



## KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANIZATION

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### FACTSHEET FOR TECHNOLOGY INNOVATORS WORKING WITH SMALL HOLDER

#### FARMERS IN KENYA

#### POULTRY VALUE CHAIN

Local and Improved Chicken

“Kienyeji” / Indigenous chicken



#### Introduction

In 2017, the country had about 40.1 million indigenous chickens with Migori County being the largest producer by 3.6 million birds followed by Homabay County at 2.9 million, Kakamega County coming third at 2.5 million birds and Bungoma County at 2.4 million birds coming fourth. These four counties have the largest numbers of indigenous chickens because of the socio-cultural value attached to the chickens. In addition, these regions especially Migori and Homabay have large tracts of land to support free ranging chickens as well as being the largest producers of sorghum which is used as poultry feed.

#### Structure and construction

The following should be done when constructing Kienyeji and improved chicken house;

- Select the appropriate site for the house.
- Treat the timber and foundation to be used for termites and insects
- Foundation should be built depending on the building material to be used.

#### **Adequate space**

- Chicken need sufficient space to exercise, for movement and to roost. The house should be dry, with flat floor and raised to protect against rodents such as rats.
- As for the construction material, go for those locally available including thatch grass, reeds, bricks, timber offsets and iron sheets. Adequate space is at least 2 square feet for every chicken.

#### **Good ventilation**

- Your kienyeji chicken house must have air inlet such as a large wire mesh window to provide fresh air throughout the available space.
- The windows should be easy to open and close to help regulate airflow and natural light, but should also be configured in such a way that they exclude predators.
- For optimal natural ventilation, the roof should have reflecting surface or pitched with overlaps, while the orientation of the building should be constructed with respect to the weather conditions in that region.

#### **Good litter**

- The right litter will result in better quality chicken, reduce vulnerability to disease and improve the poultry's physical environment. The right litter material should also be quick drying to offer insulating properties, highly absorbent and free of toxins. Rice hulls and pine shaving make good litter material, but you can also use processed paper, hardwood shavings, crushed corn cobs, sawdust, peanut hulls and chopped straw.
- Construct and install perches, laying nests and brooding nest which can be made from calabashes cardboard, wooden boxes or fibre.

#### **Heat source and insulation**

A supplemental heat source is a must have to maintain the right indoor temperatures during cold weather. While there are different types of heaters, the one you choose will depend on the space and your budget. However, a well-insulated building will reduce heat loss during cold weather, prevent condensation on the inside surfaces and reduce heat gain during warm weather.

#### **Equip Kienyeji and improved chicken house**

##### **Drinkers**

- They are used to provide water for the poultry.
- They must be adjusted to the correct height so that the chicken can drink easily.

### Feeders

- Feeders are equipment used in feeding poultry. The food is deposited in the feeder and the poultry feed from it. The number of feeders provided for a poultry farm should be according to amount of birds available.
- These can also be made from local materials, or purchased. They must always have a lid to stop the poultry from entering the feeder

### Lighting

- Should be placed at 7 to 8 feet hanging on the roof.
- Bulbs should have a spacing of 10 feet while fluorescent light should have a spacing of 15 feet.

### Nest boxes

- It's used during egg laying.
- Keep it clean and close during dark period.
- Keep secure and well maintained.

### Perches

- Horizontal poles where chicken can rest sit and rest it's constructed to avoid birds from overcrowding at night.

### Curtains

For preventing draught and rain.



Drinker



Automatic drinker



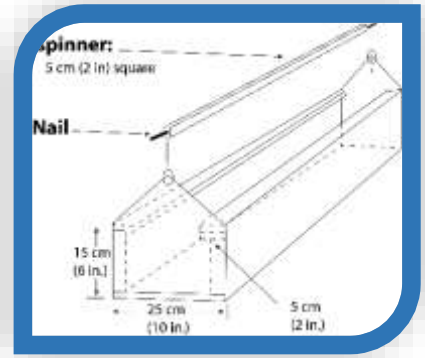
Nipple drinker



Chick feeder tray



Feeder



Naivasha Feed trough



Infrared lamps



Jikos



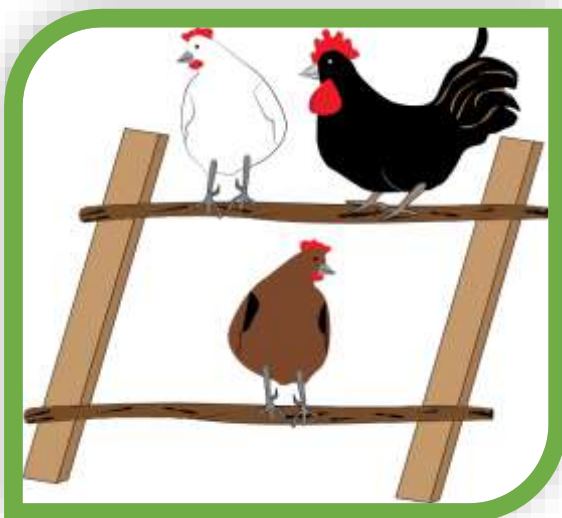
Clay pots



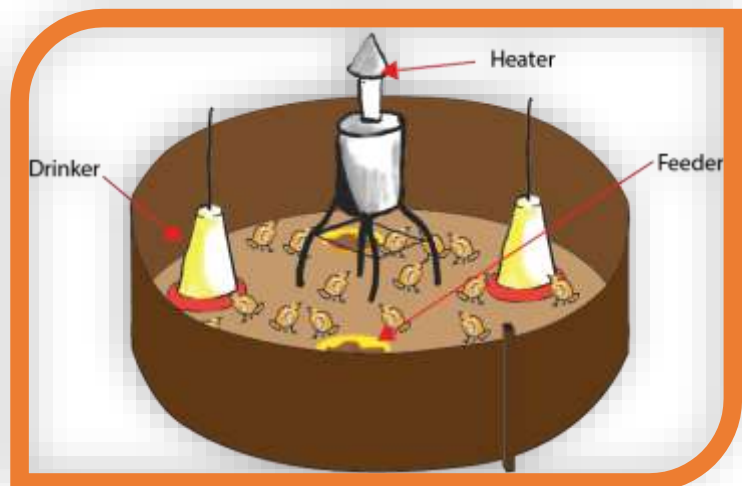
Minimum and maximum thermometer and hygrometers



Battery laying nests



Perches



Brooder ring

### Kienyeji and improved chicken breeding

It is always advisable to keep records on the growth and productivity of each bird in order to select breeding birds;

- According to features such as egg production, growth (meat production) and broody behavior.
- Keeping records may help you select the best layers or the best mother to protect the chicks.

- Most farmers use the cockerel exchange program to perform breeding. This is however discouraged because poultry diseases such as Newcastle, Gumboro and fowl typhoid may be introduced.
- The introduced breed may not adapt to the local climatic condition, and for these reasons it is very important that selection of breeding birds takes place in the existing environment.

#### **The following should be considered when selecting breeding birds**

- Livability or survival expectancy: select birds with low mortality.
- Disease resistance: select birds that are resistant to diseases.
- Healthy appearance.
- Shiny normal feathers.
- Larger size than birds of the same age.
- Clear shiny eyes.
- Clean dry beaks and nostrils.
- Clean feather around the vent.
- Straight legs and toes.

#### **Assemble tools, equipment, materials and supplies**

##### **Syringes and needles for injection**

Farmers can learn to do basic treatment before the vet is called and so is necessary to have the syringe and needles. Some syringes can be boiled to sterilize them for reuse - others cannot be boiled so need to be thrown away after use.

##### **A syringe without needle**

Is useful for measuring liquids such as dewormers or medicines given by mouth.

Other tools, equipment and materials are;

- Brooder guard.
- Heaters.
- Lighting systems/Lamps.
- Charcoal stove.
- Incubators.
- Feeding troughs.
- Drinking troughs.
- Dropping board.
- Perches.
- Nest



## **Feed breeding stock**

### **Clean feeding and watering equipment**

- Poultry Feeders should always be cleaned regularly in order to prevent rodent infestations and incidences of diseases such as coccidiosis. After cleaning, they should be left to dry well and then replenished with fresh feed the new feed must always remain dry.
- Use baby chick feeders for chicks. They have a narrow feeding area which prevent the chicks from contaminating the feed with their droppings and thus wasting feed.
- Clean drinking water is a critical factor in poultry production. Your poultry must always have access to clean drinking water at all times. To prevent diseases such as fowl typhoid or coccidiosis, the watering systems and drinkers must be cleaned on a daily basis, kept away from heat source and replenished with clean water. Encourage the chicken to drink more often so as to keep hydrated and healthy.

### **Monitoring performance**

- Check for injuries.
- Record daily mortality and observe their droppings.
- Always visit the poultry house and examine the activities of the chicks this will help with early disease detection.
- Monitoring daily the temperature, humidity and ventilation inside the house as well as outside temperature.
- Monitoring transition times can help with understanding what is happening in the poultry house. (e.g., from day to night, when birds are placed, during half-house brooding, feed changes, etc.).
- Monitoring feed and water consumption helps to monitor the flocks' progress.

### **Handling Kienyeji and improved chicken eggs**

- Egg hygiene and storage are fundamental to maximizing hatchability and chick quality which can only be achieved when the egg is held under optimum conditions between laying and incubation.

### **Identify tools and equipment required for collecting and handling eggs**

- Plastic or paper egg trays, weighing scale, sorting table, crate, boxes, wheelbarrow, pencil or pen, nest box, nest box material

### **Collecting and handling of eggs**

- Collect eggs every 2 hours.
- Collect clean nest eggs before collection of eggs laid on the floor.
- Place eggs in plastic or carton trays.
- Transport eggs to the sorting bay

- Sorting eggs by separating dirty from clean eggs
- Grade eggs according to market requirements for shape, size and color
- The quality of the egg is determined before laying. Once laid, egg quality cannot be moved

### **Cleaning of eggs**

- Dirty eggs are as a result of eggs laid on the floor or dirty nest boxes
- Insufficient laying nests cause birds to lay on the floor.
- Diseases can cause birds to lay bloody eggs.

### **Procedure for cleaning dirty eggs**

- For eggs with mild or little fecal or stuck wood shaving, use a blade to scrape off the dirt.
- For eggs that are heavily soiled, use scoring pad or steel wire to scrape off the dirt.
- During scrubbing, you damage the shell cuticell which reduces the egg shelf life
- Wash heavily soiled eggs in warm water and allow to cool in a cool dry environment. Such eggs have a very short shelf life.
- It is not advisable to wash eggs, rather produce clean eggs by keeping the nest box clean. Replace nesting material at least once a week.

### **Package eggs**

- Put eggs into plastic or paper trays after sorting and grading.
- Place trays in cartons and crates ready for dispatch to the market.
- Cushion the bottom and top of the carton and crate to reduce breakages

### **Broody hen management**

#### **Prepare and incubate eggs**

The following should be done when incubating the eggs;

- Pick clean and healthy eggs.
- Before you pick eggs for hatching, make sure that you wash your hands. Handle the eggs very gently because if you don't, the embryo is vulnerable to damage.
- As you do the selection, ensure that you pick eggs that are of good size but not too big because the later size may also reduce the success of hatching.
- Pick eggs that are clean but if some of them are a bit stained, do not wash them. The reason behind this is that if you wash hatching eggs, you are most likely to damage the natural coating on the egg which facilitates the success of the embryo. There is need to pay attention to the quality and condition of the eggs before they are incubated.



### **Pay attention to the age of the egg**

- The age of the eggs is another very important area that you should have to take care of before placing them into the incubator. Make sure that the eggs you want to incubate are between 1 to 7 days old. After a week, the possibility of the eggs hatching decreases drastically.

### **Pay attention to storage humidity**

- Another important area to take care of is the storage humidity of the eggs before they are placed into the incubator for hatching. Make sure that you store hatching eggs in conditions that are at least 55 degrees.
- The relative humidity in the storage should be 40 to 50 percent, humidity must be maintained for the first 18 days 65 to 75 percent humidity is needed for the final day. In addition, ensure that the eggs are stored with their smaller end pointing downwards.

### **Allow for gradual egg warming before incubating them**

- Before you place cool eggs into the incubator, give them time to warm. Allow them to warm naturally to room temperature before incubation because if you suddenly warm them from a higher to lower degree for a few hours the moisture in the shell of the egg will condense and lead to lower chances of hatching or even terminate the embryo.

### **Assemble tools, equipment, materials and supplies**

- **Rake:** For turning and removing litter
- **Brush:** For scrubbing off organic matter when cleaning
- **Egg basket:** For egg collection and transportation.
- **Egg trays:** For collecting and holding eggs
- **Egg crates:** For transporting trayed eggs

### **Perform natural egg incubation**

Place selected eggs in the brooding nest;

- Set eggs based on the size of the hen. Ensure all eggs can be adequately covered. Larger birds can sit on 15-22 eggs. Smaller hens can sit on between 7-15 eggs.
- Set eggs under the hen preferably in the evening
- Alternative incubation can be done by using other poultry species (surrogate mothers such as ducks, geese and turkeys although their period to sit on eggs may be different from hens).
- Hens sit on eggs for 21 days.

### **Monitor the incubating hen**

- Periodically observe the eggs. Ensure they are covered at all times when the hen is sitting

- Do not touch eggs during hen incubation. The hen turns its own eggs
- Check for any disease or pest infestation
- Monitor the period of time the hen remains seated on eggs.
- The hen should leave to feed and drink water as well as groom but should spend most of its time sitting on eggs.
- The hatching percentage of a hen that leaves the eggs once a day is better than that of hens that leave more often
- Synchronized hatching can be done by delaying setting of eggs until more hens are broody; this can be done by putting dummy eggs so that chicks are hatched at the same time.
- Relay hatching can be done by making hens sit on more than one batch of eggs in succession. When the eggs hatch, remove the chicks at night and replace them with a fresh batch of eggs.

### **Feed broody hen**

Identify the type of feed for broody hens:

- Broody hens that are sitting on eggs feed less than laying hens.
- Provide a balanced feed ration within the vicinity of the incubation box.
- The feed can be commercial; available in mash or pellets.
- The hens can also be fed with locally available materials like grains, worms, vegetables, food remains from the kitchen, among others. Ensure the hen has access to a balance diet

### **Install feeders and drinkers**

- The hen sitting on eggs will decide when it will go to eat.
- Ensure feed and water is available through out and accessible to the broody hen.
- Provide clean portable drinking water.
- Change the feeds and water daily to maintain hygiene. Wash the waterers at least once a day.

### **Control chicken vermin**

Identify potential chicken vermin

- Vermin are small creatures or pests that spread disease and have the potential to harm animals or cause discomfort.
- Some vermin that can attack Kienyeji chicken include the following;

**Rats:** They consume feeds, occasionally attack chicks and are vectors for diseases (carry salmonella)

**Safari ants:** They attack young chicks and cause distress

**Mosquitos:** They are vectors (fowl pox)

**Fleas:** They attach themselves to the wattles, combs and around the eyes and no let go

**Lice:** They live underneath the feathers and suck blood

**Scaly leg mites:** They cause great discomfort by digging tiny tunnels underneath the skin, eat the tissue and deposit crud.

### **Vermin control measures**

- Keep the environment clean by clearing bushes and debris.
- Set up baiting stations like rodent baits.
- Avoid feed spillages.
- Apply repellants like spent oil and pesticides along the boundaries of the house to prevent ants from accessing the house.
- Control vermin by dusting with appropriate insecticides when necessary.
- Maintain cleanliness of the house and the nest.
- Seal off any cracks on the wall and floors.

### **Control chicken predators**

- Fencing off chicken run to limit entry.
- Strong reinforced walls around the chicken house to prevent entry.
- Baiting the predators using appropriate methods.
- Doors should always remain closed.
- Feed store should be vermin proof.
- Proper disposal of dead birds by burning or putting in mortality pits.
- Control the predators through baiting, ensuring the walls and house is strong enough to prevent entry of predators and fencing off the incubation area.
- Apply repellants around the house such as used engine oil.

### **Artificial incubation management**

#### **Operate egg incubators**

- Incubation machines come in different sizes. Some machines are manual while others are automatic. However, whether simple or complex, all incubation machines have an incubation chamber that is divided into a setting area and a hatching area.

#### **Setter area:**

- Setter trays used for holding eggs in the setter section of the machine.
- Setter trolleys holds the setter trays in position in the machine

#### **Hatcher area**

##### **Hatcher trays**

- These hold the eggs in the hatcher section of the machine.

##### **Hatcher trolley**

- Holds the hatcher trays in position in the machine.
- Manual incubators require you to turn the eggs physically. Automatic machines are set to turn the eggs. The humidity is controlled by adding water into the incubator.

### **Identify incubation guidelines**

- Wear appropriate personal protective gear.
- Disinfect incubation chamber using appropriate disinfectants as per the manufacturer's recommendation.

### **Switch on the incubator**

Set the incubation chamber parameters as per the manufacturer's guidelines Temperature (35-37) - Humidity (60-75) - Well ventilated incubation room.

Transfer the eggs into disinfected setter trays, the pointed end facing downwards;

- Load the setter trays with eggs into the incubation chamber
- Lock the door of the incubation chamber

### **Hatcheries**

Should be located in areas with good infrastructure; transport, electricity, water and waste disposal systems. Movement of the chicks and persons should be in one direction inside the hatchery. Design separate rooms for receiving eggs, fumigating, setting, hatching and chick harvesting.

### **Assemble tools, equipment, materials and supplies**

- Egg trays (plastic egg tray, paper egg tray, plastic egg crate).
- Brush.
- Egg basket.
- Scoring pad for cleaning eggs.
- Scalped/blade cleaning eggs.

### **Manage eggs in incubator**

- Set eggs in the incubator following the recommendations below; Fumigate selected eggs Pre-warm the incubator to achieve set temperature (37°C).
- Load eggs into the incubator as per the manufacturer's instructions making sure that the pointed end is facing down. The eggs are loaded into the setting trays and into the setting trolleys.
- Ensure the eggs are placed with the sharp end down for the first 18 days (in setter) Ensure temperature is at 35-37°C and humidity of 65-70%.

### **Monitor hatching process**

- Monitor the following parameters every hour; temperature, humidity and turning.
- Transfer the eggs on day 18 from the setting trays to the hatcher trays.
- Candle eggs at 10 days or day 18 at transfer to remove dead and infertile embryos. Candling is the process of detecting defects with the growing embryo using light.
- Monitor for pipping from the 19th day.

- On day 19, gradually increase the humidity to between 70-75%. This will prevent the beak from sticking to the shell.
- In a manual incubator, turn the eggs 8 times a day. In an automated incubator, the egg should turn once every hour.
- Ensure the egg is in horizontal position in the last 3-4 days in the hatcher.
- Monitor the hatch progress on day 21.

#### **Removal from hatching chamber**

- Let the chicks break the eggs.
- Pull out chicks when 95% of chicks are hatched and dry.
- Grade by selecting good quality chicks. Unhealed navel and underweight chicks are removed.
- If necessary, vaccinate the chicks before dispatch.
- Dispose off hatchery waste.

#### **Transfer of chicks to crates**

- Count the chicks and place them in clean carton boxes or crates ready for dispatch.
- Package chicks with adequate ventilation.
- Chicks should be delivered early in the morning during cool hours to allow time for observation in the brooder
- Dispose off hatchery waste as per proper health practices and clean up the hatchery

#### **Install biosecurity structures and equipment in the hatchery**

- Biosecurity is a set of management practices which when followed, reduces the likelihood of introducing or spread of disease-causing organisms.
- Set bio security structures and equipment as per the standard operating procedures.

#### **Biosecurity measures include;**

- Showering and changing clothes before accessing the hatchery this is for large hatcheries.
- Foot dips at the entrance of the hatchery.
- Hand washing stations for cleaning hands.
- Wheel dips at the entrance of the farm for large hatcheries.
- Bait stations for vermin and predators.

#### **Institute biosecurity measures in the hatchery**

The following are the biosecurity measures that should be considered in the hatchery;

**Location:** Site the hatchery in secluded area away from other poultry operations

**Litter disposal:** Remove used materials and litter and properly disinfect or dispose of it

**Movement:** Restrict entry into the hatchery. Design hatchery to ensure chicks and persons move in one direction.

**Staff medical check-up:** Ensure that the staff get tested every six months

**Use of PPE:** Ensure all staff wear appropriate uniform and PPE while working at the hatchery

**Hand washing:** Monitor handwashing to ensure hygiene is maintained in the hatchery

### **Clean, disinfect and fumigate the hatchery building and equipment**

The hatchery equipment and building are cleaned and disinfected according to general management practice (GMP) regulations and work place policy. The following procedure is recommended;

- Prepare a wash out program as per farm practices.
- Gather PPEs: dust mask, overalls, gumboots, gloves.
- Gather appropriate tools and materials for cleaning: broom, brushes, bucket, water, detergents, hose pipes and pressures washers.
- Wear appropriate PPEs for cleaning.
- Disconnect electricals.
- Mix the detergents as per the manufacturer's directions.
- Clean and disinfect the incubation machine.
- Clean and disinfect the egg trays and return to the machine.
- Soak the floor with water only and scrub to remove remaining organic material as well as dirt and grease Allow to dry. Wash with detergents from outside inside, from top bottom and allow to dry.
- Disinfect the unit from top to bottom and close.

### **Dispose waste in the hatchery**

- Dispose of all organic and inorganic hatchery waste carefully to avoid environmental contamination. Use disposal pits, incineration or composting where appropriate.

### **Importance of record keeping**

- Records are kept in the hatchery for monitoring and evaluation. It is important to note hatch rates and dates so that one can learn from past mistakes. Record charts in the hatchery will also help to track the micro climate to ensure that no mistake is left too late that may lead to poor hatchability for example a drop-in temperature or humidity.

**Hatchery records:** It is recommended that the following records are kept in the hatchery;

**Egg record:** Number of eggs received, number of eggs set, number of eggs hatched

**Incubation record:** Date of setting, date of transfer, date of hatching, parameter reading, candling

**Chick records:** Number of chicks hatched, weight of the chick hatched, number of chicks culled, number of chicks dispatched. Do a hatch analysis to note the percentage hatched and compare to standard

**Inventory records:** Shows both permanent and usable materials, equipment, chemicals and detergents

**Health records:** Shows sources of vaccine and drugs administered, quantities used, batch number and expiry date.



## **Artificial chick brooding management**

### **Select brooder construction materials**

- Determine suitable construction materials based on the following factors:

**Availability:** Use readily available materials locally to minimize cost

**Cost:** Work within your budget but do not compromise on the integrity of the brooding structure

**Workability:** Choose materials that are easy to use during construction, durable and long-lasting material.

**Construct chick brooder:** Construct chick brooder based on the number of chicks to be housed

**Brooder ring:** Recommended materials used include plain galvanized iron (GI) sheets, cardboard, ply wood. Wooden pegs or nails are used to join the guard. Bring the edges of the construction material to overlap and hold with pegs to allow flexibility for expansion;

- Brooder ring should have rounded corners to avoid smothering of chicks and conserves heat and ensures uniform heating in the brooder.
- Edge of the brooder ring should have a radius of 60-150cm from the edge of the hoover (heat source).
- The brooder ring should have a height of about 60cm from the floor to allow workability, accessibility, conserve heat, prevent draft, and contain chicks within a uniform radius.

### **Floor materials**

- Recommended litter materials include wood shavings, rice husks, coffee husks and straw.
- Also acquire absorbent paper. Note that newspaper or Kraft paper is placed on top of the litter material and can be used on the first three days' feeding. It increases feeding space and prevent chicks from eating litter and prevents wetness from water spillage.
- Avoid using sawdust as chicks may feed on them causing crop compaction, they are also dusty causing respiratory problems and uncomfortable for the poultry attendant.

### **Heat source**

Recommended heat sources include electric infra-red, jiko with hoover (fueled by charcoal or briquettes), clay pot with holes, gas fueled brooder heater.

### **Construct in the brooder using the following steps;**

- Place flooring material – the litter material should be even at a depth of 2 to 4 inches (5- 10cms). For earthen floor, the depth may be doubled.
- Construct the brooder ring – consider the stocking density.
- Fix heat source – can be jiko, infra-red bulb, gas burners, kerosene lamp, electric elements
- Spread absorbent paper (newspapers or craft paper).
- Place feeders and drinkers.
- Fix thermometers and hygrometer.

## **Assemble tools, equipment, materials and supplies**

**Heat source:** Jiko, infra-red bulb, gas burners, electric elements

### **Chick feeders and drinkers**

- Alternate feeders and drinkers to allow easier accessibility by the chicks.
- Drinkers should be placed in such a way that they can be reached easily by any chick that is within 1.5 meters. Drinkers during week 1 should be placed on a solid surface, a little larger than the drinker itself to make the drinker easily accessible.

### **Thermometer and Hygrometer**

**Floor material:** Kraft paper, newspaper, wood shavings

**Feed and water day old chicks:** Use the correct feeders for baby chicks.

- The use of open feeding trays at placement is recommended to help chicks locate feed easily.
- Provide 1 chick feeding tray measuring 30 x 45cm (1 x 11/2ft) per 100 chicks placed between the main feeder and drinkers adjacent to the heat source.
- Feed 25g per day for days 1 to 3 and give multi-vitamins for three days.

## **Manage brooder house micro climate**

Below are the factors to manage in brooder micro climate

### **Temperature**

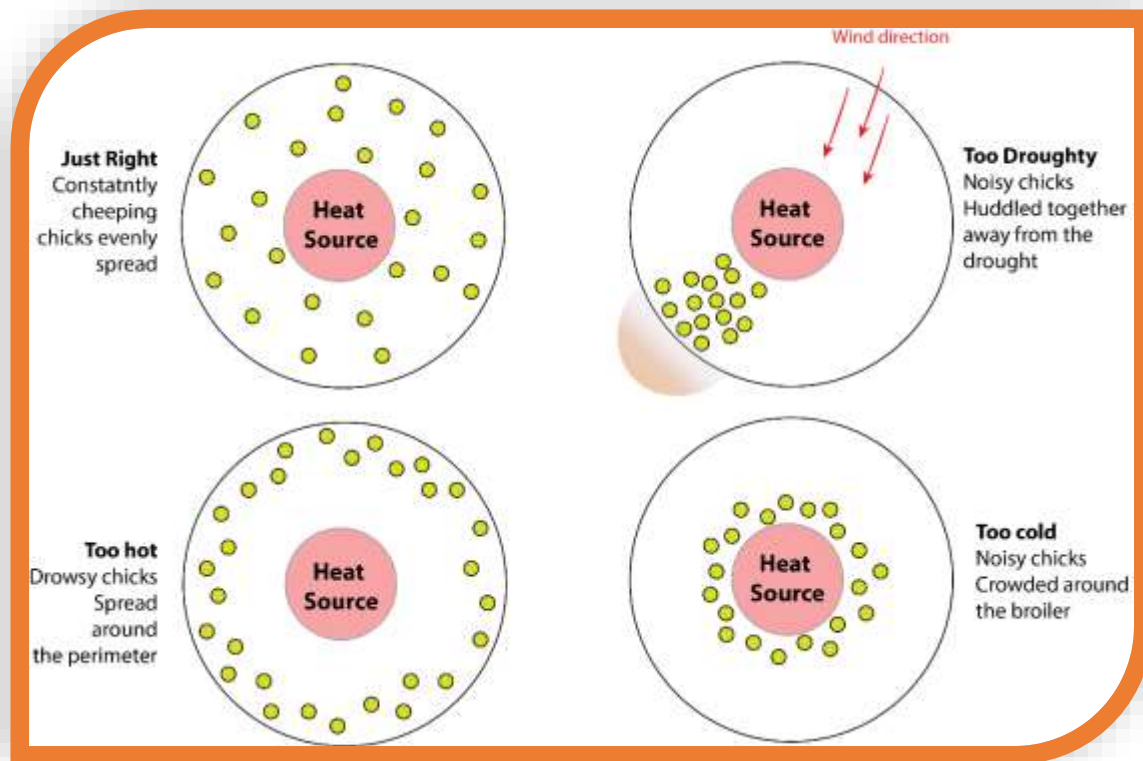
- Maintain the proper temperature in the brooder.
- The temperature should be monitored using the thermometers at the height of the chicks.
- Use chick behavior to determine if the temperature is correct, excessive chick noise during brooding is an indication that the chicks are uncomfortable.

### **Low temperatures (chilled chicks)**

- Chicks huddle together especially under the brooder.
- Watery intestinal and fecal contents leading to watery/wet droppings and wet pasted vents.

### **High temperatures (overheated)**

- Chicks lie prostrate with their head, neck and legs stretched out on the floor.
- Increased water consumption by the chicks.
- Chicks move away from the heat source and seek cooler parts of the brooder.
- It is important to maintain the proper temperatures during brooding as chicks which are chilled in the first day of life will be stressed, have increased mortality, get dehydrated, slow growth and a higher incidence of ascites.
- While overheated chicks will be dehydrated resulting in high mortality, runting/stunting syndrome and poor flock uniformity.



## Ventilation

- Ventilation is important in removing the ammonia from the house and ensuring that the litter is fresh dry thereby reducing disease challenges.
- Chicks also require fresh air to grow and be productive.
- For proper ventilation allow 1ft minimum ventilation from the top. in high temperatures open the curtains from the bottom this is to avoid drafts, chicks are susceptible to wind chill effects.
- Secure the curtains at the bottom of the side opening.
- Open the curtains from the top down to allow proper circulation of air but with minimum draft.

## Maintain brooder hygiene

- Maintain clean and dry litter in the brooder.
- Remove any wet or caked litter.
- Replenish litter to maintain 4 inches' depth.
- Use appropriate drinkers to avoid water spillage.
- Change drinking water on daily basis.
- Wash the drinkers with water and detergent on daily basis using the following procedure;
- Clean equipment using water and brush to remove organic material
- Wash with detergent to remove grease and oils.

- Disinfect and sanitize equipment using either of the following methods; heat, steam, hot water, chemicals like alcohol or by sun drying.
- Use appropriate feeder in the brooder.
- Do not fill feeds in the feeders. Portion out the daily ration into 3 portions.
- Refill feeders every time they are re empty.
- Feed *ad libitum* but avoid wastage.

### Perform chick vaccination

- Vaccination is done to prevent specific diseases and only healthy birds are vaccinated.
- Consult the local veterinary officer on the recommended vaccination programme for the region based on the prevalent diseases.
- If chicks are supplied by a breeder, consult the chick supplier/ hatchery/breeder on the recommended vaccination schedule for their birds.
- Prevention is cheaper than treating while some diseases have high mortalities even with treatment.
- Monitor post vaccination behavior of chicken and it is recommended to administer anti stress vitamins.
- Never vaccinate sick birds.

### Methods of administering and vaccines

AGE	VACCINATION	METHOD
Day 1(at hatchery)	Merek IB+NCD	Intra muscular spray
Day 10-14	Gumboro	Drinking water
Day 14-18	IB+NCD	Drinking water or eye drop
Day 24-28	Gumboro	Drinking water
Day 28-32	IB+NCD	Drinking water or eye drop

### Procedure for water vaccination

- Determine the number of birds to be vaccinated.
- Acquire vaccines. Its recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C-8°C.
- Withdraw the water to thirst the birds.
- Wash the drinkers.
- Constitute the vaccines as per the manufacturer's recommendation.
- Administer the vaccine, it is recommended the vaccine to be consumed within 2hours.
- Record the vaccines used, dosages, batch number and expiry date.

### Procedure for eye and nasal vaccination

- Determine the number of birds to be vaccinated.

- Acquire vaccines. Its recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C-8°C.
- Constitute the vaccines using the right amount of diluent depending on the number of birds.
- Pen all the birds and start administering the vaccine one bird at a time into the eye or the nasal opening.
- Place the birds gently to the floor.
- Record the vaccines used, dosages, batch number and expiry date.

#### **Procedure for spray vaccination**

- Determine the number of birds to be vaccinated.
- Acquire vaccines. Its recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C-8°C.
- Constitute the vaccines using the right quality and amount of water depending on the number of birds and the spraying equipment to be used.
- Spray the birds using the correct jet preferably during the night when the birds are calmer.
- Record the vaccines used, dosages, batch number and expiry date.
- Do not use chlorinated water when vaccinating birds.

#### **Control chick predators**

- Fencing off chicken run to limit entry.
- Strong reinforced walls around the chicken house to prevent entry.
- Baiting the predators using appropriate methods.
- Doors should always remain closed.
- Feed store should be vermin proof.
- Proper disposal of dead birds by burning or putting in mortality pits.
- Control the predators through baiting, ensuring the walls and house is strong enough to prevent entry of predators and fencing off the incubation area.
- Apply repellants around the house such as waste oil.

#### **Control chick vermin**

- Keep the environment clean by clearing bushes and debris.
- Set up baiting stations like rodent baits.
- Avoid feed spillages.
- Apply repellants like spent oil and pesticides along the boundaries of the house to prevent ants from accessing the house.
- Control vermin by dusting with appropriate insecticides when necessary.
- Maintain cleanliness of the house and the nest.

- Seal off any cracks on the wall and floors.

## **Kienyeji and improved chicken grower's management**

### **Feed growers in intensive production system**

#### **Prepare feeding and watering equipment**

- Determine the number of feeding and watering equipment to be used depending on number of flocks.
- Clean and disinfect watering and feeding equipment.
- Hang at appropriate height that is accessible by the growers.

#### **Dispense feeds and water**

- Calculate the amount of feed to be fed by multiplying the number of birds and the allocation (grams per bird).
- Weigh the feed using the weighing scale.
- Scoop and distribute the feed into the feeders ensuring even distribution.
- Feeds should be distributed within the shortest time possible.
- Provide quality clean drinking water on daily basis.
- Maintain drinker heights to avoid spillage.

### **Feed Kienyeji chicken in Semi intensive production system**

- In this system, birds are fed on commercial feeds or own farm mixture and allowed to scavenge around the compound.
- While birds are on free range, they are left to forage and scavenge the feed resources including; Household kitchen waste. Crop by products, a range of cereal grains available in the farm, insects, ants, worms and termites.
- Reduce the amount of commercial feeds depending on the amount of time the birds are left to forage.

### **Feed components**

**Energy feed:** Maize, wheat, sorghum, millet, wheat, rice and other by products (bran, polishing).

**Proteins:** Termites, insects, worms, omena, small fresh water shrimps, fish meal, sunflower cake, cotton seed cake, soya bean and sweet lupins.

**Minerals:** Calcium and phosphorous.

**Vitamins:** Green grass and fodder (provide vitamin A and D) vitamin B from fresh cow dung.

- Pro-mixes containing vitamins and minerals can be purchased.

#### **Assemble tools, equipment, materials and supplies**

- **Digital weighing Scale:** Used for weighing feed.



- **Weighing scale and bucket:** Weighing individual chicks or a sampled number of chicks scooped in a bucket.
- **Feed scoop:** Used for scooping feed.
- **Tube feeder:** Feeding growing chicken.
- **Automatic pan feeder:** Feeding growing chicken.
- **Trough feeder:** Used to feed growing chicken.
- **Fountain feeder:** Provide water.
- **Bell drinker:** Provide water.
- **Galvanized iron drinker:** Provide water.
- **Nipple drinker:** Provide water.

#### **Monitoring growing kienyeji chicken**

- Weigh the birds at least once a month.
- Sample least 10% of the flock (sampled randomly).

#### **Use the following procedure when weighing**

- Pen off the birds using chicken wire.
- Suspend or hang the scale within the pen enclosure.
- Adjust the weighing scale to zero.
- Weigh individual sampled birds and record their weights.
- Using a string, tie the bird's legs and suspend the bird on the weighing scale.
- Record the weights and calculate the averages.
- Maintain a record of the average weights. Weigh every sampled bird that is held within the catcher / by hand regardless of the body condition.

#### **Mortality**

- Record daily mortality and medication record.
- Submit dead birds for post mortem examination to the local veterinarian.

#### **Monitor feeding behavior of the chicken**

- Check for over-crowding at the feeders. This is an indication of inadequate feed space.
- Check for feed spillage: This is an indication of over filling the feeder, imbalance feed particles where birds are looking for smaller particles.
- Check for continuous occupation of feeders: this is indication of feed not meeting nutritional requirements of the birds. Over consumption of water: An indication of high temperature or high salt levels in the feed.

#### **Cull non-performing birds**

- Culling is done to minimize the cost of bringing up non-performing birds in terms of feeds and

medication.

- Monitor birds exhibiting disease symptoms, stunted and the ones that cannot walk and feed.
- Remove non-performing, diseased, stunted birds from the flock.

#### **Cull growing chicken if;**

- They have poor growth rates.
- Poor feeding.
- Sickly.
- Off types.
- Deformities either physically or naturally.
- Injured birds.

They have vices tendencies like;

- **Pecking:** condition where birds attack their pen mates and eat their flesh. This may cause deep wounds and cause mortality
- **Pica:** conditions where the birds start eating materials which are not fit for consumption such as feathers, litter material, threads among others. In order to prevent pecking and future egg eating, growers should be de-beaked. Growing birds' beaks are trimmed between week 8 and week 10. Debeaking can be done using a Debeaker machine or Jiko (does not give uniform results).
- Debeaking using knife is discouraged due to animal welfare concerns.

#### **Control chicken predators**

- Fencing off to limit entry.
- Strong reinforced walls to prevent entry.
- Baiting the predators using appropriate methods.
- Doors should always remain closed.
- Feed store should be vermin proof.
- Proper disposal of dead birds by burning or putting in mortality pits.

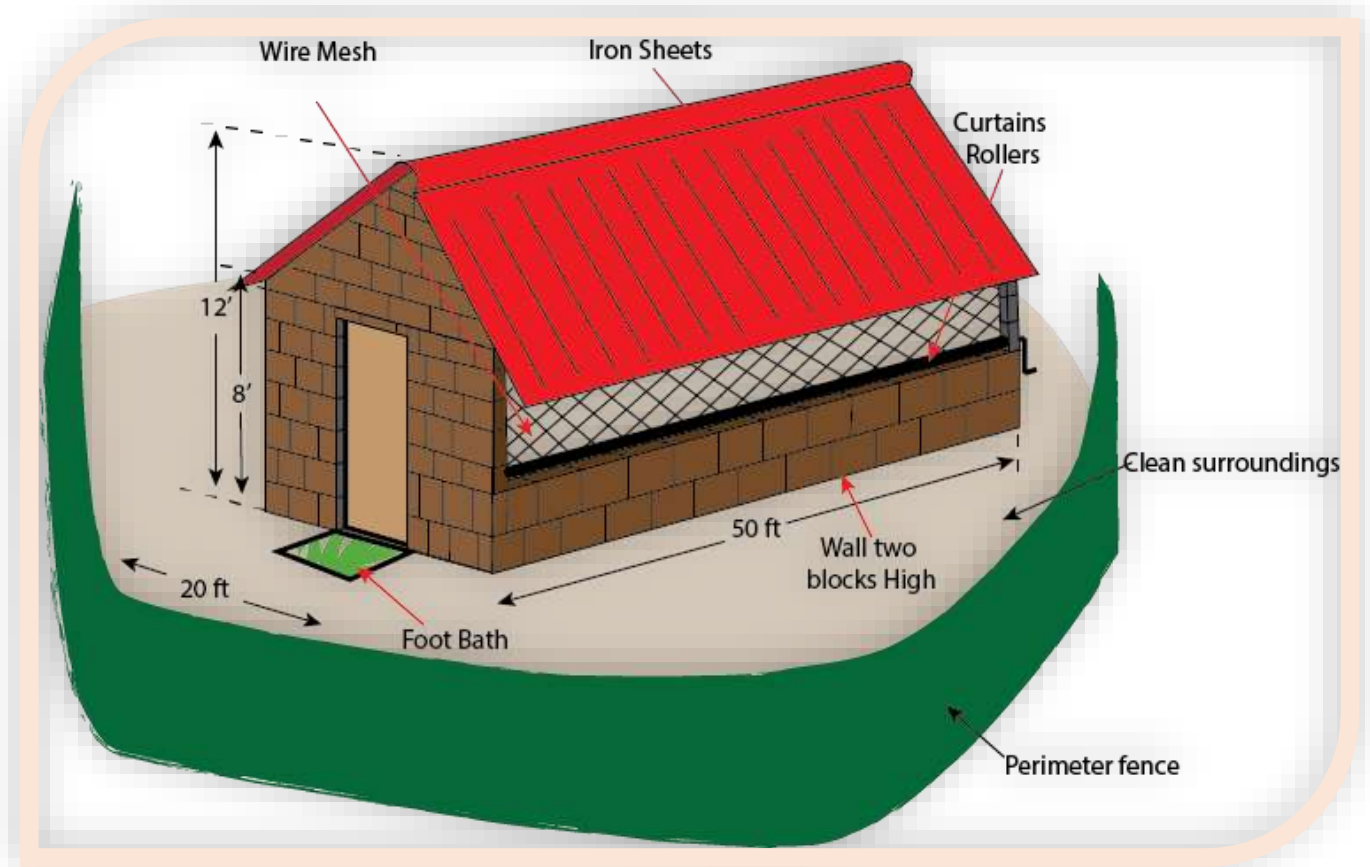
#### **Control chicken vermin**

- Keeping the environment clean by clearing bushes and debris. Use of baits. Bait stations are located outside the chicken house. Avoid feed spillages.
- Avoid overcrowding of birds.
- Separate newly acquired birds from the old flock.

#### **Manage poultry biosecurity**

### Construct bio security structures and equipment

- Fence off the chicken houses to control free entry of persons and other livestock species.
- Build a gate at the entrance to minimize entry of persons and other livestock species.
- Construct a foot bath and vehicle sprays at the entrance of the gate for disinfection of persons and vehicles entering the farm.
- Construct a foot bath at the entrance to the chicken house to sanitize foot wear before entering the chicken house.
- Install hand sanitizers before entry to the flock unit.
- Install disposal pits/furnace for disposal of dead birds and waste management.
- Install bait stations for rodents and pest control traps outside the house.
- Put in place dustbins and pits for disposal of other wastes.



Sample chicken house for 500 chicken

### Occupational health and safety measures

- Site the chicken house in a secluded place away from human traffic.
- Construct the unit in a secure area from the farmer's house.
- Ensure staff take medical tests and adhere to biosecurity standards.

- Maintain clean structures and facilities by regular repairs and replacement.
- Do not allow visitors and vehicles into the brooding area unless they are thoroughly disinfected.
- Proper disposal of dead birds by burning and burying.

### **Manage poultry waste**

Identify the types of wastes in a poultry unit include:

- Litter (droppings, feathers, spilt feed, dead birds).
- Other wastes (plastics, glass, paper, metals and fluids).
- Dispose waste in the following methods; On farm waste management and off farm waste management.

### **On-farm waste management involves the following**

- Compost all organic wastes and use as fertilizer.
- Disposal pit for organic.
- Incineration.
- Direct combustion of litter for production of fuel.
- Anaerobic digestion for production to biogas.
- Ethanol production.
- Vermiculture (Growing of earthworms).

### **Off farm waste management involves the following;**

- Outsource waste management for recycling.
- Outsource waste disposal to county disposal sites.
- Outsource inorganic waste disposal management.
- Dispose organic wastes to other farms for reuse.

### **Tools, equipment, materials and supplies**

- Vaccines.
- Feed supplements.
- Rake.
- Health records.
- Thermometers.
- Gumboots.
- Aprons.

### **Control poultry parasites**

- Sanitation and cleanliness are key in the control of parasites.

- The walls, floors, roosts, nest boxes should be cleaned. Some parasites, easily transfer from bird to bird.
- Separate new birds from the old flock to control the parasite transfer.
- Avoid overcrowding of birds give birds plenty of room to be comfortable overcrowding can cause an abundance of germs in a small area.
- Cleaning and adding fresh bedding prevents infected droppings from accumulating.

#### **Avoid introducing infested chickens to the flock**

- Purchase your chickens as newborn chicks. If you purchase adult birds, quarantine them for a minimum of two weeks to monitor their health and assess for potential disease and parasite.

#### **Avoid giving feed on the ground**

- Ground pecking for feed increases the risk of your flock consuming parasitic bugs and encountering droppings from contaminated birds.

#### **Use integrated pest management (IPM) practices to control insect populations**

- IPM practices are an eco-friendly way to eliminate or control factors required for pests to survive.

#### **Sanitize drinking water**

- One sick bird can infect the rest of the flock simply by contaminating the waterers. Sanitize the water and keep waterers and feeders cleaned to help control or reduce the chance of spreading infection.

#### **External parasites**

Birds must be treated with a powder or recommended pesticide sprays. The cages and houses must be thoroughly cleaned.

#### **Poultry vaccination**

Vaccination is done to prevent specific diseases and only healthy birds are vaccinated. Have a vaccination program depending on prevalence of disease and farm practice. Vaccination can be done through drinking water, eye drops, spray and injections.

#### **Administering vaccine through drinking water**

Procedure for water vaccination is as follows;

- Determine the number of birds to be vaccinated.
- Acquire vaccines.
- Its recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C - 8 °C
- Withdraw the water to thirst the birds Wash the drinkers Constitute the vaccines as per the manufacturer's recommendation.
- Administer the vaccine, it is recommended the vaccine to be consumed within 2 hours Record the vaccines used, dosages, batch number and expiry date.

### **Administering vaccine through nasal or ocular drops**

Protocol and procedure for eye and nasal vaccination is as follows;

- Determine the number of birds to be vaccinated. Acquire vaccines. It's recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C - 8 °C.
- Constitute the vaccines using the right amount of diluent depending on the number of birds.
- Pen all the birds and start administering the vaccine one bird at a time into the eye or the nasal opening.
- Place the birds gently to the floor. Record the vaccines used, dosages, batch number and expiry date.

### **Procedure for spray vaccination**

- Determine the number of birds to be vaccinated.
- Acquire vaccines. It's recommended to maintain the cold chain while transporting and storing recommended temperatures are 4°C-8 °C.
- Constitute the vaccines using the right quality and amount of water depending on the number of birds and the spraying equipment to be used.
- Spray the birds using the correct jet preferably during the night when the birds are calmer.
- Record the vaccines used, dosages, batch number and expiry date.
- Do not use chlorinated water when vaccinating.

### **Administering vaccine by injection**

- Consult a qualified veterinarian to help you administer injectable vaccines to your chicken flock. Injection of vaccines is administered at following sites on the chicken's body. Thigh, Neck, Breast, Wing web.
- The site chosen / used will depend on the type of vaccine being administered, the age of the bird and vaccine manufacturer's recommendation.

### **Manage poultry diseases and vices**

Manage Kienyeji/improved chicken diseases by;

- Adhering to bio security measures.
- Following vaccination and health program to the latter.
- Quarantine of sick birds and new birds by isolation.
- Contacting a veterinarian for diagnosis and treatment of sick birds.
- Monitoring and controlling poultry vices such as pecking through beak trimming.
- Once you observe one or a combination of the symptoms above place the flock under quarantine.

### **Quarantine procedures**

- Restrict movement of personnel and equipment.



- The sick flock should be attended to last.
- Designate PPEs to be used in the sick flock only.
- Follow the recommended medication regime.
- Dispose eggs from the sick flock.

### **Identify poultry vices**

Poultry may suffer from certain vices (bad habits), that need proper attention and care for complete eradication. These vices may cause loss to the poultry farmer. Some of the important vices are:

**Cannibalism:** a condition in which birds of a flock attack their pen mate and eat its flesh, which may impose deep wounds and heavy mortality. Vent pecking is common in laying birds. Once the birds adopt this vice it spreads rapidly through the flock and it has got no direct treatment.

#### **How to avoid cannibalism**

- Debeaking at right age in proper way i.e. One-third of the upper beak and tip of the lower beak is to be cut.
- Isolation of birds involved in cannibalism
- Provision of adequate and well-designed nest boxes
- Wounded birds should also be segregated and given proper treatment.
- Overcrowding of the birds must be immediately corrected.
- Feed must be available in sufficient quantity at all the times.
- Formulate feeds to specifications
- Environment should be peaceful in case of layers because the disturbance during laying creates congested external genitalia in layers which attracts other birds for cannibalism.

**Egg eating:** the tendency to eat their own eggs. It's one of the most common poultry vices. It may start due to the presence of cracked eggs or accidental breaking of eggs and once the birds develop taste for it they start breaking their own eggs.

- Isolation of the birds
- Quantity of lime stone and protein should be increased in the diet.
- Egg-eaters should be caged such that the eggs drop out after the lay.
- Debeaking also reduces this tendency.
- Darkness in the laying area may prevent this habit.
- Egg collection interval should be reduced.

**Egg hiding:** this is common with chicken on free range when they hide eggs in the field or bushes

- Restrict freedom of movement of the birds Laying area should be built inside poultry house and made comfortable by providing sawdust, straw etc.
- Egg collection interval should be reduced.

**Pica:** eating materials which are not fit for consumption, such as feathers, litter material, threads, etc. It is less commonly found in modern poultry farm. Phosphorus deficiency, parasitic infestation, new litter material etc. may predispose the birds to pica.

#### **How to control pica**

- Provide balanced diet
- Debeaking at right age in proper way i.e. One-third of the upper beak and tip of the lower beak is to be cut.
- Isolation of birds involved in cannibalism
- Provision of adequate and well-designed nest boxes
- Wounded birds should also be segregated and given proper treatment.
- Overcrowding of the birds must be immediately corrected.
- Feed must be available in sufficient quantity at all the times.
- Formulate feeds to specifications
- Environment should be peaceful in case of layers because the disturbance during laying creates congested external genitalia in layers which attracts other birds for cannibalism.
- Provision of red bulbs near laying nests may help during the period of the problem.
- Increase the fish meal content of diet or addition of fresh raw meat.
- Vitamin, mineral mixture and salt must be increased marginally in poultry ration.
- Increased amount of methionine in the diet is said to prevent this habit in layers.
- Provide greens and scratch feeds.

#### **Economics of Kienyeji and improved chicken**

Before starting any poultry production enterprise, calculate if it is economically feasible, thereby making the right decisions regarding the production system and the necessary interventions.

#### **Revenue or income**

- Is all the money earned in relation to the poultry enterprise such as.
- Income from sale of live birds, e.g. growers, cockerels or spent hens.
- Income from sale of eggs;
- Value of eggs or poultry eaten or given away.
- Value the standing stock, e.g. the production flock which is the foundation of future income. Poultry manure also represents a value when used on the farm or sold for other activities. Manure reduces the cost of buying fertilizer and improves crop production.

#### **Expenditure or costs**

These are costs involved in relation to the poultry enterprise:

- Material for baskets, shelters or poultry houses.
- Starting up flock e.g. Growers, hens or cocks.

- Fertile eggs for incubation.
- Day old chicks.
- Supplementary feed, vitamins or minerals.
- Vaccines and other medication labour and technical advice.

### **References**

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