

POULTRY PRODUCTION MANUAL



Applicable for mid-altitude areas including Dera, South Achefer, Burie and Jabi Tehenan districts of Northwestern Ethiopia

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**Capacity building for scaling up
of evidence-based best practices
in agricultural production in Ethiopia**

The CASCAPE project is designed to assist the activities deployed under the Agricultural Growth Programme (AGP) by further strengthening the capacity of AGP stakeholders in identifying, documenting and disseminating best practices in agricultural production. CASCAPE is jointly executed by Ethiopian researchers from Jimma University, Haramaya University, Bahir Dar University, Hawassa University, Mekelle University, Addis Ababa University and Dutch researchers from Wageningen University and Research Centre. In each site researchers from the universities and from the RARIs from different disciplines work on the CASCAPE project. The CASCAPE project is financed by the Dutch Ministry of Foreign Affairs through the Embassy of the Kingdom of The Netherlands.

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Abbreviations

ANRS	Amhara National Regional State
BoARD	Bureau of Agriculture and Rural Development
cm	centimetre
CSA	Central Statistics Agency
EARO	Ethiopian Agricultural Research Organization
m	meter
m ²	meter square
NCD	Newcastle Disease

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1. Introduction

In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of family protein and income (Tadelle *et al.*, 2003). The total chicken population in the country is estimated to be 56.5 million with native chicken representing 96.9%, hybrid chicken 0.54% and exotic breeds 2.56% (CSA, 2014). The most dominant chicken types reared in Ethiopia are local ecotypes, which show a large variation in body position, plumage colour, comb type and productivity (Halima, 2007). However, the economic contribution of the sector is not still proportional to the huge chicken numbers, attributed to the presence of many productions, reproduction and infrastructural constraints (Aberra, 2000; Halima, 2007).

The chicken production system in Ethiopia can be characterized by not market oriented, low input, scavenging and traditional management system consisting of local breeds (Alemu and Tadelle, 1997). The indigenous birds are small in body size and low producers of meat and egg (EARO, 2000). For example, the productivity of scavenging hens is 40-60 small-sized eggs/bird/year (Tadelle 1996; Alemu and Tadelle, 1997). The total chicken egg and meat production in Ethiopia is estimated to be about 78,000 and 72,300 metric tonnes, respectively (Tadelle, 1996).

The most dominant (75%) chicken production system in Amhara region is free range /scavenging type/ using a majority (95.8%) of local chicken ecotypes, with only seasonal feed supplementation, scavenging only (2.5%), scavenging with regular feed supplementation (21.9%) and intensive production system (0.63%) (Fisseha *et al.*, 2010). Similarly, Fisseha *et al.* (2010) reported that the most dominant (82.9%) chicken production system in Bure district was scavenging type using a majority (96.8%) of local chicken ecotypes, with only seasonal feed supplementation.

Similar to the national system, the major proportion of chicken production (98%) in Amhara National Regional State (ANRS) is a traditional sector, at small holder level, from which almost the whole annual meat and egg production is produced (ANRS BoARD, 2006).

According to the recent agricultural census study, the total chicken population of the region is estimated to be 14.44 million, accounting to 33.3% of the national chicken population, and kept for both eggs and meat production purposes.

Despite the large population and the great role of chicken both to the livelihood of resource-poor farmers and to the national economy at large, the current level of on-farm productivity in the smallholder production system is low due to various factors such as biological, social, economical and institutional factors. On the other hand, the modern poultry production system is very small in size and confined to urban and peri-urban areas and contributes less than 2% of eggs and meat production in the country.

One and the major suggested solution to increase the production and productivity of chicken is utilization of chicken production system which is modern, market oriented and compatible with the existing situation of the farming system. Therefore, by minimizing the production constraints through use of selected and productive poultry breed as well as improvement of the production system (feeds and feeding, housing, health, etc), it is possible to supply chicken products for the market demand over the household consumption. That is manual shows better poultry production in the region.

2. Importance of chicken production and Consumption

Chicken production and consumption provide different functions for the producer as compared to the other livestock production. Among the different functions, the following are the main ones:

- Immediate source of cash income
- Provides meat and egg for household consumption
- Contributes for food security and creates employment
- Source of organic fertilizer
- Requires low initial capital investment, small land and low labour input
- Efficient feed converters and have a wide range of adaptability for different agro-ecologies
- Their product is acceptable by most of the community and the meat and eggs contain special proteins that allow children to grow strong and their brain to develop

The reports of Halima *et al.* (2007) and Fisseha *et al.* (2010) indicate that village chicken is raised in northwest Ethiopia for various purposes and the first purpose (51%) of production of village chicken is sale for cash income.

3. Chicken production systems

Chicken can be reared in different management and production systems. Based on chicken breed type, input and output level, mortality rate, type of producer, purpose of production, length of broodiness, growth rate and number of chicken reared. In Ethiopia as well as in Amhara Region, there are three types of chicken production systems (ANRS BoARD, 2006). These are free-range production system, semi-intensive production system and intensive production system.

3.1 Free-range chicken production system

This chicken production system is practiced in most rural areas of the country and objectives of production are for household consumption and as source of additional income for the household (Figure 1). It covers 95-98% of the chicken production system of the country and it is not profitable since it is not market oriented. It contains small flock size (5-20 chickens per household) which are indigenous breed types mostly depend on locally available feed material as supplement with low health services and other management practices. The chicken does not have their own constructed chicken house rather maintained in the main house with the family. Chicken brooding and rearing is only the care they obtain from their mother/hen. Because of these there is high mortality of chicken and long broody periods and there is risk of exposure for different chicken diseases and predators. The major feed sources for chicken are worms obtained from free scavenging, legumes, cereals and sometimes there is supplemental feed during feed shortage. The amount given is small and do not fulfil their nutrient requirement. Because of this their productivity is low. Indigenous poultry breed in this system of production does not produce more than 60 eggs per hen per year (Tadelle, 1996; Alemu and Tadelle, 1997).

Advantages of free-range chicken production system

The advantages of free-range chicken production system include, the chickens are healthy since they exercise in the open air freely, there is minimal infection with parasites if enough

space is available, there is little or no labour input, the chickens in this type of production system help to limit the amount of rubbish in a productive way and the direct costs of the system are low.

Disadvantages of free-range chicken production system

The disadvantages of free-range chicken production system include, it is difficult to control and manage the chicken especially the young chicks are easily exposed for predators and unfavourable weather conditions, the chickens eat sown seed when looking for feed, a large percentage of the eggs can be lost as the laying hens are not accustomed to laying nests, high diseases transmission and occurrence of high death, chickens are less productive.



Figure 1. Traditional/scavenging system

3.2 Semi- intensive chicken production system

This type of chicken production system is better than free ranging production system since it uses inputs like supplemental feed, vaccine, etc (Figure 2). It has a small house which accommodate laying nest and feeders which serves as chicken house for night time. The house has one or two side open door for easy movement of the chicken to the fenced area

during the day time. The fence can be made from mesh wire or other materials and will not allow the chicken to escape above on it. The fenced area should be always clean and dry. Since the feed the chickens obtain from the scavenging is very low, they should be supplemented with energy and protein feeds. Since the main objective of the production is to get profit, they should get better health management practice like vaccination against NCD than free scavenging system. They are more productive than the chicken in free scavenging system. It contains flock size of 50-200 birds/chicken per household which are improved breeds.



Figure 2. Semi-intensive system

Advantages of semi-intensive chicken production system

The advantage of this system include, complete control over operation, useful for record purposes, operational throughout the year, economic use of land (free range) and there is better protection during winter.

Disadvantages of semi-intensive chicken production system

The disadvantage of this system of chicken production system include, high cost in fencing, danger of over stocking and exposure for different disease if the campass is not clean and dry.

3.3 Intensive chicken production system

This type of chicken production system use more inputs (feeds and feeding, breed, health, housing and other inputs) than the above two chicken production systems. It is market oriented and the main objective of production is to get better profit.

The number of chickens involved are relatively high (more than 200 chicken). The chicken breed used is specialized improved breeds (layer or broiler). They should provide the expected product within that time.

There are three types of intensive chicken production systems which include deep litter system, cage system and full slated rearing which are stated bellow in detail.

3.3.1 Deep litter system

It involves rearing of chickens on a floor littered by 5-10 cm thickness litter (Figure 3). The litter can be made from locally available material such as dry hay, teff straw, coffee pulp and sow dust. The litter should be dry at any time otherwise it can cause occurrence of different disease. In addition to provision of comfort for the chicken, the litter absorbs any waste material excreted from the chicken and make the house dry. It is possible to place the feeders and drinkers in the house on the litter. But it is advisable to hang them as the age of the chickens increase. It is also important to place laying nest in the house. In this way it is possible to rear either layer or broiler. At least once a week, the litter should be sprayed with disinfectant chemicals. Deep litter is recommended for both meat birds and layers.

To keep healthy chicken in this type of system, the following points should be noted:

- The existing litter should be removed totally when the existing stock culled
- Before introduction of new stock, the house should be cleaned carefully and left free at least for two weeks
- Make sure that the litter should be dry at any time
- At any time the thickness of the litter should not be less than 5cm



Figure 3. Deep litter system

Advantage deep litter system

The advantages of the system included proper accommodation, prompt culling of unproductive birds, proper control of diseases and predators, good record keeping and high egg production. It has also advantageous in that land requirement is minimum, easy and economic management, scientific feeding and management, high degree of supervision, minimum labour, automation is possible and manure value is increased. Deep litter is a good insulation. It protects chickens from cold weather, and during hot seasons they can nestle into it and reach the cool floor below. Studies show that when all other factors are equal, layers produce more eggs on deep litter than in cage systems. Chickens can be brooded and kept through their productive lives in the same house. Deep litter allows the bird to dust itself against lice and other parasites.

Disadvantage of deep litter system

The disadvantages of this intensive system of chicken production include high capital investment, problem of cannibalism and diseases outbreak. If the management is bad, liberation and accumulation of ammonia, wet litter problem dirty eggs, disease problems may result. There is a greater chance of worm and tick infestation and coccidiosis (internal protozoan parasites) than with cages or raised floor systems. The deep-litter system is inappropriate for very humid areas (80 - 90% humidity) damp litter spreads diseases. The litter must be turned often, particularly in damp weather, and this requires more labour than other systems. Sometimes adequate litter is difficult to obtain.

3.3.2 Cage system

This type of intensive production system involves rearing of chicken in one house on the prepared cages or nests and it is more appropriate for layers (Figure 4). The egg produced is used only for food since there is no cock. The chicken has no any access for free ranging. Therefore, the chicken should get the required nutrient through supplementation. The ration can be formulated in the house using locally available materials like maize, noug seed cake and other materials. Even though the system requires high initial capital investment, it is profitable. The rearing cage can be made from locally available materials like timber and wood. Cages are good for climates with high humidity, where labour costs are high, and when a farmer wants to keep a large flock of layers. Where ticks are a problem, cages are especially advantageous. Cages are recommended for layers, but not generally used for meat birds.



Figure 4. Cage system

Advantages of cage system

The advantages of the system include cages can be placed under existing roofs; thus, a special building may not be required. With cages more birds can be kept in a building than on deep litter. Less labour per bird is needed than other systems. Poor layers can be identified immediately and culled, thus saving feed. Problems with parasites, particularly ticks, are reduced, but nutrition may be a problem. When properly constructed, cages can last many years. Fewer disease problems are caused by transmission through faecal matter. Cages are a cheaper investment in the long run due to ease in care and feeding of the birds.

Disadvantage of cage system

The disadvantages of the system include, high cost of installation, breeding is not possible unless artificial insemination is practiced, cage layer fatigue or paralysis is a problem if not attended to, cages are hard to construct properly, they involve very high initial investment per

bird. There must be constant and excellent ventilation. There are more broken eggs than with deep litter. The feed must contain all necessary vitamins and minerals needed by birds.

4. Chick Brooding

It is rearing of chicken using different methods. There are two methods of chick brooding. These are natural and artificial brooding.

4.1 Natural brooding

It is chick brooding method which involves using of a natural mother/hen (Figure 5). Naturally hatched chicks are reared and protected by the broody hen and can be left undisturbed as long as their yard is protected from predators. The mother/hen provides heat for her chicks and she guides the chicks where the feed is available.



Figure 5. Natural brooding

Disadvantage of natural brooding

- Unable to rear large number of chicks at a time



- It is not preferable to brood the pullets
- Relatively high mortality rate

4.2 Artificial Brooding

This chick brooding method use different brooders/heaters to brood the chicks like electric, kerosene, charcoal and hay box. It is practiced in wide chicken production stations.

Advantage artificial brooding

- Allow to rear large number of chicken at a time
- Low chicks mortality

Disadvantage artificial brooding

- Need better input/feed, medication
- Need chicken production equipments (drinker, feeder, etc)

4.3 Brooders/Heaters

Chicks need heat at start of brooding until they emerge their own feather. Chicks reared through natural brooding get the heat they require from the hen. But in modern poultry production stations, the heat sources for chicks are brooders/Heaters. Kerosene lump, Charcoal heater, Bulb with 60-100 watt (Figure 6) as well as Hay box can be used as brooder/heaters. The advantage and disadvantage of some brooder types is as follows

Kerosene lump

This brooder type can support up to 100 chicks. The advantage of this heater include:

- No risk of power failure, low investment, supplies light and it is portable

On the other hand, the disadvantage of this brooder include:

- High fuel demand and fuel expensiveness, danger for fire, carbon dioxide production
- Needs a lot of control, heat goes to wrong direction and needs ventilation

Charcoal heater

The advantage of this heat source include:

- Charcoal is cheaper than kerosene and no risk of power failure

- Require low investment and is portable

On the other hand, the disadvantage include:

- There is risk of fire and carbon dioxide production
- Ventilation is necessary and it needs a lot of control

Bulb with 60-100 watt/electric brooder

The advantage of this heat source include

- It is easy to manage and there is no risk of fire
- It is easy to adjust and supplies light

On the other hand, the disadvantage include

- Electricity is expensive and there is risk for power failure
- Life time not very long and can break easily



Figure 6. Electrical brooder

Hay box brooder

Hay box brooder can be made from timber, straw and mesh wire. The sizes of the timber differ according to the number of chicks to be reared (Table 1). In this type of artificial brooder, it is possible to rear 10-70 chicks and it has two parts. These parts are heat

maintenance and chick feeder & shelter box as indicated in the following picture (Figure 7 and 8).



Figure 7. Heat maintenance box



Figure 8. Chick feeder and shelter box

The advantages of Hay box brooder include

- Provides service in rural areas/ no electricity and it is cheap
- Increase the productivity of local chicken breeds and reduces chick mortality
- Helps to rear many chicks at a time and is effective in all agro-ecologies

On the other hand, the disadvantages of this brooder include:

- Sometimes there is the occurrence of pests and
- When there is unavailability of lumber and its expensiveness

Specifications for hay box brooder

Table 1. Size of hay box brooder by the number of chicks to be reared

Number of chicks	Size of brooding box (cm)	Size of run box (cm)
10	30x26x26	30x56x56
20	30x37x37	30x80x80
30	30x45x45	30x98x98
40	30x52x52	30x113x113
50	30x57x57	30x127x127
60	30x63x63	30x139x139
70	30x68x68	30x150x150

5. Chicken ration formulation and feeding

The major production cost incurred in intensive chicken production system is feed and feed related costs which account 60-70%. Therefore, there should be proper utilization of the feed since it determines the profitability and the sustainability of the farm. The type and amount of ration given should be safe for their production or growth.

Improved chicken breeds can express their potential if they are provided with balanced ration and if they are fed properly. The importance of provision of balanced ration include for maintenance, growth, production, disease prevention, to produce well and have good resistance against diseases, etc. Young chickens should be fed separately from the adult chickens. They will often have a special diet and it is best for them not to have to compete with the adults for food.



Laying hens should have easy access to calcium rich food that may be supplemented by calcium-rich sources such as crushed snail or egg shells. Do not hatch new chicks if you don't have enough feed for them. If you hatch too many chicks, they may die from starvation or malnutrition, or their resistance to diseases may be reduced.

A broody hen should be separated from the flock to prevent other hens from disturbing her. Keep the hen in a separate nest with free access to fresh water and feed within a short distance. Supplementary feed and clean water should be given at least early in the morning and again in the evening when the chicken are returning to the house for the night. The major nutrients required for chicken include the following.

Carbohydrate/Energy

The amount of energy in the ration is the major nutrient that determines the daily feed consumption of the chicken. The main aim of feeding is to satisfy their energy requirement. At least $\frac{3}{4}$ of the chicken diet is made of energy feeds. Energy feeds are the most important feeds to maintain body temperature, exercise levels of the chickens, for maintenance, walking, feed searching, to trap insects, to protect from predator, for growth and production, etc. Major energy source feeds include cereal grains such as maize, sorghum, rice, wheat, barley, finger millet, industrial/cereal by products such as wheat bran and wheat middling.

Protein

Protein is needed for growth, keeping up a good health status, for maintenance, production, to grow feather, etc. No more than $\frac{1}{5}$ of a diet is protein-rich feeds, as they are normally very expensive. Harmful substances are present in some protein-rich plants, e.g. beans and the proportion in the diet should thus be kept low. The level depends on the type of plant, and whether the feed is being prepared before feeding.

Protein source feeds are obtained from both animal and plant origin. Chicken unable to produce amino acids rather they are 100 percent depends on farmers feed for protein. Plant origin protein source feeds include oil crop by products (contain high fat and protein nutrients), oil factory by products such as cakes. Animal origin protein source feeds include grounded blood, grounded meat, grounded meat and bone, fish by product such as fish meal;



green legumes and grasses, etc. Examples of protein-rich locally available feeds include maggots, termite eggs, insects, worms, meat scraps, fish scraps, fish meal, meat meal, bone meal, blood meal, feather meal, peas, beans, and oil cakes from e.g. ground nuts, cotton seeds, palm kernels and coconuts.

Vitamins

Vitamins are important for different purposes such as for disease prevention, to produce strong & healthy chicken and to motivate different chemical changes that take place in their body. Scavenging chickens get vitamins by eating green grass, vegetables and through sunlight. Confined chickens always need additional vitamins mixed with their feeds. The major vitamin source feeds are green legumes, grass species, vitamin mixes produced by factories, etc. Sunlight and green grass or green fodder normally provide Vitamin A and D. Vitamin B may also be added by giving Riboflavin tablets. Additional vitamins may be given in very small quantities and purchased from drug stores or feed sellers.

Minerals

Minerals are important for bone & eggshell formation, to develop strong bone & muscle, for blood circulation and to produce good feather. The most important minerals are calcium and phosphorous. To produce strong shells for their eggs, laying hens need free access to calcium (limestone or crushed shells), and adult chicken are usually able to balance their intake according to their needs. When phosphorous rich feeds are added, it should be balanced with calcium, since too high levels of one may cause deficiency of the other.

Major mineral source feeds are salt, locally available grounded bone & crushed oyster egg shell, snail shells, bone meal, burned eggshells, limestone, sand and calcium phosphate. Using bone meal or eggshells is a good way of balancing the calcium and phosphorus levels. Eggshells should always be scorched or cooked before re-use in diets to remove any disease germs.

Cool and clean water

It is very important for chicken particularly small chicks always to have access to clean water as they may easily die from dehydration. Chicken requires clean water two times their daily feed consumption. Water is important for digestion, excretion, thermo-regulation, egg

production, chicken and layer to keep them healthy & productive and to rear chickens properly. At any time, there should be clean water in the drinker.

Feed Additives

Feed additives are supplemental feeds which are added to the main ration in small amount and have the following function in the mix:

- They are growth promoters
- Improve palatability
- used as preservatives/to maintain the feed fresh and
- to make the product more attractive such as the colour of the yolk of the egg

6. Chicken ration formulation from locally available materials

Make sure that the nutrients mentioned above such as energy, protein, minerals and vitamins should be included in the ration during ration formulation.

Points to be considered during ration formulation are nutrient requirement of chicken, feed ingredients availability and type, its nutritive value & price and daily feed intake of the chicken.

Main factors that determine the daily feed intake of the chicken are the amount of energy in the ration, weather condition, health and management condition of the chicken and feed quality.

Starter, grower and layer diets

If the production is based on improved breeds for egg production, different types of commercial diets may be given. The diet of chicken is divided into three distinct categories with decreasing amount of protein as starter/chick, grower and layer diet. The ration formulated for chicks should contain more protein nutrient until age of 8 weeks (0-8 weeks). The ration can be produced or obtained from chicken multiplication centers, private feed producers and in the locality. It should contain enough amount of the nutrient protein since it affects the growth and reproductive performance of the starter. The ration formulation for the different categories of chicken is presented below (Table 2).

Table 2. Ration formulation for starter, grower and layer

Ingredient	Starter (%)	Grower (%)	Layer (%)
Maize	45.9	52.9	50.4
Wheat bran	7.5	7.5	7.5
Dried and grounded trifolium	2	2	2
Grounded bone and meat	4	4	4
Noug seed cake	37	30	30
Limestone	1	1	4.5
Grounded bone	2	2	1
Salt	0.35	0.35	0.35
Vitamin & mineral mix	0.25	0.25	0.25
Chicken ration formulated by feed win software using different ingredients			
Noug seed cake	10	10	10
Maize	45	60	55
Wheat bran	10	10	10
brewery dried grain	3	5	5
Soya bean meal	12	3	8
Salt	0.5	0.5	0.5
Alfalfa	3	0.5	1
Limestone	1.5	2	3.5
Sesame cake	15	9	7

Factors affecting feed intake of chicken

There are many factors which affect feed intake of chickens and hence determine nutrient intake level and efficiency of chicken production.

Flock size: In studies on laying hens, feed consumed per bird was less in large than in small flocks for the overall production cycle. Feed conversion for egg production also improved with size of flock. This was probably due to better management by owners of large flocks, thereby avoiding unnecessary wastage of feed.

Stocking rate: Feed intake and efficiency in broiler chickens were adversely affected by high stocking rate (30-40 kg/m²) compared to moderate stocking (24 kg/m²) even under conditions of sufficient feeder space. The effect of stocking rate and feed utilisation could be attributed mainly to the restricted access to the feed, increased heat stress, increased ammonia level, and prevalence of pathologies. Much of these effects could, however, be alleviated with proper ventilation and other management and feeding practices.

Temperature: High temperatures have the most striking effects on feed intake, particularly at the post-brooding stage. This relationship may be described by the following equation: $ME=1690-2.1T$: where “ME” is the metabolisable energy and “T” is the ambient temperature.

Feed and water factors: From the time the chicks arrive on the farm, they should have immediate access to clean, fresh feed and water which are essential to maximise the genetic potential and take advantage of the modern chicks voracious appetite.

Physical form of feed: Pelleting feeds usually results in increased density and intake of the ration, and also improves growth and feed efficiency. It has been estimated that 0.01 in feed conversions is lost with each 10% increase in ‘fines’ in pelleted feeds. Although pellet quality may appear adequate immediately after leaving the feed mill, pellet quality at the time the flock is consuming the feed in the house is what counts. Every effort should, therefore, be directed toward improving the quality of pellets that arrive in the feed trough for broiler.

Anti-nutritional factors: Some feed ingredients such as raw soybeans contain a number of unknown factors which inhibit pancreatic trypsin activity and inhibit digestion of the dietary proteins. Therefore, chickens fed raw soybeans often exhibit low intake and reduced feed efficiency.

Water supply: Water intake is correlated with feed intake and thus any decrease in water consumption due to failure in the water supply or lack of watering space would result in decreased consumption of feed to a varying extent, depending on the age of the chickens and the degree of water restriction.

Feather cover: Some hens lose their feathers over large parts of their body due to feather pecking, poor beak trimming, abrasion, and/or moulting. As a result, there is a decline in their

natural heat insulation and increase in heat loss from the bird. This aspect is more pronounced with poor feather cover on the neck and back, since these parts are more exposed to the environment compared to the breast or the legs. In this case, there is an increase in feed intake to compensate for the amount of feed energy lost as heat, coupled with low egg production and poor feed efficiency, expressed as the amount of feed per dozen of eggs.

Feed intake of layers can be increased through providing feed at the proper time of the day particularly at early in the morning & late afternoon, stirring the feed frequently with your hand 2-3 times per a day, providing cool & fresh water 2-3 times/day, make the feed wet to make the feed less dusty, providing pelleted feed and through feeding high energy diets.

6. Chicken house importance and construction

Housing is essential to protect against predators, thieves, rough weather (rain, sun, very cold winds, dropping night temperatures) & to provide shelter for egg laying and broody hens. A suitable or comfortable chicken house is also important for efficient production and convenience of the chicken farmer.

6.1. Preconditions before chicken house construction

- The site should not be swampy
- The soil should be water absorbent
- The site should have access to transport, water, electricity and other infrastructures
- It should be far from homesteads
- It is preferable where there is trees in the surrounding which serve as wind break and as a shade
- The site should be good for future expansion.

Once the site has been selected, the chicken house can be constructed in different type and quality. The house to be constructed should fulfil the following points.

Comfortable for the chicken: it should provide for the chicken enough space, well ventilated, allow entrance of light and should not be wet. These make the chicken productive and free from diseases.

Protect the chicken from unfavourable weather conditions and predators: It should protect the chicken from predators such as rat, wild predator birds etc; parasites; theft and from unfavourable weather conditions such as rain, wind, etc.

6.2. Cares to be taken for chicken house

- It should be cleaned properly
- If there were other stock before, all the old stock and the different waste materials should be culled, removed, cleaned properly and left free at least for 15 days.
- The floor and wall of the house should be cleaned properly and sprayed with pesticides such as formalin.
- Before introduction of the poultry, the floor should be deep with 5-10 cm thickness litter (hay, straw, saw dust, etc).
- Feeders, drinkers and other poultry house equipments should be placed in a proper place.

6.3. Chicken house types

Depending on availability of materials, weather and tradition, there are different types of chicken houses and shelters in tropical regions. Choice of chicken house should be built upon a rationale involving an estimate of the costs, durability, and immediate gain of using a house for chicken. Even though there are different types of chicken house around the world, the main ones are five types. These are:

All side open chicken house

All the open side is closed with sieve wire to protect the chicken from theft and different predators. It is mainly common in hot areas and should be constructed far (at least 50m) from other chicken houses. The open side should be in the wind direction to remove the unwanted smell and should have guard which allow to protect the rain dropping and wind.

One side open chicken house

This type of chicken house construction differs from all side open house in that there is only one side open. It is preferred in areas where the daily temperature is 15-30c°. The height of the house should not be greater than 9 m.

Chicken house with guard

The house has guard in two sides which allow controlling the temperature and the openness of the guard should be 1-1.5 m in hot areas and 0.3-0.6 m in cold areas. The guard should be closed from the lower to the higher/top to prevent the effect of coldness on the chicken.

All side closed chicken house

This type of chicken house construction is important to control the effect of extreme hot and cold weather conditions on the chicken. It is suitable for areas which are very cold and very hot weather conditions. The majority of the different activities, such as control of internal temperature, in this type of chicken house are accomplished by mechanical way.

House with deep pit

This type of chicken house is suitable for layers reared in cage or open slated system and the waste material from the layer/chicken is collected in the deep pit for several years (5-10 years). The objective is by collecting and mixing of the waste material to minimize its wetness (to make it dry). Since there will be flies, rats and smell of the waste material in the surrounding particularly during the wet season it will create a problem on the work.

6.4. Internal chicken house arrangement

Even though there are different chicken house arrangement types around the world, the main are deep litter system, half litter and half slated floor, full slated floor and cage system (Figure 9 and 10).



Figure 9. Deep litter system

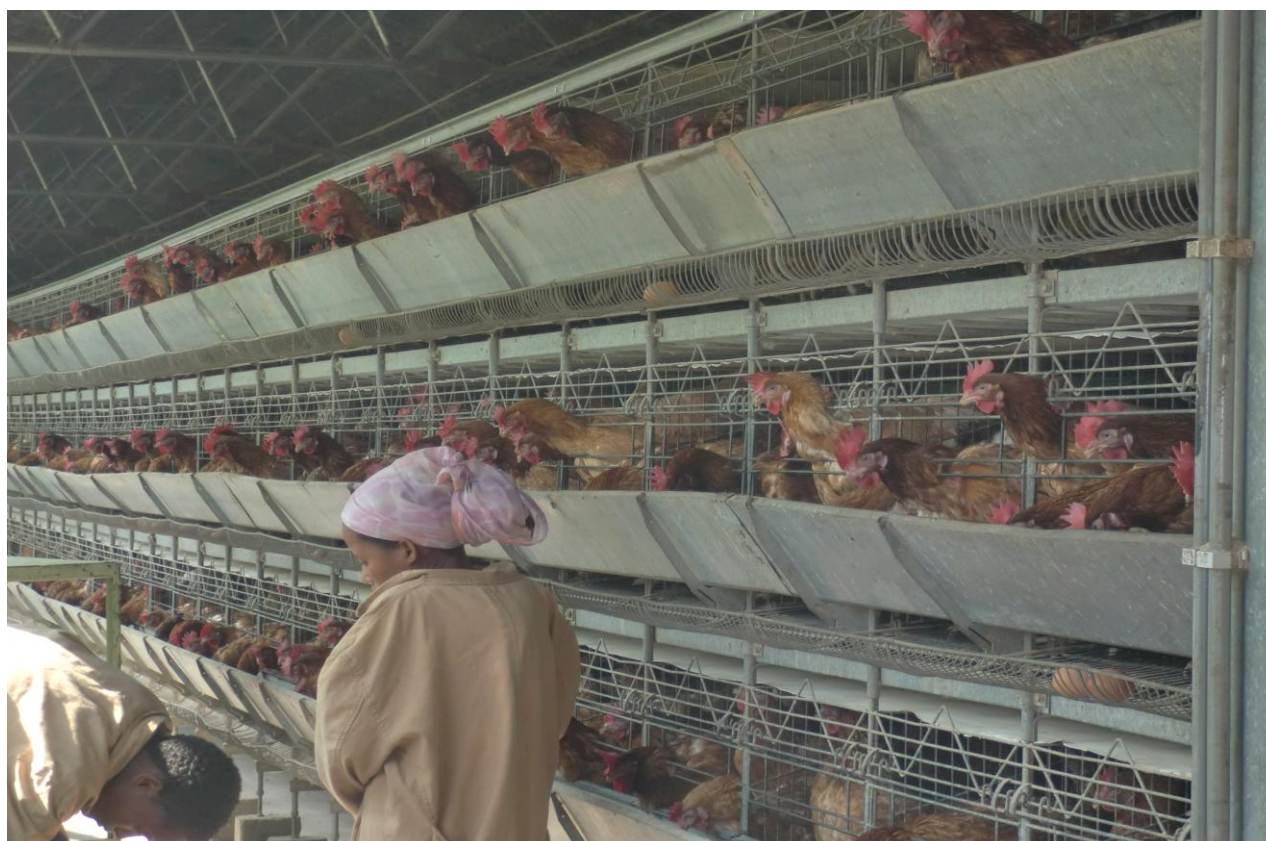


Figure 10. Cage system

7.0. Chicken production equipments

For successfulness of chicken production based on the production type and standard, it is advisable to use suitable and selected production equipments. The different equipments used in the chicken house differ according to the chicken age, breed and productivity status. The major production equipments used in chicken house are the following.

7.1. Feeders

Feeders are the same, whether being used in free-range, semi intensive systems or intensive systems. They should always be kept clean to prevent spread of diseases and big enough for all chickens of the same age to feed at the same time. One metre trough or a 35 cm (diameter) tube feeder is big enough for 20 adult chickens to eat. It is important that the feeders are constructed in such a way that feed waste is avoided. Also feed waste can be decreased if feeders are not filled to the top. It is better to fill feeders just half full and then check them

regularly for refills. Commercial feeders may also be bought at the market, either in metal or plastic. They are often expensive and normally not any better than locally produced feeders. The feeders can be made from locally available materials in different shapes like long, round feeders and can be made up of wooden, tin can, metal, plastic, etc (Figure 11). The type and number of feeders to be prepared should consider the age and productivity of the chicken (Table 3).

Characteristics of good feeders:

- Avoid wastage of feed, prevent contamination of feed
- Easy to clean, durable & strong and easy to fill and cheap



Figure 11. Feeders made from locally available material

7.2. Drinker

Drinkers are the same, whether being used in free-range, semi intensive systems or intensive systems. They should always be kept clean to prevent spread of diseases, big enough for all birds of the same age to drink at the same time and easily be produced out of local materials (Figure 12). One metre trough or a 35 cm (diameter) tube drinker is big enough for 40 chickens to drink. An empty tin can placed upside down on a plate forms an excellent drinker. Commercial drinkers may also be bought at the market, either in metal or plastic.

The type and number of drinkers to be prepared should consider the age (chick, grower and layer) and productivity of the chicken (Table 3). The drinker should be always cleaned, dried at least twice a day and sprayed with disinfectant chemicals once a week after properly cleaned.

Characteristics of good quality drinkers:

- Can give enough, clean and fresh water
- Strong, durable and stable
- Easy to clean and fill
- No splashes of water and cheap



Figure 12. Drinkers made from locally available material

7.3. Laying nests

Provide nests in the hen house for laying makes it easier to collect eggs and they can be kept clean (Figure 13). There should be adaptation period of the hen for the laying nest before start of laying eggs which is important to prevent the hen not to lay their eggs outside the laying nest. If you mark the eggs properly, you will know which eggs are new and should be collected. You may avoid dirty and cracked eggs, if the eggs are collected twice a day.

Collect eggs at the same time every day in the morning and the evening. Removing eggs continuously is important if you want to avoid that the hens become broody.

In many villages, nests are not provided for the hens and eventually the hens will lay their eggs on the ground, in high grass or in natural shelters, where it may be difficult to find. Some chicken farmers build nests on the ground outside the chicken houses. This should be avoided, as eggs outside houses are more exposed to predators and thieves. Nests should be placed inside the chicken house and preferably above the ground. For laying you may have a battery of nests where more hens can lay at a time. Nests should be of the right size for the hen to feel comfortable. The size and length as well as the number of compartments of the laying nest to be prepared should consider the number of hens. A nest box will typically measure 30 x 30 x 30 cm. The laying nest prepared by this size is enough for 5 layers. It is advisable to place the laying nests in the dark part of the house to prevent exposure to the sun. Don't make them too big, as the hen will not feel comfortable. A calabash or nest basket may measure 40 x 20 x 25 cm (upper diameter x height x lower diameter). A clay pot is made more or less the same as calabash.

To avoid the number of eggs laid by hens on the ground and loss of product, we have to consider the following points:

- Place enough nest and introduce nests one week before onset of lay
- Collect ground eggs many times a day and use a comfortable nest
- Don't feed when the hens are on the nest
- Avoid dark corners in the house and do not collect the first eggs
- Divide the nests uniformly over the house and place nests on a wind free place



Figure 13. Laying nests made from locally available material

Recommended standards of equipments and density (feeders, drinkers and nests)

Table 3. Feeding space, watering space, housing space and laying nest requirements for chickens at different ages

Feeding and watering space requirement in cm/bird					
Feeder/ Drinker type	Chicks 0-8 weeks	Layer growers 8-18 weeks	Broilers	Layers	Breeders
Long feeder	7	9	5	12	18
Round feeder	3	4	2	5	7
Long drinker	1.5	2	1	2.5	3.5
Round drinker	1.5	2	1	2.5	3.5
Housing space requirement (number of birds in 1m²)					
Housing type					
Full slats			15	7	-
2/3 slats, 1/3 litter			-	6	4
1/2 slats, 1/2 litter			-	5	-
Full litter			10	4	3
Laying nests requirement					
Types of nests					
Individual nest (hens/nest)				7	5
Communal nests (hens/m ²)				50-75	30-50

7.4. Litter

Importance of litter include (Figure 14):

- Provide comfort and heat for the chicks
- Make the house dry by absorbing the waste material excreted from the chicken
- It creates unfavourable condition for breeding disease causing organisms

Materials used for litter include:

- Dried grass/hay
- Wood by product/sow dust
- Cereal straw (teff straw, wheat straw, barley straw, etc)
- Coffee plant byproducts, etc.

Cares to be taken:

- Should be clean, dry and not change its colour
- the litter should be deep/littered three days before entrance of the chicken
- the litter should be sprayed properly with disinfectant chemical (like formalin) weekly to prevent bred of the pests
- The litter should be 5-10 cm thick
- The wasted litters should be replaced by new litter always



Figure 14. Litter made from locally available material

Qualities of good litter material:

- It should readily absorb moisture
- Should not cause injury to birds
- Moisture level should be less than 15%
- Should get decomposed and form good manure
- Should spread evenly
- Should be non-toxic
- Should not cause dust pollution

8. Major chicken diseases and prevention methods

8.1. What is disease?

It is any abnormality which disturb daily movement/activity of an animal by injuring either internal or external part of the body. If an animal's normal activity/movement is disturbed or decreased by injuring all of either the internal or the external part of the body that animal is called diseased/sick animal. Particularly when chicken disease occurs in one area once, it can transmit fast and disturb the production process through death of many chicken which intern cause high economical loss as well as the farm to be closed.

8.2. Identification of healthy and unhealthy chicken

It is very important for the farmer to learn how to detect an unhealthy or sick bird. So he can initiate the right action. You will find the main characteristics of healthy and unhealthy birds. Healthy birds may be able to fight against the diseases themselves whereas unhealthy birds will have difficulties in fighting diseases. It is important to isolate unhealthy or sick birds from the healthy flock in order to ensure a minimum of loss. Characteristics of healthy and unhealthy chicken is mentioned as follows.

Healthy chicken (Figure 15):

- Externally they are clean and alert
- Have normal position head and neck
- Well to move and walk freely
- Have strong leg and normal voice
- Have bright eyes and comb
- Eat and drink normally
- Lay eggs normally and have smooth and neat feathers
- Soft and compact droppings
- Breathe quietly

Unhealthy chicken

- Heavy head and close their eyes
- Tired and lifeless

- dull eyes and comb
- Sit or lie down
- Eat and drink less
- Lay less or stop laying eggs
- Ruffled and loose feathers
- Wet droppings with blood or worms
- Diarrhoea, cough, sneeze and breathe noisily, drooping wings
- Body parts mainly around anus there is waste material
- Unable to move and abnormal voice



Figure 15. Healthy chickens

8.3. Causes of chicken disease

Causes of chicken disease are divided as living and non living agents. From this perspective, chicken disease causing agents are three types. These are germs & microorganisms, parasitic worms & pests and inappropriate nutrition.

8.4. Major chicken diseases

According to the disease causing agent and based on the attacking ability of the disease, chicken diseases are classified as acute and chronic disease.

➤ **Acute disease**

The majority of the disease causing agent enter to the body of the animal and multiply immediately. After this time the disease start fast and ends within short period of time. The diseased animal can die or survive.

➤ **Chronic disease**

Small number of disease causing agent enter to the body of the animal. Through progress they multiply and make the animal injured for a long period of time and finally it can cause death of the animal.

On the other hand, based on the nature of causative agents chicken diseases are classified as follows.

8.4.1. Protozoan chicken diseases

The most common economically important protozoan chicken diseases include coccidiosis etc.

A. Coccidiosis

Coccidiosis is one of the chicken protozoan diseases which affect chicken at all ages and mainly attacks chicks at age of 3 - 6 months. It affects mainly the intestine and is one of the fatal chicken diseases.

Ways of transmission

- Through diseased chicken and by drinking contaminated water & by feeding spoiled feed
- When there is moist condition in and around the chicken house and their day shelter which creates favourable condition for the microorganism to multiply.

Prevention

The disease can be prevented by regular and careful cleaning of troughs and chicken houses.

Symptoms

- Sick, tired, head down, ruffled feathers, bloody diarrhoea
- Death in young chicks
- If the chicks survive, they will remain thin and be late in egg laying

Treatment

Anti-coccidial in drinking water or feed, e.g. provision of Amprolium drug

Prevention

- Do not keep too many chickens together, avoid different age groups of chickens in the same house as the disease may spread from adults to young chicks
- Cleaning of drinkers and feeders with soap, prevent moist conditions in and around the chicken house and their daily shelter

8.4.2. Bacterial chicken diseases

A. Salmonellosis

The disease affects chicken at all ages. The causative agent is the unobservable bacteria salmonella spp.

Ways of transmission

- From the mother to the egg, if the egg shell is contaminated with waste of diseased chicken
- Through water or feed contaminated with waste of diseased chicken and through incubator which is contaminated with the disease



Symptoms

- lack of appetite, eye blindness, the faeces is thin and white
- The diseased chicken will die within some days, the recovered diseased chicken are carrier and the egg they lay is contaminated by the germ and the chicks are carrier
- Increase body temperature in older hens, weakness, anaemic, inactive, whiteness of the comb and wattles and white faeces with green colour

Treatment

Treatment of the diseased chicken is not supportable because they are carrier, provision of antibiotic to reduce mortality but it cannot be cured at all.

Prevention

Smoking of the equipments used for different purposes and the egg with antimicrobial drugs, culling of the diseased carrier chicken.

B. Pasteurellosis

It a communicable chicken disease which suddenly cause high pain and lead to death within short period of time. Mostly it attacks chicken above 6 weeks age. The causative agent is bacteria.

Ways of transmission

- The diseased and carrier chicken by contaminating the feed, water, air & soil transmitting the disease to healthy chickens
- Putting of the dead chickens anywhere and transmitted to other areas by carnivores animals like dog

Symptoms

- Lack of appetite, inactiveness, their faeces is yellow colour with green and white diarrhoea
- Pink colour of the comb, sleepy, discharge from mouth and nose, neck round and swelling of front joint parts

Treatment

Provision of antibiotics through injection or with feed

Prevention

Culling of the diseased chickens, burning of dead chickens and provision of drugs

8.4.3 Viral chicken diseases

The common economically important viral chicken diseases are the following.

A. Fowl pox

This viral disease is often seen in young chicks, but also in adults. It is contagious and occurs in sub-acute form. The disease causing agent is virus. The disease is common during dry seasons, but may be found year round.

Transmission ways

Contact of the diseased and healthy chickens through skin damage, snacking pests, equipments contaminated with diseased poultry and through cannibalism.

Symptoms

- Shows as pocks (small lumps) on wattles, comb and face, high body temperature
- Tiredness followed by sudden death, presence of injuries or swellings in different shapes on body parts
- There is no feather around eye, head, mouth and leg, occurrence of black swellings
- Injury is around eye and head area, discharge from the mouth and eye dropping
- Small white swellings on the higher feed track and breathing part
- Because of the injury, they are unable to breath properly
- Lower appetite, lower weight and egg production, the chicken takes 3 - 4 weeks to recover from the disease

Treatment

Since the disease is viral, there is no treatment. Vaccine is available and highly effective. To prevent expansion of the injury, it should be treated with antimicrobial drug with water or feed.

Prevention: Provision of fowl fox vaccine by injecting on the feather

B. Newcastle disease (NCD)

The disease is very common during dry seasons and is often seen in young chicks but also in adults.

Ways of transmission

Breathing in waste from diseased chicken, contaminated water and feed

Ways of transmission

The disease can be communicable from one area to the other in different ways.

- Purchase/gift and introducing/mixing diseased chicken to healthy chickens
- In the nearby of carrier wild birds, due to carnivore animals like dog, cat, etc
- Contact with human being and vehicles, by wind/air
- Utilization of equipments of diseased chickens for healthy chickens

The causative agent is virus and it can be seen from 3 perspectives:

Dangerous: This type of disease causing virus is causes high damage on the intestine and nerve system which result high mortality rate

Medium: - This one cause medium damage/injury on the breathing organs and nervous system which result small mortality rate. In addition it brings a decrease of egg production.

Lower/simple: - This type of disease causing virus cause little damage on the breathing organs which result in mortality in chicks.

Symptoms

It varies with the disease tolerance ability, age of chicken, intensity and type of the virus.

- Sudden death (if mortality rate 50 - 100%), weakness of the egg shell and decrease of egg production

- Abnormal breathing, inactiveness and loss of appetite, green diarrhoea, discharge from the mouth and nose, injury of the nervous system, weakness of wing and leg
- Neck round, swelling on face and neck area, lose appetite and have poor digestion, show heavy breathing, greenish droppings, and sometimes bloody diarrhoea
- Show nervous symptoms, paralysis and die suddenly, and the symptoms may occur all at the same time

Group investigation: post-mortem examination of chicken died by NCD indicates that there is swelling and lesions on breathing, digestive and reproductive organs. The disease is caused by a virus, so there is no treatment, but it may be prevented through vaccination of all birds including chicks from two weeks of age.

NCD prevention vaccination

The vaccine is prepared to make weak in different ways the action of the living disease causing virus and to motivate the immune system of the animal. Once huge amount of the vaccine is produced, allow drying the vaccine in very cold conditions and then after the produced vaccine will be packed with bottle in different doses.

NCD vaccine storage and service period

The vaccine should be stored and managed properly as it contains living germ otherwise the germ will die and make the vaccine unable to create immune. The vaccine should not be stored/exposed to hot and sunny areas. If the vaccine is stored at +4 °C room temperature, it can be utilized for 6 months and if, at -20 °C room temperature for 2 years.

Types of Newcastle vaccine

Thermo-unstable vaccine: This type of Newcastle vaccine requires cooling equipment like icebox to transport from one area to another and to store for further utilization. Otherwise it will expire. Example: HB-1, LaSota

Thermostable vaccine: - On the other hand this type of Newcastle vaccine does not require cooling equipment like icebox to transport from one area to other and to store for further utilization. One example of this type of vaccine is I₂ Thermostable vaccine.



The importance/advantage of I₂ Thermostable vaccine are:

- Easily manageable by farmers and utilizable mainly in rural areas where there is no electricity and animal health clinics
- Because of easiness for utilization, the community will have sustainable vaccination service through selected and trained vaccinators in the locality

Vaccination preconditions and cares to be taken

- If it is provided with drinking water, the chicken should be given enough amount of drinking water at least for 2 hours before vaccination
- The waterer should be free from any chemical contact and should not be made of iron material rather from clean plastic material
- It should not be given for diseased/sick and weak chickens
- The vaccine which is expired should not be used
- Vaccination syringes and droppers
 - Should be cleaned properly both before and after utilization
 - Do not use antimicrobial drugs to clean the materials
 - After proper cleaning of the materials, it should be stored after packed with clean and dried clothes
- The vaccination should be provided in morning where the weather condition is cold
- The left vaccine should not be used in the future rather it should be removed
- The vaccination should be used based on the guideline of the producer company

C. Gumboro disease (Infectious Bursal Disease, IBD)

The disease introduced to our country is associated with the introduction of improved commercial chicken breeds. It makes the chicken lose their immune system and to be exposed easily to different diseases. Only seen in chicks younger than 6 weeks and normally only in large flocks kept in confinement. Not common in small-scale village based systems.

The disease-causing agent is a virus that attacks white blood cells. Once it enters the internal body part of the chicken, it multiplies outside the body part around the bursa of Fabricius.

Common symptom

- Diarrhoea, occurrence of swelling or reducing the size of bursa

- When the bursa swells, it becomes red, contain water
- Under skin it seems splashed with blood, sudden death of the chicks

Prevention

The disease is viral, so there is no treatment. Vaccine is available. Wash successively with chemicals, removal of the dead chickens, prevent entrance of human being and animals to the farm, prevent introduction of purchased chickens.

8.4.4. Feed related chicken diseases

The chicken produces the expected product only if they have got balanced ration. During ration formulation it should contain the different nutrients like energy, protein, minerals, vitamins, etc. Otherwise the product will be reduced. Lack of adequate nutrition/balanced ration exposes the chicken to different diseases.

Common symptoms

- Bone deformation and feather loss, walk with difficulty, they limp
- Legs will be deformed, some deficiencies may cause feather loss

Treatment

- If detected in time supplementary vitamins and calcium and fresh grass
- Nutritional diseases may be avoided when the chickens have access to normal vegetation and are therefore rare in scavenging chickens

Prevention

Provision of different feed sources like cereals, legumes, limestone, bones, etc. Make sure that the ration formulated should contain the nutrient the chickens require.

8.5. General chicken diseases control and prevention methods

There are different prevention methods and ways of provision of vaccination. Ways of provision of vaccination include through eye drop, water/drinking, feed and injection.

Generally, either in traditional or modern chicken production system to control and prevent different chicken disease the following points should be considered.

- **Monitor the chickens not exposed to transmittable disease**

- Allow the chicken to scavenge in and around the chicken house rather far from the house since it helps to protect the chicken from predators
- Separate chicks from the adult chickens since the chicks are easily exposed to diseases and the disease can be easily transmitted to chicks
- Separate and removed immediately the dead and diseased chickens from healthy chickens
- Prevent introduction of new chicken from other area during occurrence of seasonal diseases
- Place in quarantine of new comer chickens/purchased or gift/ at least for one month
- quarantine /put in separate place the chicken back from the market
- Careful control of visitors of production station
- Do not borrow as well as give the production equipments
- Supply clean water and balanced ration to make the chicken strong
- If you find an unhealthy or sick bird, isolate the animal and call for the veterinarian or health assistant for disease identification and further advice
- If the chicken dies, burn it or bury it; you should remove dead chickens, so that the germs are not left on the ground to be passed on to the other chickens
- Construct a separate house for the chicken a little bit above the floor

- **Keep the environment clean**

Chicken keepers in the house, chicken production equipments and internal chicken house environment including the litter should be clean always as well as control of different predators (rats and pests).

- **Utilization of antimicrobial (Disinfection)**

There are two methods that allow removing germs. These are:

- Utilization and spray of antimicrobial chemicals/disinfectants such as iodine, phenol, formalin, etc
- Non chemical disinfectant such as use of warm water, air drying, sun drying

- **Utilization of drugs for prevention (medicine and prophylaxis)**

Prevention of disease using drugs after the occurrence of the disease and many of the time it is not effective. The recovered chickens are not as such productive as before. Therefore, provision of antibiotics drug before the occurrence of the disease help to be strong the immune of the animal and provision of effective drugs/based on research results for prevention and total curing with feed or drinking water.

- **Vaccination**

Prevention vaccination: it is provision of vaccine for chickens before the occurrence of the disease which helps them to prevent the disease.

Control vaccination: it is provision of vaccine when there is disease outbreak to prevent expansion of the disease. The diseased chicken will be separated from the healthy chickens and the healthy chickens will be given control vaccination which helps to control the disease (Table 4).

Table 4. Summary of vaccination program

NCD vaccine vaccination program				
No	Steps	Age	Vaccine type	Vaccination method
1	1 st vaccination	1-7 days	HB1	Eye/nose drop
2	2 nd vaccination	18-21 days	Thermostable	Drinking/eye drop
3	3 rd vaccination	2 months	Thermostable	Drinking/eye drop
4	4 nd vaccination	5-6 months	Thermostable	Drinking/eye drop
5	Every 3 months	Different	Thermostable	Drinking/eye drop
Vaccination program for layers				
Age (days)		Disease type		Vaccination provision
9-14		Newcastle		Drinking water/eye drop
14		Gumboro		Drinking water/eye drop
28		Gumboro		Drinking water/eye drop
Age (week)		Disease type		Vaccination provision
4		Newcastle		Drinking water/eye drop
8		Fowl pox		Injection on feather
13-14		Newcastle		Drinking water/eye drop
16		Newcastle		Injection under feather

9.0. Record keeping

To manage chicken production, you have to keep detailed records on a daily or weekly basis. It is very important to spend some time each day observing your flock carefully. In this way early signs of disease, malnutrition, or other problems may be discovered and the necessary precautions will be taken. There are different kinds of data to be collected during chicken production process. These include:

Feed intake related data: name of the farmer, age in weeks, light exposure (hours), chicken category based on age (chicks, grower, layer/hen, cock), feed intake (gm/day/head).

Chicks data collection : chicks growth data, date of brooding, breed, age in days, number of chicks present, mortality data, average body weight (every 15 days), causes of death.

Market related data: number and chicken type sold (hen, cock, grower, chicken), eggs sold, where and to whom sold, eggs/chicken consumed and to whom, income from sale of eggs, gifts and home consumption of eggs and chickens by your family and friends should also be noted, all expenditures for feed or feed ingredients should be registered carefully, noting quantities, price and date of purchase. If you buy feed from feed sellers, note the name of the seller and the time of purchase.

Layers data collection: date of brooding/ hatching, date of start of laying egg, breed, number of eggs laying per day/head, number of eggs broken or out of use, number of hens (present, died, transferred), eggs laid, dead chickens, cause of death and chickens given as gifts.

Health record sheets: date of vaccination, name of the vaccinator, type of vaccine, name of the disease, method of vaccination, etc.

Treatment data: date of treatment, age of the chicken (week), type of drug used, dose of the drug used, method of drug administration (water, feed), etc.

Reference

- Aberra Melesse, 2000. Comparative studies on performance and physiological responses of Ethiopian indigenous ("Angete-melata") chicken and their F1 crosses to long term heat stress. PhD Thesis. Martin-Luther University, Halle-Wittenberg, Berlin.
- Alemu Yami and Taddesse Dessie, 1997. The Status of Poultry Research and Development. Research Bulletin No. 4. Poultry Commodity Research Program, Debre Zeit Agricultural Research Center, Alemaya University of Agriculture, Ethiopia.
- Amhara National Regional State Bureau of Agriculture and Rural Development (ANRS BoARD), 2006. Poultry Development and Marketing Strategy. Bahir Dar, Ethiopia
- Central Statistical Authority (CSA), 2014. Agricultural Sample Survey Vol. II. Statistical Bulletin No. 331, Addis Ababa, Ethiopia.
- EARO (Ethiopian Agricultural Research Organization), 2000. Summary of Livestock Research Strategy, EARO (unpublished).
- Fisseha Moges, Abera Mellese, and Taddesse Dessie, 2010. Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. African Journal of Agricultural Research Vol. 5(13), 4 July, 2010, 1739-1748pp.
- Fisseha M, Abera M, Taddesse D, (2010). Assessment of village chicken production system and evaluation of the productive and reproductive performance local chicken ecotype in Bure district, North West Ethiopia. African Journal of Agricultural Research Vol. 5: 1739-1748.
- Halima H., Nesser F.W.C., Van Marle-Koster E., and De Kock A., 2007. Village-based indigenous chicken production system in north-west Ethiopia. Tropical Animal Health and Production. 39:189-197.



Halima Hassen Mogesse, 2007. Phenotypic and genetic characterization of indigenous chicken populations in North-West Ethiopia. PhD Thesis Submitted to the faculty of natural and agricultural sciences department of animal, wildlife and grassland Sciences. University of the Free State, Bloemfontein, South Africa.

Tadelle Dessie, 1996. Studies on Village Poultry Production Systems in the Central Highlands of Ethiopia. MSc Thesis, Swedish University of Agricultural Sciences.

Tadelle D., T. Million, Alemu Yami and K.J. Peters, 2003. Village chicken production systems in Ethiopia: Use patterns and performance valuation and chicken products and socio-economic functions of chicken. *Livestock Research for Rural Development* 15 (1).