Do

- Feed chickens to meet their energy needs. Additionally, feed chickens to meet their nutrient requirements for their life stage for protein, energy, calcium, phosphorus, vitamins and minerals.
- To optimize feeding regimens feed chickens ad libitum. This allows them to eat as much as they wish. Another feeding system option is timed or meal feeding where chickens are without food for short periods to stimulate feeding. If using to time, try to feed 3 times per day.
- Keep feeding and watering areas and equipment clean. Disinfect regularly and eliminate waste.
- Store feed in a cool dry area away from pests.
- Provide plenty of fresh water.
- Monitor litter to ensure proper digestion is occurring.

### Don't

- Don't ignore the temperature. As temperatures rise high enough to cause heat stress, mortality increases and feed intake and conversion reduces. Avoid heat stress by keeping chickens out of direct sunlight and make sure to keep clean water available at all times in the shade. In colder climates birds will need to use more energy through greater feed intake or higher energy density in the diet.
- Don't feed moldy, oxidized or contaminated feed. Pay attention to feed conditions and dispose of spoiled rations. Visually inspect and smell the feed to verify freshness.
- Don't allow feed ingredients to separate. Be sure the various ingredients are mixed well and that chickens are not sorting.
- Don't feed only one ingredient, chickens need protein, energy, vitamins and minerals in a balanced ration.

## Nutritional Requirements for Chickens

Chickens need feed with all the required nutrients for growth, meat or egg production, maintenance of body functions and resistance to disease. To perform these functions, the diet should contain adequate amounts of carbohydrates, proteins, minerals, vitamins, fat and water.

The daily feed ration should provide all the nutrients, listed below in *Table 2*, in the correct proportions, according to the age and physiological state of the chicken. Lack or shortage of a single nutrient can lead to poor growth, reproduction and/or increased susceptibility to diseases.



## Six Classes of Nutrients

**Table 2: Major nutrient requirements for chickens and their functions**

Type of nutrient	Function	Sources (see Table 5)
Carbohydrates (CHO)	<ul style="list-style-type: none"> <li>To provide energy</li> <li>Maintenance of body temperature</li> </ul>	Maize and its by-products (bran), sorghum and their by-products, wheat and its by-products (bran), rice and its by-products (bran), tubers and roots such as cassava, sweet potatoes
Protein	<ul style="list-style-type: none"> <li>Body building by replenishing body organs, muscles and fluids</li> <li>Reproduction</li> <li>Formation of enzymes that regulate physiological processes</li> </ul>	<i>Animal protein:</i> maggots, termites, eggs, insects, worms, meat scraps, fish scraps, fish meal, meat meal, bone meal, blood meal, feather meal <i>Plant protein:</i> peas, beans, pumpkin seeds (after removing the outer shell), sesame seeds, sunflower seeds, ground nuts and oil cakes from e.g. ground nuts, cotton seeds, sunflower, soy bean, palm kernels and coconuts
Fats	<ul style="list-style-type: none"> <li>Provides energy</li> <li>Maintenance of body temperature</li> <li>Enhances availability of certain vitamins, such as A, D, E, K</li> </ul>	Oil cake meals and fish oil
Minerals (especially calcium and phosphorus)	<ul style="list-style-type: none"> <li>To build bone</li> <li>To build egg shells</li> <li>To assist in chemical reactions in the body</li> <li>Growth and development</li> </ul>	Limestone, bone meal, crushed oyster shells, snail shells and burned eggshells and bone meal
Vitamins	<ul style="list-style-type: none"> <li>To build resistance to diseases</li> <li>To maintain body functions</li> <li>Growth and development</li> </ul>	Green grass, vegetables, fresh cow dung and through sunlight
Water	<ul style="list-style-type: none"> <li>Essential for all body functions</li> </ul>	

## Feeding

### Feeding Confined Commercial or Hybrid Chickens

- Confined chickens should consume balanced rations as they have no opportunity to satisfy their needs through scavenging.
- Chickens should consume balanced or formulated feeds, ensuring they get the right type of feed for their age and physiological needs. Provide chicks, growers and layers with chick mash, growers feed and layers feed respectively.
- Feed can be made at home to ensure all desired nutrients are included. In addition to feed rations, hang greens in the chicken house to provide nutrients and discourage vices such as cannibalism and egg eating.
- Introduce new types of feed gradually by offering a mixture of the existing feed and the new feed for several days, increasing the quantity of the new feed and decreasing the previous feed.
- Additional guidelines for feeding confined chickens:
  - A mature chicken requires about 75g of commercial feed per day
  - Provide fresh feed daily to avoid contamination
  - Feeders should be large enough to allow all chickens access to feed. If they are too small, weak chickens will be pushed away by the stronger ones, stunting their growth.

- Minimize feed waste and contamination by using feeders that don't allow chickens to sit in or scratch into the feeder
- Fill feeders 1/3 full to minimize spillage
- Clean the feeders regularly

## Supplementary Feeding

Table 3 outlines the amount of feed needed for the flock for a day and for a month. This helps with planning ahead for maintaining a continuous stock.

**Table 3: Amounts of required supplements for scavenging and confined chickens**

Age (weeks)	Approximate amount of supplementary feed given to a scavenging chicken per day (gram dry weight)	Approximate amount of feed given to a confined chicken per day (gram dry weight)
1 week	10-15 grams	12-15 grams
2 weeks	15-20 grams	15-21 grams
3 weeks	21-30 grams	21-35 grams
4-6 weeks	30-40 grams	35-50 grams
7-16 weeks	30-40 grams	55-60 grams
16-27 weeks/grower	30-50 grams	65-80 grams
28 week/adult	30-50 grams	100-150 grams, depending on the size of the chicken

Table 4 shows how to calculate the amount of supplementary feed needed per day based on a flock of 1 rooster, 4 hens, and 15 three-week-old chicks.

**Table 4: Simple calculation on how much feed is needed per day as supplement**

Chicken category	Amount of supplementary feed needed per day
1 rooster: 35 grams =	35 grams
4 hens: 4 x 35 grams =	140 grams
15 chicks: 15 x 25 grams =	375 grams
Total =	At least 550 grams per day

- Supplementary feed is used to add needed nutrients on top of what chickens are already consuming from scavenging to ensure a nutrient balanced diet. It is not meant to replace scavenging.
- Supplementary feeding is different for semi-scavengers and confined systems of production.
- The best time for supplementary feed is in the morning and in the evening when the chickens return to the house according to scavenging patterns.
- The day's ration should be provided in at least 2 feedings, fed in equal amounts.
- Provide free access to water in shady areas at all times of the day to avoid heat stress.

### What can be used for supplementary feeding?

- The composition and availability of feeds will vary, depending on the season, geography and farming system.
- The need for feed will change depending on the age and status of the chicken (chicks, growers, egg layers, brooding hens) and of the purpose of the production (meat or eggs).
- The cheapest and often the best way to supplement a chicken's diet is to use local feed resources; however, this might be difficult if large quantities of feed are needed.



- Give chicks premixed supplementary feed from the market during the first 4-6 weeks of age increases their survival and growth rate of chicks.

## Feeding Scavenging Chickens

- Local chickens under a semi-scavenging system get their feed mainly by scavenging for insects and waste grains scattered in the farm and around the homestead, food leftovers, green vegetation and water supplied by the farmer.
- The economic advantage of free-range or improved free-range systems is that chickens find most of their feed when scavenging in the surroundings, decreasing the costs of feed. The scavenging feed resources will change depending on the season, climate, geography and farming systems. Depending on the season, chickens may find almost all they need from scavenging alone (e.g. during harvest or rainy season) or close to nothing (during dry and lean season).
- Scavenged feed can be deficient in some of the essential nutrients. The best time for scavenging is early morning and late afternoon, as there are more insects and less heat.
- To ensure the chickens get adequate feed with the required essential nutrients, supplementary homemade feeds are recommended.

### Simple Techniques for Producing Protein Rich Feed for Scavenging Chickens

Earthworms, maggots, insects, termites and cockroaches are good sources of protein for scavenging chickens. These can be produced in the following ways:

- Maize germ mixed with water makes it cloggy enough to attract insects.
- Branches, grass and rubbish collected in heaps on the ground will be colonized by different types of insects. The material can be turned and the chicken can scavenge beneath. Having several of such heaps provides a continuous source of protein for scavenging chickens.
- Heap branches and plants to attract termites.
- Heap cow dung to attract insects.
- Growing plants such as *Leucaena leucocephala* and *Sesbania Sesban* as a source of protein. In this case, their leaves are dried and then crushed before feeding to the chickens.

## Simple Feed Mixing

- To ensure a balanced diet for the small chicks (0-6 weeks), allow locally available ingredients to dry in the shade (the sun may destroy important vitamins) before mixing.
- For easy measurement of the different ingredients, use locally available containers such as tins, cups or matchboxes (see *Table 6* below). Grams or percentages should be translated into local quantities for field practice.
- Large quantities of ready-mixed feed should only be stored if adequate storage options are assured.
- Use *Table 5* as a reference for mixing feeds, it outlines the level of essential nutrients for common feed resources.
- For example, As it can be seen from *Table 5*, young chicks need a cereal grain. For older chickens, some of the cereal grain can be substituted with cereal residues like bran or hulls depending on the area, availability, and price.
- *Table 6* provides an estimated amount of each ingredient required to make a given volume of feed, and in result helps determine the cost.
- All age groups will need to be fed some kind of protein source. Again area, availability, and price will determine which one is best for the flock.

- There can also be problems in using too high concentrations of some ingredients. Harmful substances in some feeds can cause problems if fed in excessive amounts, or they may contain anti-nutritional components and should not be fed in raw form.

## Common Ingredients

**Table 5: Common sources of essential nutrients for chickens**

Feed ingredient	Protein	Energy - CHO	Energy - Fats	Minerals	Vitamins
Animal based fats	None	Low	High	None	None
Barley	Low	High	Low	Low	Low
Beans	Medium	High	Low	Low	Medium
Blood Meal	High	Low	None	High	Medium
Bones	None	None	None	High	None
Cassava tuber	Low	High	None	None	Low
Cotton seed cake	Medium	Medium	Low	Low	Low
Cow peas	High	Medium	Low	Low	Medium
Eggshell	None	None	None	High	None
Fish meal	High	Medium	Medium	High	High
Grass	Low	Low	Low	Low	Medium
Groundnuts	High	Medium	High	Low	Low
Groudnut oil cake	High	High	Low	Low	Low
Insects	High	Medium	Medium	High	High
Insect larvae	High	Medium	Medium	High	Medium
Maggots	High	Medium	Medium	High	Medium
Maize bran	Low	Medium	None	Low	Low
Maize grain	Low	High	Low	Low	Low
Millet	Low	High	Low	Low	Low
Millet bran	Low	Medium	None	Low	Low
Oats	Low	High	Low	Low	Low
Plant oil	None	High	High	Low	Low
Potatoes	Low	High	None	Low	Low
Rice	Low	High	Low	Low	Low
Rice bran	Medium	Medium	None	Low	Low
Rice hulls	Low	Low	None	None	Low
Rye	Low	High	None	Low	Low
Sesame oil cake	High	Medium	Low	Low	Low
Sesbania leaves	Medium	Low	Low	Low	Low
Sorghum bran	Low	Medium	None	Low	Low
Sorghum grain	Medium	High	Low	Low	Low
Soya bean	High	Medium	High	Low	Medium
Soya bean meal	High	Medium	Medium	Low	Medium

**Table 6: Examples of composition of 1 Kg feed mixture for local chickens at different ages**

Age	Cereals: millet bran, sorghum bran, rice bran (g)	Oil cake, e.g. sunflower or cotton (g)	Meat, blood or fish meal (g)	Cassava tubers (g)	Total (g)
0-8 weeks	700	200	100	-	1000
9-20 weeks	650	150	50	150	1000
> 20 weeks	600	100	100	200	1000

### Guidelines for Including Different Ingredients in Supplementary Feeds

- Beans and peas contain anti-nutritional components and should be dried in the sun or cooked for a short period to deactivate these inhibitors (chick pea and pigeon pea are exceptions and can be fed raw after crushing). Untreated soya bean can cause digestive problems in chickens, resulting in low growth or death.
- Cassava tubers contain cyanide, which is toxic; the tubers must be sliced and dried in the sun before being fed to chickens.
- Fish meal can give a fishy taste to meat and eggs and should therefore be given in moderation.
- Energy rich feeds usually form the largest part of the diet (60-75%) followed by protein (about 15- 20%) while various minerals and vitamins are only needed in very small quantities with the exception of calcium for laying hens. For layers, the formation of the egg shell requires a higher level of required calcium compared to non-laying chickens (at least 8%).
- Oil cakes may contain much fiber and oil which lowers digestibility and should therefore be given in limited amounts to young chickens (less than 10% of the diet).
- Eggshells should always be scorched or cooked before re-use in diets to remove any potential disease and to prevent creating egg eating habits for the chickens.
- Confined chickens always need additional vitamins mixed into their feeds or as a minimum given some green grass and vegetables.
- Use local feed ingredients for local chickens. Commercial premixed feeds are more expensive but are more uniform in their quality and thus more suitable for commercial breeds.
- Know the quality or feed value, and change prices of each feed ingredient.
- Purchase missing feed ingredients, such as vitamins or protein sources.
- Change the feed formulation depending on availability, quality, feed value, and varying prices.
- If changing feed and feeding level, always do it slowly and gradually.
- Mix feed ingredients consistently and store small quantities to avoid extended storage time. In general, mixed feed should not be stored for more than 4 weeks to avoid contamination from mold, bacteria, or rodents.
- Store mixed feed and feed ingredients separately high above the floor to avoid flooding, entry of rats, or other types of birds from contaminating. Ensure proper ventilation of air so the feed ingredients are not tainted from humidity.
- Quality control: Be careful that feed ingredients that are moldy, discolored, or from which pests or rodents have eaten, are not used.
- Fresh feed should be provided daily rather than large heaps being provided for several days.
- Feed should be distributed in feeders to avoid contamination. Clean the feeders daily before refilling. Using the right feeders will minimize fecal contamination, see *Figure 4* for an example.
- Feed offered to chicks such as cereals and beans should be crushed or ground to ease swallowing (not so fine to be powder as it can cause digestive issues for chickens).

- Chicks have limited capacity to ingest and digest high fiber feedstuffs.
- Simple procedures can improve the nutritional value of certain feedstuff. E.g. Beans and pea seeds can be placed in a covered moist container (if mold grows due to moisture, you must discard) to allow germination before being fed to chicks. Cereals can be soaked overnight to improve their digestibility. These treated feeds should be fed to the chickens immediately to avoid becoming moldy.

## Water Management

Water is vital for softening of feed and for the bodily function of chickens. Deprivation of water may result in dehydration and potentially death. Ensure the chickens have access to clean water. By placing waterers in different locations around the homestead or at usual feeding points.

- Clean water should always be available to free range and confined chickens. Chicks die quickly without access to water.
- An adult chicken drinks about 250 mL a day and more during hot weather. When it is hot, keep the water as cool as possible by placing waterers in the shade.
- Water should be introduced in small quantities if for some reason it was not accessible to chickens during the day and is to be provided at the end of a hot day.

# Chicken Management

## Do's and Don'ts

### Do

- Follow vaccination and de-worming programs. (See [Health section](#))
- Provide protection against predators and extreme temperatures.
- Use safe and sustainable methods for manure management.
- Keep equipment, nests and those entering the chicken house as clean as possible.
- Regularly check in on the chickens.

### Don't

- Don't build chicken houses near drinking water sources to avoid contamination.
- Don't allow vegetation to grow near the chicken house to avoid predators and diseases.
- Don't dispose of manure near the chicken house to avoid disease.
- Don't reuse equipment and nests to ensure a clean living environment.

## Introduction

Eggs hatch after 21 days. Chick rearing should focus on increasing survival of hatched chicks and increasing their growth rate, according to their genetic potential. After hatching, the hen should stay with the newly hatched chicks for at least 3 weeks or when they are old enough to be on their own. During this period, the hen protects the chicks directly from adverse weather conditions, predators and indirectly from diseases for the first 2 weeks via antibodies in the yolk; and slowly she transfers her natural instincts to the chicks. Natural instincts include knowing how to search for food and water, which feed to eat and which to avoid, how to avoid predators by hiding or seeking shelter, how to keep healthy by dust bathing, etc.

The following key management practices will increase the survival of young chicks:

- Confining chicks for the first 12-16 weeks depending on production practices.
- Following a vaccination and de-worming program against common diseases and parasites.
- Providing sufficient balanced rations during the first 3-6 weeks of life and supplementary feed during the remaining rearing period to allow the chickens to develop in accordance with their genetic potential.
- Providing adequate protection from predators and extreme temperatures.

## Farm Hygiene

In order to maintain high hygiene standards in a flock, the following practices are recommended:

- Remove chicken litter from the house regularly and add new bedding whenever the litter is wet.
- Manure from the house should be used for making compost. If not composting, be sure it is disposed far away from the house and disinfected whenever possible to avoid disease build up.
- Clean the vegetation around the house to keep rats and predators away.

- All equipment must be kept as clean as possible.

## **Protecting Chickens from Disease**

The following steps should help to minimize exposure of chicks to diseases and parasites:

- Clean and disinfect nests after each laying period to minimize spread of diseases.
- Treat brooding hens from external parasites to avoid infestation of the newly hatched chicks.
- Regularly check the chicks for blood sucking parasites (e.g. lice and fleas) and treat as soon as infestation is noticed.
- House with young chicks should be separated from the rest of the flock.
- Practice recommended vaccination and de-worming of chicken regularly. For local chicken, vaccination against Newcastle Disease and Fowl Pox is very important.



# Housing

## Do's and Don'ts

### Do

- Select appropriate location for constructing a chicken house.
- Construct the chicken house according to the number of chicken you are planning to raise. You can always expand as and when needed.
- Use materials that are locally available to be more cost effective.
- Apply appropriate roofing and ventilation while constructing chicken house.
- Include sufficient numbers of nest boxes, perches, waterers and feeders based on the number of chickens you are raising.

### Don't

- Don't build your chicken house in low land areas to prevent flooding or water logging.
- Don't overpopulate the chicken house.
- Don't keep the chickens inside the house all day. Provide a closed space around chicken house for the chickens to roam.
- Don't forget to clean the chicken house regularly.

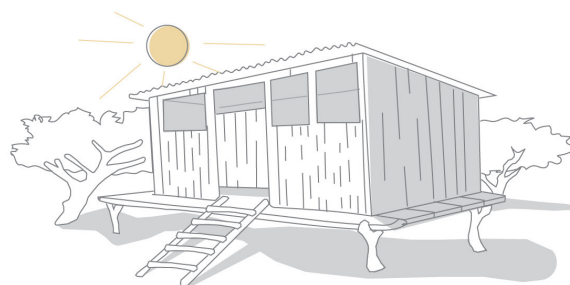
## Constructing a Chicken House

### Factors to consider when selecting a location for chicken house

The ideal location for a chicken house is flat, dry, shady and raised off of the ground. If the place is vulnerable to flooding, dig a drain around the house or raise the house above the ground, because wet floors may lead to disease.

- For security purposes, it is important to have the chicken house near the living house.
- When constructing a chicken house, the natural sun and wind movements must be considered to ensure it is shaded and well ventilated. In most locations it is best to select a site where the chicken house faces South or East. Windows placed on the south side of the house will be a good source of light and warmth during the cold weather and a good source of ventilation in hot weather. In a rectangular house the end walls must face East and West (*Figure 1*). This will ensure that only the end walls face the hot morning sun and afternoon.

**Figure 1: East-West orientation of a chicken house**



## Construction Guidelines

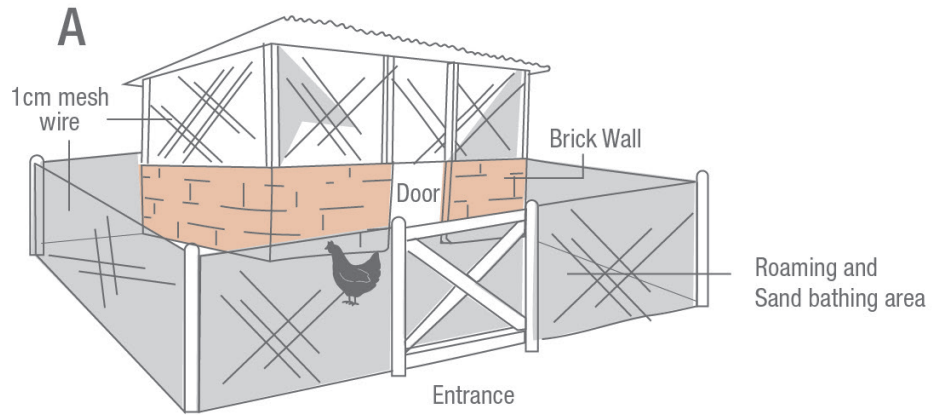
Always use the cheapest and most appropriate materials available like bamboo, wood, reeds, mud, thatch grass, or clay brick.

- The size of the house will depend on the number of chickens it will house. The house has to be large enough so there is sufficient room for the chickens, and so the air inside does not become heavy with humidity and gas. Space for an overnight shelter should be at least 5-6 local chickens per square meter. For semi intensive and intensive system, the house should provide a space of 4-5 chickens per square meter.
- Remove the bark from the wood used for construction of the houses, as parasites often hide behind the bark.
- Provide ventilation to reduce heat, humidity, and harmful gases. High temperatures can cause death or decrease egg production, low shell quality, and reduced weight gain. A combination of high temperatures and high humidity can kill young chicks.
- The house should protect the chickens from rain, wind, predators and other adverse weather conditions.
- Depending on geography, weather and specific sites of construction, chicken houses should be raised at least 60 cm above the ground. This will protect the chickens from predators and minimizes wet floors.
- Put inverted metal cones around the supporting poles to prevent rats and snakes from climbing into the house, if necessary.
- For Intensive systems where there is poor drainage, it is important to raise the house above the ground and build a slatted floor. A slatted floor will help reduce spread of infectious diseases in the flock and makes it easier to clean the house.
- Where the floor is slatted, the spacing between slats should provide adequate space for the feet while allowing the droppings to fall through.
- The door of the house should allow an adult person to clean, collect eggs and carry out other management practices.
- Install a lock on the door to prevent theft.
- Spray lime wash on the house after cleaning to disinfect and reduce parasite eggs on the wall and in the cracks. Place ashes or dry lime in a deep liter, on the floor and in the nests to prevent parasites.
- Chicken houses can also be constructed from mud, if using this method, use wire-meshed windows to avoid predators. The wire mesh can also be constructed from woven sticks.
- Ensure there are no sharp-edged objects that could cause injury to the chickens.
- A good chicken house:
  - Allows plenty of air to move in and out of the house.
  - Protects the chickens from wind, rain and the hot weather.
  - Provides a good comfortable place to rest.
  - Protects the chickens from wild animals and other predators during the night.
  - Is easy to clean and manage.
  - Has plenty of room for the chickens to move around.
  - Provides a comfortable place for laying eggs.
  - Uses a separate area for sick chickens.

- Includes a perching area.
- Has a place for feeding and drinking.

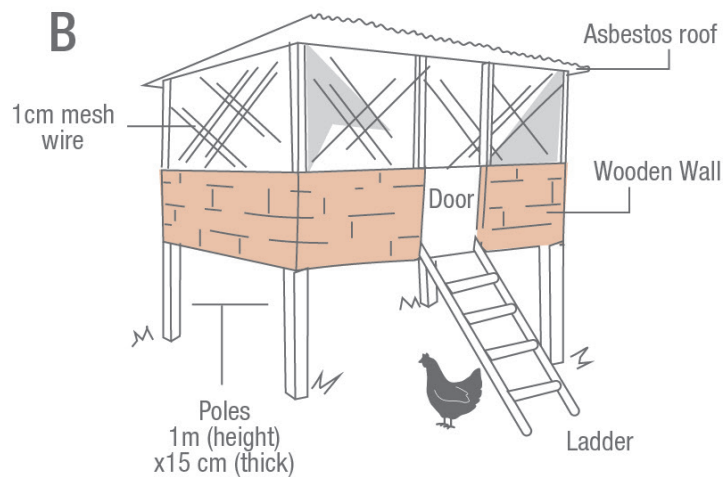
## Different Housing Designs

**Figure 7: Chicken House A**



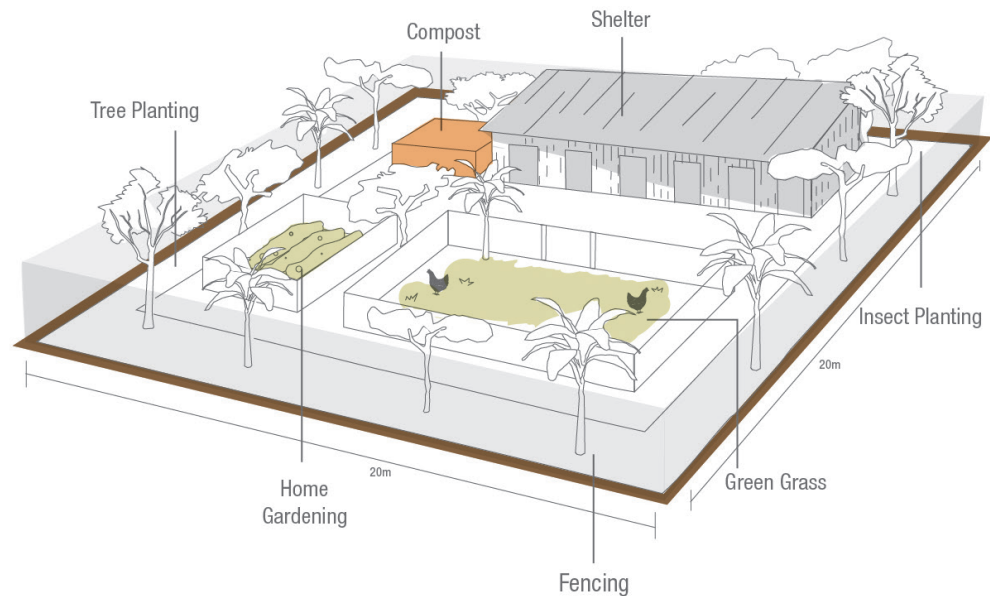
A chicken house with free space outside where the chickens can graze and exercise

**Figure 8: Chicken House B**



An elevated chicken house where chickens are housed at night to prevent predators, floods, and extreme heat

**Figure 9: Chicken Production Model**



## Routine Maintenance Practices for Chicken Houses

The following are important management practices for a chicken house. The frequency is guided by the type of production system, the prevalence of certain parasites and the prevailing climatic factors. Reach out to local vaccinators, community animal health works or para-vets to ask about the frequency of doing the recommended practices.

- Remove droppings from the inside of the house. If the house is portable, move it to fresh area once a week.
- Fumigate the chicken house by:
  - Lighting a fire under the raised chicken house or placing cages above the flames to control external parasites
  - Spraying the houses, floors, and perches with lime after cleaning to disinfect and reduce the quantity of parasite eggs on the walls and cracks. A rule of thumb is to apply new lime wash when the old has been worn off the walls.
- Put ashes on the floor (for non-slatted floors) and in the nests to deter parasites.
- The isolation houses for sick chickens should be cleaned and fumigated as soon as the sick chickens have been removed.

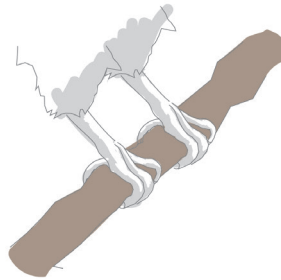
## Important Structure and Equipment in Chicken Houses

### Perches and Roosts for Smaller Numbers of Chickens Only

*Note: If the flock size is big, there will be competition among chickens for space on the perches, this is neither recommended nor appropriate.*

Perches are important for chickens to rest on during night (*Figure 2*). Perching, in addition to being a natural behavior for chickens, helps minimize contact between chickens, the floor and their droppings. This in turn reduces the chance of spreading diseases and parasites. Each adult chicken requires about 15-20 cm of perch space. The diameter of the perches should be 2-3 cm. Where more than one perch is used in the chicken house, the space between perches should be about 40-50 cm and the first perch should be 20-25 cm from the back wall. The perches should be at the same level to avoid chickens fighting for the highest perch.

**Figure 2: Perch example**



### Laying Nests

Nests are an important part of the chicken house as they help control and improve productivity by:

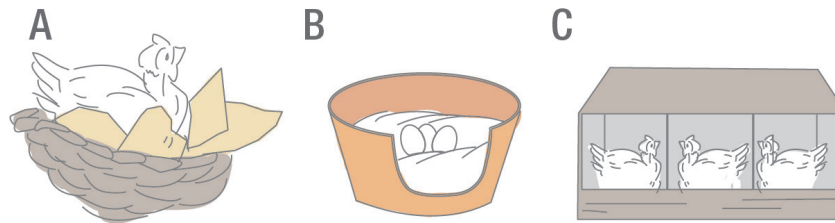
- Preventing loss of eggs to predators, through breakages and theft.
- Allowing better production monitoring.
- Ensuring production of clean eggs.
- Providing a safe and convenient place for egg incubation when hens go broody.

#### **Guidelines for provision of laying nests:**

- Locally available materials such as clay pots, or baskets made of local fibers, cardboard, or wooden boxes can be used for making nests (*Figure 3*).
- Nests should be placed somewhere clean and dry, protected from rain, floods, wind and predators inside the chicken house.
- Ensure the nest are in a dark, quiet corner of the house. Hens have the instinct to lay their eggs in a safe place. Nests should be raised approximately 10cm off the floor.
- Nests should be designed or placed within the chicken house with easy for collecting eggs and periodic cleaning.
- Nests should be the right size so the hen feels comfortable. A nest box will typically measure 30 x 30 x 30 cm. Do not make them too big, as the hen will not feel comfortable. A nest basket may measure 40 x 20 x 25 cm (upper diameter x height x lower diameter). A clay pot should be a similar size.
- The nests should be padded with clean and dry nesting materials e.g. leaves, straw or saw dust to keep eggs warm and minimize the risks of breakage or contamination.
- Provide an adequate number of nests in the chicken house. There must be at least 1 laying nest for every 5 hens. The nests for brooding, on the other hand, must be individual, placed in a quiet and dark place, and they must be easy to move.

- Nests should be constructed to protect hens from to keep hens at a comfortable temperature (especially avoid cool drafts from below the nest) and to prevent falling out of the nests.
- If there has been a disease outbreak or heavy infestation of parasites, the entire nest and its materials should be burned and completely replaced.
- The rim of the nest should be 1/3 of the depth to make the hen feel secure, and if necessary put “dummy eggs” (e.g. boiled or stone eggs) in the nest to attract a hen. Mixing ashes, tobacco leaves, dry lime, or other anti-parasitic substances with the nesting material will keep out most external parasites. External parasites in nests may reduce the hatchability of eggs, as the hen will use too much time and energy leaving the nest, cleaning and scratching her body, thus leaving the eggs cold.
- A nest for a broody hen may be prepared by following these three steps:
  - Take a clean pot or basket and fill sand mixed with ashes up to 1/3 of the depth.
  - Place a clean, soft nesting material (hay or straw) on top, up to 2/3 of the depth.
  - Place the eggs in the nest.

**Figure 3: Different types of laying nests**



A= Hen laying in a well padded old kara; B= An old bucket improvised to make a laying nest;  
 C= Modern laying nests made of timber. These are usually fitted along the darkest wall of the house.



## Best Practice: Hatching Pots

### A simple solution with great economic impact

Hatching pots are an effective solution to avoid broody hens wondering far for food, which would usually result in decreasing egg hatchability. Adding a place for food and water, attached to the brooding pot, eliminates hens' need to scavenge for food during this time.



### Benefits of hatching pots include

- Broody hens remain healthy
- Increases egg hatchability percentages by up to 95%
- A single hatching pot is used for hatching 18-20 eggs at a time
- Reduces the fetus's death rate
- Prevents lice, mites, and tick infestation during brooding period

### How to construct a hatching pot

1. Mix together mud, chipped straw, cow dung or sand, cement and water.
2. Create a round shape with the mixture by hand. On one side of the pot shape a flat surface for to place two small tin. One tin will be used for water and the other for feed. This provides the broody hen easy access to feed and water, instead of wondering off in search for these resources.
3. Once molded, leave the pot in the sun to dry. If cement was used to construct the pot, spray or pour water on the pot every 10-12 hours.
4. After the pot is dry and hardened it is ready for use.

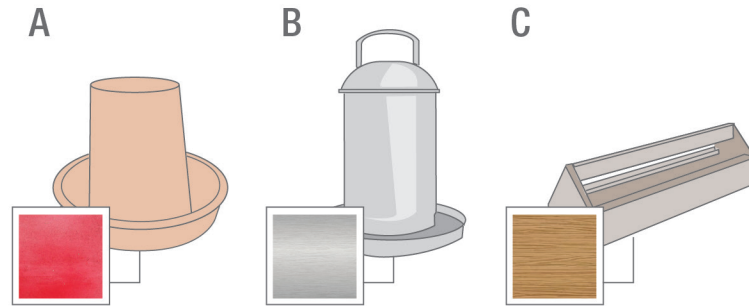
## Feeders

Feeders should be distributed evenly throughout the chicken house.

### A quality feeder should be

- Durable enough to withstand frequent cleaning;
- Stable enough not to be knocked over;
- Of the correct height and depth;
- Chicken proof (such that chickens cannot get into it or roost in it); and
- Equipped with a lid to prevent chickens from spooning feed out onto the floor with their beaks.

**Figure 4: Different types of feeders**

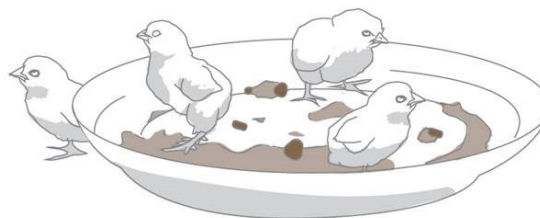


A= Modern plastic feeder; B= Modern circular feeder; C= Wooden feeder

Feeders can be made from locally available materials such as wood, metal sheets and bamboo (Figure 4), or purchased in a store. Feeders should allow, at least 10 cm of feeding space per chicken. Circular feeders should provide at least 4 cm feeding space per chicken. Table 7 outlines the feeding space requirements for 100 chickens. It is important that feeders are strategically placed to minimize feed waste. This is done by placing the feeder on top of several bricks or hanging it from the ceiling at a height where the edge of the feeder and the back of the chicken are at the same level. Feed waste can also be decreased if feeders are not filled to the brim. It is better to fill feeders half full and then check them regularly for refills.

Feeders should be large enough for all chickens of the same age to feed at the same time. A one meter feeder or a 35 cm (diameter) tube feeder is big enough for 20 adult chickens to eat.

**Figure 5: A poor feeder that allows soiling and wasting of the feed**



**Table 7: Feed and feeder space requirements for 100 chickens**

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

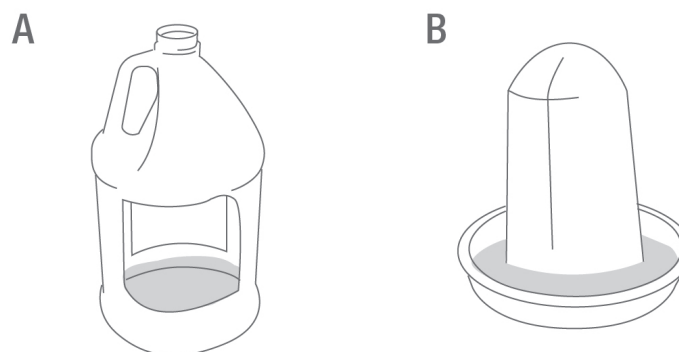
*Note: Chickens at the age of 1-4 weeks can be fed on plastic plates since at this time, they are separated from adult chickens.*

## Watering Equipment

Providing clean water is very important for the physiological function of chickens. The amount of water, the right type of equipment and where it is situated are important considerations for optimal production. Table 8 shows water consumption rates for hot, dry conditions. These can be halved for cooler regions.

**Waterers should be:**

- Not too high so that all age groups can drink without risk of drowning.
- Not too large to allow contamination with droppings.
- Cleaned daily.
- Constantly kept in one place so the chickens are used to the watering place. This is helpful in aiding provision of medication and vaccination.
- Placed in a location where the risk of attack of chickens by predators is minimal.

**Figure 6: Types of watering equipment**

A= Watering equipment made from locally available materials;  
B= Plastic waterer that can readily be bought in local shops

**Waterer Space**

The waterer requirements for 100 chickens in dry conditions is presented in *Table 8* below. A one meter waterer or a 35 cm (diameter) round feeder is big enough for 20 adult chickens to drink. If continuous drinking waterers are used, at least 5 cm of the waterer should be available for each chicken. Water should be placed at wings length so chickens can swallow water with the help of gravity. For chicks, consider placing stones on the floor of the waterer to avoid drowning in case chicks accidentally fall into the waterer.

**Table 8: Minimum water and waterer requirement for 100 chickens in hot dry conditions**

Age (weeks)	Daily consumption (litres)	Water space per 100 chickens (m)
0-1	3	0.7
2-4	10	1.0
4-9	20	1.5
9 or more	25	2.0
Layer	50	2.5

Where water availability is not a challenge, the only consideration to be made about provision of water is its cleanliness. In drought prone, arid and semi-arid land (ASAL) areas, water availability and its quality are important considerations.

**How to construct a waterer using a tin can:**

- Make two small holes on a tin can.
- Pour clean water in the tin can.
- Put a flat plate with a small rim on top and turn the can and plate upside down, while pressing them against each other.

- Gently place the drinker on the ground. The rim of the plate should be low enough for small chickens to drink, but high enough for adult chickens to dip their wattles to keep them cool during hot weather.
- It is important to monitor the quality of the tin cans because they may rust quickly.

# Breeding

## Do's and Don'ts

### Do

- Decide what the objective of the breeding stock is (e.g. egg or meat production) and the number of hens you need.
- Select quality chickens by keeping records of their weight gain or number of eggs produced. Chicken appearance, size and behavior can also be taken into account for breeding selection.
- To assure fertilization of eggs, have 1 rooster for every 15 hens.
- Provide quality housing conditions for egg production. This includes adequate number of dark and quiet nests with food and water nearby so brooding hens do not have to leave their nests for a long period of time.
- Cull hens that are not laying eggs (check pubic bones first, see *figure 10*) and cull hens that are older than 2 years.

### Don't

- Don't make the breeding flock too large. A crowded chicken house increases chances of disease. A small well-managed flock brings more benefits than a large neglected flock.
- Don't wash the eggs. The eggs have a protective lining that should stay intact.
- Don't store eggs longer than 14 days in temperatures below 20°C or longer than 5 days in temperatures above 20°C.
- Don't put more eggs in the nest than a hen can handle. The rule of thumb is a hen can brood 10x her own body weight (in kg). Meaning, a hen of 1.5 kg can handle a maximum of  $1.5 \times 10 = 15$  eggs.

## Selecting of Breeding Stock

Breed selection ensures that the desired traits are passed from one generation to the next. This involves identifying desired traits linked to flock productivity. In selecting breeds keep the following questions in mind:

- What is the objective for raising chickens (meat, eggs or both)?
- What are the desirable traits to consider when selecting a hen for breeding?
- What are the desirable traits to consider when selecting roosters for breeding?

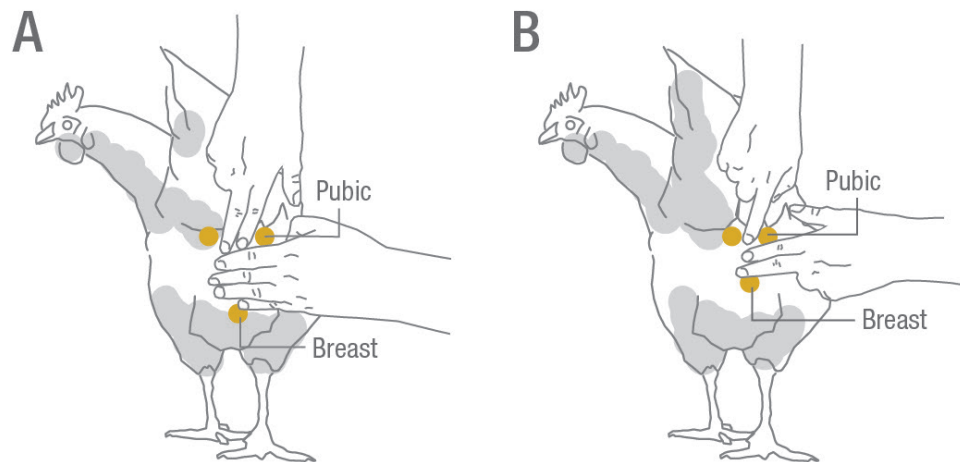
### Such traits include:

- Egg laying potential
- Growth rate
- Meat production potential
- Disease resistance
- Good chick rearing ability

### Features of a healthy hen:

- Shiny and clear eyes
- Should appear healthy and lively
- Feathering normal for the breed; clean feathers around the vent
- Clean and dry beak and nostrils
- Straight legs and toes, with no signs of scaly legs
- Legs less colored in lay
- The breast bone should not be sharp
- For a good layer the space between the two pubic bones (pin bones) can fit 2-3 fingers while for a non-laying hen, the space between the two pubic bones can fit only one finger (*Figure 10*).
- In a laying chicken the space between the pin and breast bone can fit 4-5 fingers while for a non-laying hen the space between the pin bones and the breast bones can fit only 2 fingers (*Figure 10*).

**Figure 10: Hen in lay (A) and outside lay (B)**



Adult hens with a small pale comb are not in lay, while a large red comb is an indicator that the chicken is in lay. A hen with a continuously small plate comb should be culled (removed) from the flock. A small pale comb is common when a chicken is moulting, hence the farmer should take time to observe the behaviors of chickens before making the decision to cull.

A non-laying hen has a puckered vent while a layer has a large, oval, moist and bleached vent.

### Feature of a healthy and good rooster:

- Alert and protective nature
- Shiny and normal feathering for the breed
- Clear and shiny eyes
- Clean and dry beak and nostrils
- Clean feathers around the vent
- Straight legs and toes with no signs of scaly legs
- Large size relative to the hens



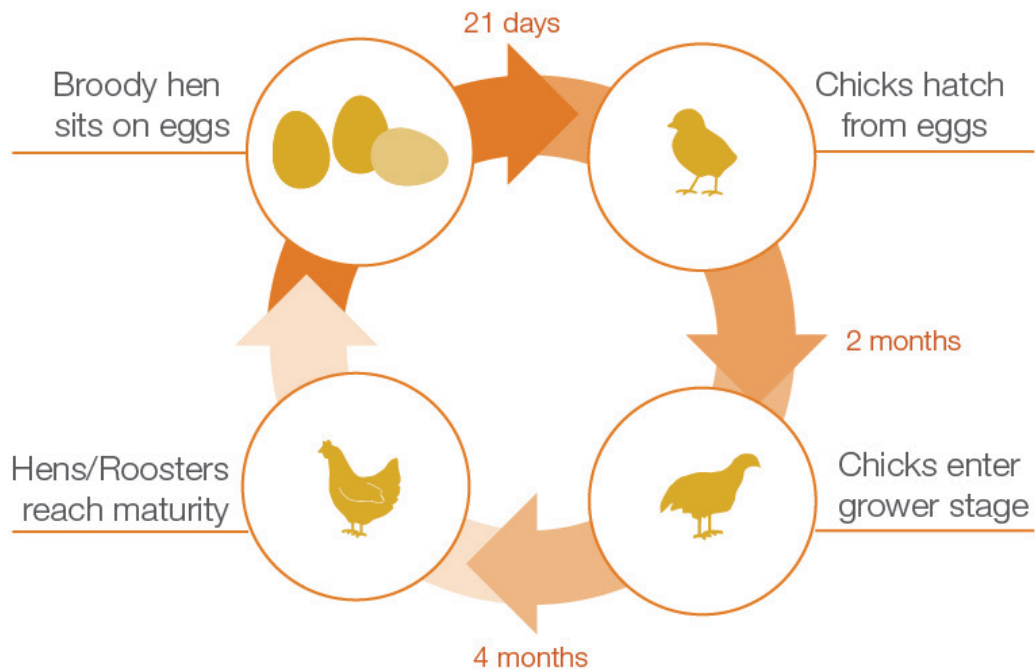
### Features of dual purpose chickens:

- Dual purpose chickens lay eggs and produce meat.
- Laying hens are “boat-shaped” with a long straight back and a big bottom.
- Meat producers are long-legged, have a more upright position and wings are placed in high position on the body.
- Dual-purpose breeds have body forms in-between layers and broilers. Local breeds often have the form of a dual-purpose breed, though much less heavy in body form and size.

### Factors that contribute to a successful selection of breeding animals:

- It is important to keep records on the growth and productivity of each chicken to guide selection of chickens with desired traits.
- Keeping records helps select the best layers or the best mothers to protect the chicks.
- Chickens must be judged based on the appearance, size, sound and behavior.
- When buying replacement chickens from the market or other external sources, select or buy new chickens early in the day, as stress from lack of water, feed, and rest, will make most chickens look rather sick and drowsy.
- Chickens with undesired characteristics, including being unproductive should be culled. The following points should guide in making culling decisions. Cull cockerels for sale or consumption at 4-5 months of age since only a few mature male chickens are required for breeding:
  - Cull hens that do not lay or lays very few eggs
  - Cull hens older than 2 years as production and meat quality rapidly deteriorates after 2 years
- Introducing some technologies (ex. artificial incubators) can increase the egg production cycle. Work with your local field representative to learn what technologies may fit your system.

**Figure 11: Lifecycle of a well-managed chicken**



## Managing Flock Sizes

A farmer should increase their flock size gradually as they gain experience in managing and feeding the chickens. The farmer should control the number of hens hatching eggs at any one time in order to maintain the flock size.

This involves maintaining a healthy flock of a specified size all year round. Consider the following topics when deciding on a size of flock:

### Feed Resources

- This involves the scavenging feed resources and the capacity to provide supplementary feeds.
- All of the chickens should be able to feed at once if supplementary feed is provided.

### Housing

- The farmer should ensure to keep a flock size that can be housed adequately, especially in regard to shelter at night and the number of laying nests.
- Gather hens inside the chicken house at night to protect from predators and to increase morning egg production.
- A crowded house increases chances of disease, infection and is related to poor management practices.
- The capacity of chickens should allow for regular removal of droppings inside and below the chicken house.
- Provide an adequate amount of perches to avoid fighting.

### Available Labor

- Improved rearing of local chickens requires a time investment from the farmer to clean the house, feed the chicks, observe for diseases and ectoparasites among other tasks.
- A small flock that is well managed brings more benefit to the farmer than a large flock that is neglected.

## Production of Quality Eggs for Hatching

- Hens start laying eggs at the age of 22-32 weeks, depending on the breed, their health, and development.
- Malnutrition and poor health conditions will delay the age of laying and lead to poor egg production.
- The farmer should provide nests in the hen house for laying and should remove floor eggs regularly in the morning, especially during start of lay. To teach the hen to lay in the nests, place a couple of eggs or stones that look like eggs in the nests. The eggs should be marked properly to know which eggs are new and should be collected.
- After laying about 20-25 eggs (under improved management), the hen becomes broody, stops laying eggs and sits on the eggs in its nest.
- Eggs from different hens can be collected for incubation by one hen. The following tips will help to achieve higher production of quality eggs:
  - A hen likes to lay in quiet, safe and dark place, usually in places where there are other eggs. Placing dummy eggs in the nests or use of communal nests is a good practice to ensure that eggs are laid in the nests.
  - Provide sufficient nests with adequate nesting materials
  - Hens lay most eggs during their first year of production, then production decreases. To maximize production, hens should not be kept for more than 2 years.

- Monitor your flocks to select the hens that produce the most eggs and those that raise the highest number of chicks.
- Eggs for incubation must be fertilized. To ensure all eggs are fertilized, there should be 1 rooster for every 10-15 hens; plus 1 extra rooster in the flock in case 1 dies or gets sick.
- Successful hatching of eggs depends on how they are taken care of from laying until setting.

## **Selection and Caring of Eggs for Incubation**

- To ensure quality eggs, collect eggs from the nest at least twice a day; always leave 1 egg in the nest to encourage the hens to continue using the nest.
- Collected eggs daily and store them somewhere cool and dry.
- Store eggs with the broad end facing upward to facilitate breathing. This is because the air sac, through which eggs breathe, is found in the broad end of an egg.
- Egg shells are porous (meaning good things, like air and bad things can enter) which if blocked by materials such as dirt, may suffocate the embryo. At the same time, there is a thin waxy lining that protects bacteria from entering the egg through the porous shell. Eggs should not be washed as this would destroy this lining.
- When eggs are stored at temperatures below 20° C, the eggs should be stored no more than 14 days. If stored in a higher temperature, the eggs should not be stored for more than 5 days.
- For the best incubation result, the eggs selected for incubation should be of average size and normal shape. The eggs should have a smooth shell without cracks. If there are cracks in the shell, the risk of losing moisture in the egg can be too high and the chick may die.
- To ensure quality eggs are used for incubation, record the dates when each egg was laid, including the ones left in the nest. Once the hen becomes broody, the farmer will be guided by the dates to select fresh eggs.

## **Managing a Brooding Hen**

- For small scale operations, hens are better brooders than an artificial incubator. On average they have a higher rate of hatching (80-100%) than an incubator (60-80%).
- A brooding hen should be separated from the flock to prevent disturbance from other hens. She should be provided with a brooding nest or basket big enough to contain all her eggs. Fresh hay or straw should be put in the nest and some ashes mixed with tobacco leaves may be added to avoid parasites. More eggs from other nests can be added until the hen has enough according to its size.
- A hen can sit on a number of eggs equaling 10 times her body weight, e.g. a 1.5 kg can sit on maximum 15 eggs.
- If the hen has to leave the nest for long periods of time to look for feed and water, the eggs may cool down excessively, leading to poor hatchability and decreased chick survival. To avoid this, it is important to provide easy access to feed and water to the broody hen.
- In the dry and hot season, farmers ought to spray the breast of the hen with water to increase the humidity around the eggs.
- During incubation, the broody hen loses a lot of weight because it spends a lot of its time sitting on the eggs. In addition, the calcium reserves are usually depleted after laying a clutch of eggs. It is therefore important to provide the brooding hen with calcium supplements to build her bones and commence laying soon after rearing her chicks.

- To ensure chicks are healthy, lively and have high hatchability provide these basic conditions:
  - Minimized disturbance
  - Easy access to feed and water
  - Minimal movements out of the nests
  - Nest is well managed with clean hay and anti-parasitic remedies
  - The temperature is comfortable

# Health

## Do's and Don'ts

### Do

- Follow the vaccination and de-worming recommendations provided in this section.
- Focus on practicing biosecurity measures.
- Isolate sick chickens for treatment or culling.
- When treating sick chickens, follow directions from your local veterinarian.

### Don't

- Don't mix chickens of different ages to reduce transferring diseases.
- Don't over crowd the chicken house.
- Don't dispose of culled chickens close to your chicken house.
- Don't misuse antibiotics or other treatments for sick chickens.

## Factors that Influence the Health of Chickens

- Animal factors, including age, inherited characteristics, stress levels, etc.
- Environmental factors, including housing, climatic conditions, availability of feed and water, feed quality, air quality, etc.
- Presence of infectious agents such as viruses, bacterial, protozoa, parasites, fungi and Mycoplasma.

## Cause of Diseases

Husbandry, nutrition, environmental factors and flock management all have important influence on the health and productivity of the flock. There are three major categories of disease:

- Infectious diseases caused by organisms that can be transmitted from one chicken to another. These organisms include virus, protozoa, bacteria, mycoplasma, and fungi.
- Nutritional diseases caused by poor nutrition and husbandry.
- Parasitic diseases typically caused by internal and external parasite infestation.

## Detecting Healthy and Unhealthy Chickens

It is very important to spend time each day observing the flock carefully. By doing this, early signs of disease, malnutrition, or other problems may be discovered, and the necessary precautions can be taken.

If a disease is detected, immediately report this to your community worker or proper government official to reduce the risk of the disease spreading.

**Table 9: Characteristics of healthy and unhealthy chickens**

Healthy chickens	Unhealthy/sick chickens
<ul style="list-style-type: none"><li>• Alert and on guard</li><li>• Bright eyes and comb</li><li>• Walk, run, stand and scratch continuously</li><li>• Eat and drink normally</li><li>• Lay eggs normally</li><li>• Smooth and neat feathers</li><li>• Soft compact droppings</li><li>• Quiet breathing</li></ul>	<ul style="list-style-type: none"><li>• Tired and lifeless</li><li>• Dull eyes and comb</li><li>• Sit or lie down</li><li>• Eat and drink less</li><li>• Lay less or stop laying eggs</li><li>• Ruffled and loose feathers</li><li>• Wet/loose droppings with blood or worms, diarrhea</li><li>• Cough, sneeze and breathe noisily and may have nasal discharge</li></ul>

## Disease Control through Appropriate Biosecurity Measures

Effective disease control involves preventing the disease causing pathogens from entering the flock and limit the spread of diseases should an infection occur. Biosecurity is defined as “a set of management practices put in place to prevent introduction of infectious organisms or pathogens into a site” (bio exclusion). Furthermore, if a pathogen is present in a site then the biosecurity should prevent its spread to other parts of the system (bio containment). This key tool provides the cheapest and most effective means of disease control and helps maintain the health, welfare and productivity of the flock.

### The main objectives of biosecurity are:

- To prevent the introduction of infectious agents into farms.
- To prevent the spread of disease between farms and between units on a farm.
- To improve the standard of farming and the public perception of food producing enterprises.
- To minimize the potential disease risk for humans handling chickens.

## Key Principles of Biosecurity

The biosecurity principles are simple and few, but how they are applied may be the difference between success and failure. If producers are concerned about disease transmission in their flocks, then biosecurity management can pay big dividends.

Effective biosecurity management requires an assessment of what the effective control points are, the means to implement those control points and knowing the benefits to animal health and performance outweighs the costs.

### Key principles of biosecurity include:

- Keep chickens in good condition through improved nutrition and flock management.
- Provide a protected environment, proper housing and flock management to minimize exposure to disease causing pathogens, parasites and effects of extreme weather conditions.
- Control entries into the chicken house and farm to control introduction of potential diseases.

**The following are some of the practices that should be implemented to enhance biosecurity on a farm:**

- Give access to the right feed and clean water, especially for small chicks.
- Build houses or shelters to protect chickens from diseases, wind and rain.
- Clean chicken houses regularly and apply lime wash on the floor and walls regularly. For confined chickens, make sure to leave the house empty for 2-3 weeks and disinfect the house properly between flocks.
- Provide clean and dry litter regularly.
- Separate chicks from adult chickens with exception of the mother hen.
- Vaccinate chicks against the most important diseases and re-vaccinate if necessary, according to recommended vaccination calendar.
- Simple fences, such as hedges, should be put in place to separate flock houses and areas.
- Visitors should not be allowed to enter the chicken houses.
- A disinfectant dip should be provided at the entrance of the chicken houses.
- Regularly clean out and dispose manure; preferably compost it for at least 3 weeks.
- Avoid introducing new chickens to your flock directly. Always have an isolation pen or basket to observe new chickens for a period of 2 weeks.
- Avoid contact between your chickens and visitors, cages, egg trays, etc. from an area where a disease outbreak has been reported.
- Wash hands with soap and water after handling other chickens or before handling your chickens.

**Handling of sick, dead or culled chickens:**

- Remove dead chickens from the flock quickly.
- Isolate and treat sick chickens, if medication is not possible then cull the sick chickens.
- Dispose of dead or culled chickens far away from the chicken house.
- Burn or bury culled chickens, they should never be eaten.
- If burying dead or culled chickens, be sure that they are buried deep enough that other animals cannot dig them up. Additionally, deep burials reduces the chance of attracting flies, which can be carriers of diseases.

## **A Simple Vaccination Program for Chickens in the Rural Areas**

It is important to follow a vaccination schedule to make sure your chickens are protected from diseases such as Newcastle Disease. If chickens are not vaccinated every 4 months, their protection against Newcastle Disease will become weak.

**Table 10: Newcastle Disease vaccination schedule**

Chicken's age	Vaccine	Route	Dose
First vaccination: after the chick is 7 days old	Lasota, 12	Ocular (eye)	1 drop
Repeat every 4 months	Lasota, 12	Ocular (eye)	1 drop

Vaccinating chickens is always limited by several factors including:

- Small flock sizes scattered in the villages.
- Poor housing and lack of cold chains for vaccine handling.

- Vaccines packaged in large doses that are not commensurate with the small number of chickens per household.

Some vaccinations are impractical and costly at the individual farmer level, which is undesirable for the farmer and the private sector providers.

To overcome these limitations, community-based approaches are recommended.

## How to Implement a Community-Based Vaccination Program

In the community-based approach, farmers from the same communities are mobilized to form groups. One or two people, depending on the chicken population are nominated from each group using a given set of criteria. These selected individuals are taken through intensive training on chicken health and management. The training should be conducted by trained veterinary officials. The veterinary officials should guide the trainees and project facilitators to develop vaccination calendars for the common diseases in the area. In addition, training on simple business skills should be provided to enable the trainees to effectively provide affordable services while operating at profitable level. Thereafter the trainees are provided with start-up kits and presented to the community as community vaccinators. The area veterinary officials should supervise the community vaccinators to ensure quality service delivery. For sustainability, the community vaccinators should be linked to a local agro-vet operators for continuous provision of vaccines and technical backstopping. Over time, vaccinators in training will gain experience and practical skills to become poultry services advisors.

**Table 11: Common diseases, their causes, symptoms and possible treatment**

Name of disease	Importance	Causes & mode of transmission	Major symptoms	Treatment and control
New Castle Disease	High	Viral, through droppings, breath and discharges (noses and eyes)	Greenish diarrhea, heavy breathing, nervous symptoms (e.g. twisted neck, tremors and wing paralysis; lethargy (looks sleepy), respiratory distress and gasping for air, swollen head and neck, high mortality (50-100%)	No treatment; control through vaccination before outbreaks (see <i>Table 10</i> )
Coccidiosis	High	Protozoa, shed with infected droppings. Coccidia can survive in wet and humid conditions for up to 1 year. Spread through contact with contaminated feces.	Depression and listlessness, head down, ruffled feathers and bloody diarrhea, pale comb, and death. If the chicks survive, they remain thin and be late in laying if they have not been treated.	Provide Coccidiostats in drinking water or feed. Regular and careful cleaning of feeders and waterers and chicken houses. Treated chickens develop resistance to the disease. Right stocking rate and avoid overcrowding. Remove droppings regularly. Keep the chicken house clean.
Fowl Pox	High	Viral, through scabs that fall off the skin of the affected chicken (virus can survive in dried scabs for months or years). Spread through contact, insect bites and contaminated equipment. Common during dry seasons, but may be found all year round.	Yellowish or dark brownish lesions on the combs and wattles and around the eyes; yellow-white cheesy looking lesions inside the mouth and on the tongue.	No treatment; vaccine however, is available and is highly effective. Chickens that recover usually get life immunity.



Fowl Typhoid	Moderate	Bacterial, shed in droppings and can survive several months in the soil, dust or beddings; destroyed quickly when exposed to sunlight; spread through contact.	Affects mainly older chickens, yellowish diarrhea, small white spots in the liver, spleen, heart and sometimes lungs, high body temperature, tiredness and blue comb. In many cases the disease occurs as acute condition or peracute in which case there is sudden death.	Treatment with antibiotics, but doesn't eliminate infection from the flock. Treatment should therefore be coupled with through strict hygiene and culling of sick chickens in order to completely eliminates the disease from the flock.
Gumboro (Infectious Bursal Disease)	Moderate	Viral, through droppings and is very stable, can survive in the environment for 4 months. Spread through contact.	Only seen in chicks younger than 6 weeks of age, in large flocks kept in confinement. Depression and listlessness; pale skin, diarrhea and direct vent; chickens huddling together	No treatment. Controlled through vaccination; for vaccination to be effective the right strain should be determined. Before embarking on vaccinations against Gumboro, it is important for farmers to liaise with the veterinary officials in order to be guided on which strain to vaccinate against.
Fowl Cholera (Pasteurellosis)	High	Bacterial, shed through feces and discharges; can survive for 30 days in water and soil, but is destroyed by direct sunlight, heat and drying; infection occurs through contaminated feed and drinking water.	Occur as a chronic disease or as an acute or peracute disease with sudden death within a few days and chickens show no clinical signs. Clinical signs associated with chronic infection: water diarrhea and dirty vent, ruffled feathers; respiratory symptoms, loss of appetite, blue combs and wattles; swollen face and wattles; swollen joints; fast distressed breathing; coughing and sneezing; clear yellow discharges in the eyes and beak.	
Pullorum Disease (Bacillary White Diarrhea)	Moderate	Bacterial, shed in droppings and can survive in the environment for several months; easily destroyed by direct sunlight. Transmitted to chicks from the eggs to infected hens, which may not show signs of being ill.	Clinical signs are manifested in young chicks. Chicks walk with difficulty, show big bellies and drooping wings; weakness and closed eyes. Chalk white diarrhea.	Treatment with antibiotics, but the disease may appear with the next group of hens. To avoid further, it is advisable to kill the infected mother hen. In case of an outbreak, sick chickens must be isolated, killed or burnt.
Mareks Disease	Low	Viral, shed with small parts of feathers, fluff and dust. It is spread through inhalation of the virus when chickens are in close contact, through contact with contaminated materials, feed and water.	Clinical signs are seen from 2-more than 30 weeks after infection; loss of feathers, nodules in the skin, especially young chickens from 4 to 7 weeks of age; paralysis of one leg and/or wing (up to 7 months of age); loss of weight, irregularly shaped pupils in adult chickens; lameness for a short period in adult chickens; mortality usually occurs between 1 to 10 weeks of age.	No treatment, but commercial vaccines are available

Infectious Coryza	Medium	Bacterial, shed with discharges from nose and eyes, but can survive only a short time outside of a chicken. Spreads through direct contact between chickens (inhalation); intake of contaminated feed and water; infected dust particles dispersing from flock to flock; contaminated equipment and carrier chickens.	Affects all age groups, but disease is severe in adult chickens; clinical signs occur 13 days after infection; distress or noisy breathing; sneezing; nasal discharge that is clear at first, but later becomes yellow and foul smelling; discharge from eyes (eyelids may stick together); chickens shaking their heads to get rid of the eye discharge; swelling of the face	Treatment may be given by adding antibiotics to drinking water. Drug resistance may occur; relapse may occur following treatment; avoid exposing chickens to humid and cold conditions.
Chronic Respiratory Disease (CRD)/Mycoplasmosis	Moderate	Caused by bacteria like organisms called <i>Mycoplasma gallisepticum</i> and <i>Escherichia coli</i> . Shed in discharges from eyes and nose; can survive outside the chicken in droplets of discharge) for up to 3 days; spread through direct contact between chickens (inhalation); through air over short distances; carrier chickens (chickens that have recovered can continue shedding agents over a long time) vertical transmission (egg from infected chickens to chicks)	Discharge from nose and eyes (sometimes blocked nose); coughing and sneezing; respiratory sounds; swollen head; closed eyes, drop in egg production, but rarely causes death.	Treatment may be given by adding antibiotics to the drinking water. The disease may recur after treatment if there are carrier chickens in the flock. Strict hygiene and culling of infected chickens will reduce recurrence.
Collibacillosis	Low	Bacteria called E. coli; shed in droppings; spread through contact between chickens (agents in infected dropping may be inhaled), contact with contaminated water and feeds; via air; vertical transmission and contact with contaminated equipment.	Infections are common among newly hatched chicks, causing enteritis. In older chickens, the symptoms may include respiratory distress, infection in the oviduct, which cause lowered egg production.	The best way to prevent the disease is to improve the hygiene of the eggs for hatching and of the nests. Treatment of sick chicks may be possible with antibiotics, but should be coupled with strict hygiene for it to be effective.
Mycotoxicosis/Fungal Poisoning	Moderate	Fungal; common if the chickens are fed moldy feed.	General weakness and pale combs	Supplementing feeds with vitamins. The disease is prevented by proper storage of feed to prevent growth of the fungi that produce mycotoxins, the cause of the disease.
Nutritional Diseases	Low	Commonly seen in poorly managed flocks.	Clinical signs will depend on the type of nutritional deficiency, for instance bone deformation is due to calcium deficiency. The chickens walk with difficulty; they limp. Legs are deformed. Some deficiencies may cause feather loss.	If the condition is detected in time, it may be possible to treat the disease by supplementing with e.g. vitamins and calcium and providing chickens with fresh grass and cow dung. Nutritional diseases may be avoided when the chickens have access to normal vegetation and hence are rare in scavenging chickens.

Highly Pathogenic Avian Influenza (HPAI)/Bird Flu	High	Virus, shed in dropping of and discharges from infected chickens. Virus can be destroyed by direct sunlight or heat, but it can survive for several weeks in pile of droppings. Spreads by direct contact between chickens or contact with wild birds, intake of contaminated feed and water, between flocks in infected dust particles or contaminated equipment	Clinical signs may occur a few hours of infection; the whole flock may be wiped out within days. Signs are: sudden death, ruffled feathers, inappetance, distressed/noisy breathing, coughing and sneezing; eye and nasal discharge, swollen face, combs and wattles, drop in egg production, soft shelled eggs; diarrhea; small hemorrhages, under the skin usually most visible on legs and feet; lameness; twisted neck and tremors; 50-100% mortality within 1 week. Diagnosis: HPAI cannot be diagnosed on the basis of the clinical signs only, laboratory tests must be done to confirm presence for the virus. HPAI should be suspected when there is high mortality in the flocks that have been vaccinated against New Castle Disease within previous 4 months (ND is the differential diagnosis for HPAI)	No treatment, but vaccines are available. When detected, the affected flock must be isolated and quarantined; all movements of chick and pigs from the villages must be stopped; other flocks in the village must be confined immediately. The Veterinary authority must be notified immediately; sick and dead chickens should be buried or burnt; observe strict biosecurity measures; HPAI is a zoonotic disease and can cause death in humans, hence strict biosecurity measures are very important when the disease is suspected.
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## External & Internal Parasites

### External Parasites

External parasites are one of the major problems for chickens. Through sucking blood, they cause irritation, drops in production and other conditions such as anemia. Some external parasites can also transmit infectious disease such as Fowl Pox. *Table 12* presents the common external parasites and their control.

#### General control measures for external parasites:

- Remove backs on the timber used for construction of chicken houses so that parasites cannot hide underneath.
- Avoid crowded housing.
- Clean and disinfect chicken houses and shelter regularly. This should include removal of all beddings and litter from the house.
- Regularly spread ash and lime on the floors and walls of chicken houses and shelters.
- Use smoke to fumigate shelters and nests regularly.
- In case of severe infestation, burn the chicken house, nests and equipment build a new house in a different location.
- If chickens are infested, apply insecticidal dusting powder or spray directly on the body of the chickens. All chickens should be treated at the same time otherwise the parasites will spread to untreated chickens.

- Apply insecticidal spray or powder on the nests and chicken house as some parasites do not live constantly in the chickens.

**Table 12: Common external parasites, their causes, symptoms and possible treatment**

Type of parasite	Mode of infestation	Symptoms	Control and treatment
Fleas	Sticks in clusters to the skin of the chicken's health (mainly around eyes). Eggs are found in the surroundings of the chickens where they feed on feces and other organic material	Chickens are irritated and restless, often scratching the eyes, pale comb and wattles due to loss of blood; crusted skin lesions where many fleas had stuck; severely infested chicks may die	Kill the parasites by applying kerosene, paraffin or petroleum jelly to the parasites several times a day (dead flea may remain attached to the chickens for several days or even weeks). Apply general measures for controlling ectoparasites described above.
Lice	Can be found all over the body in feathers. They stay permanently on the chicken, their eggs are attached in clusters to the feathers; some feed on feathers while others suck blood.	Damaged feathers, irritation of chickens when infestation is severe	Follow the general control of external parasites described above
Scaly Legs	The parasite burrows and lives in the skin of the chicken's legs	Thick scaly legs, lameness and malformation of the feet may occur under severe infestation	The disease is treated by dipping the legs daily in kerosene, used engine oil or an insecticide until the scales disappear. Old chickens with crippled legs should be culled.
Skin Mites	These are blood sucking organisms hence prefer those parts of the chicken body with few feathers such as the head and under the wings. Some species of mites live permanently on the chickens while other hide in nests or cracks in the buildings where they emerge at night to suck blood. Mites can live up to 10 months without a blood meal.	Chickens are irritated and become weak; dropped productivity (chickens may stop laying or brooding); pale skin, comb and due to loss of blood	Reduce backs from the wood used to construct chicken houses; apply perches, nests and other structures; follow general control measures for controlling ectoparasites described above
Ticks	Blood sucking parasites found on the skin, especially on parts with few feathers such as head and under wings. Off the chicken, they live in cracks, under back of wood, walls or trees where they also lay eggs. Nymphs usually feed at night and can survive without feed as long as 15 months; adults can survive for more than 4 years without feeding on the blood of a chicken.	Chickens are irritated and become very weak; drop in production (hens may stop laying eggs); pale skin, combs and wattles due to loss of blood	Remove barks from wood used to construct chicken houses and follow the general control measures for ectoparasites described above

## Internal Parasites

Internal parasites are very common in all ages in the free-range production systems. While in the body of the chicken, parasites lay eggs, which are shed in feces. The eggs can survive in the environment for a long period of time, require an intermediary host such as insects, earthworms or snails which then might be picked by scavenging chickens. The eggs from other worms such as roundworms are directly picked by other chickens in contaminated feeds and water. The eggs,

after ingestion will go through other developmental cycles to become mature worms in the body of the chicken. Once mature, the worms will continue to shed eggs to the environment and the cycle continues.

The internal parasites cause damage to the gut wall and take the nutrients from the infested chicken. As a result these parasites will cause poor health, weight loss, drop in egg production, and bloody diarrhea. Infestations are of great importance to the young chickens.

**Common internal parasites include:**

- Large white roundworms (ascarids), which mainly live in the intestines.
- Caecal worms found only in the paired caeca.
- Small fine hairworms found throughout the intestinal tract.
- Tapeworms which live in the small intestines.
- Several types of roundworms of various sizes which can be found in the crop, esophagus, proventriculus or gizzard.
- There are some types of worms that are also found in the trachea and the eye of chickens.

**De-worming - treatment of internal parasites:**

De-worming is the practice of removing parasites from the chicken's system. It should be done every 3 months. The medicine, which should only be used by adults, can be purchased from a trusted veterinarian supplier for a low cost. It is recommended that the medicine be used every 3 months and that it be added directly to the chickens' drinking water or food.

Prevention of internal parasites is always easier than curing. Good sanitation practices, combined with regular de-worming is a best practice.

- Clean the chicken house and remove droppings weekly.
- Clean feed and water containers daily.
- Prevent wet and muddy areas around water containers or elsewhere.
- De-worm every 3 months.
- Consult with a veterinary supplier or livestock extension office to learn about local prevention practices.

## **Developing a Disease Control Calendar**

It is important to prevent and control diseases according to their occurrence. Vaccination campaigns should be implemented before the onset of the disease, especially for diseases, which occur seasonally like Newcastle Disease.

To plan vaccination and medication, it is advisable to use a disease prevention calendar, where veterinarians (and other animal health service providers), farmers, and extension workers work together to identify the periods when certain diseases occur and when conditions are favorable for certain parasites to multiply.

A disease control calendar is a very important tool for farmers, either at individual or group level to carry out various disease control measures.

# HATCHING HOPE

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