IMPROVED POULTRY PRODUCTION TRAINING MANUAL

BY

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1. Introduction to poultry production:

Poultry refers to domestic fowls/ birds that render economic service to man and generally include the chickens, turkeys, ducks, geese, quails, pheasants, pigeons, guinea fowls, and ostrich among others. However, chicken is the most numerous than any other kind of poultry aforementioned.

Importance of poultry

Poultry plays a pivotal role in the livelihoods of many communities in rural Africa as source of income, employment and proteins; and it contributes to 33% global supply of animal protein and micronutrients (FAO, 2010; Smith, 1990).

In developing countries of Africa including Uganda, poultry products supplies about 20% animal proteins in the diets of vulnerable groups (Awuni, 2002, Kyarisiima, 2004). There is increasing trend in demand and consumption of poultry especially in the developing countries while accounting for 85% income generation for household (Gueye, 1998; FAO, 2004).

Uganda's perspective

In Uganda, poultry has tremendously contributed to food security and household incomes (MAAIF 2010; MFPED, 2010; USAID, 2010). It is a viable source of side income for many civil servants and offers full-time employment for a sizable number of family supporters, house-wives, school drop outs and many others. There are increasing trends in production and consumption of poultry products (Mugga, 2009; USAID, 2010). It is estimated that 80% of total poultry meat consumed in Uganda is a contribution from free-range poultry or family poultry (FAO, 2008). Like any other business enterprises in Uganda, it is becoming more and more competitive every other day. It therefore calls for

maximization of profits and minimizing of losses in order to be meaningful. Let alone exploring the possibility of poultry value chain addition!

Therefore, any investment geared towards improving the production of poultry is timely and essential.

Objective:

To equip farmers with skill and knowledge in poultry production

Learning outcomes:

By the end of the trainings, farmers should be able:

- To prevent, recognize and respond to appropriately to threats of diseases or control disease outbreaks in their flocks
- To select quality ingredients and mix poultry feed ration for different production levels
- To implement best practices in poultry production and management
- To design and construct a good poultry house
- To design and implement vaccination schedules
- To design and keep good records
- To design and implement marketing plans and market research

2. Common poultry management systems:

Several systems to poultry management have been promoted in Uganda including the traditional free-range (free-running system and back yard /range or fenced system), semi-intensive (running system which is intermediate between extensive and intensive systems), intensive (battery/cage, slatted house and deep litter) and fold unit systems.

Free-range system- There is unlimited movement of birds and birds scavenge for food over a large area. It also characterized by inadequate and poorly constructed housing for birds to roost on at night or even takes shelter on trees.

Backyard or range system- this where birds scavenge or roam for food during day with in a restricted area or fenced range. However, they are also provided with shelter at night.

Semi-intensive system- Running system is where birds are kept in fixed house but given access to restricted run areas. In the run area bird can eat grasses, insects, worms, grains and grits.

Fold unit system-Is where by a small portable house with a run attached is used so that the birds make use of the run during day and house at night. Normally, both the house and run are raised 0.3 m above the ground and the house has slatted floor with slats of 2.5cm apart, and wire netting is used down to prevent vermin entry

Deep litter system- The birds are totally confined in the house without access to a run. This is the commonly practiced management system under intensive poultry rearing in Uganda

Slatted house- The birds are in confined structure and the floor is slatted and raised above the ground at 1.5metres high. This is structures is common in peri-urban set up in Uganda.

Cage system- The birds are kept in a cage at rate of $0.05m^2$per bird under a permanent house. This is increasingly getting adopted by some commercial farmers in Uganda.

Generally, the choice of the system is a function of the purpose of production, the farmer's economic status, knowledge of the entrepreneur, area, location of the farm and strengths (advantages) of each management system.

In poultry production, the management factors are multifactorial despite the keeping system and this manual will tackle the different aspects of management, namely poultry health and diseases, brooder management, nutrition and feeding, housing, record keeping and poultry as a business. It is acknowledged that stocking high quality breeds of poultry, use of high quality feeds and use cost effective farm inputs are key in optimal poultry

production (increased performance) and profit maximization in the enterprise (reduced cost of production and increased quick returns)

3. Opportunities for Indigenous poultry production in rural communities of Uganda?

Most parts of the country are involved in livestock production. Although livestock production is predominantly indigenous/unimproved breeds estimated at 90%, and rural householders are the greatest contributor to food security and livelihoods. It is estimated that 80% of poultry supply into market is a contribution from rural households (indigenous breeds) and 20% exotic breeds.

Despite the challenges of indigenous genetic resource of low productivity, it is associated with unique desirable attributes of adaptation and tolerance to harsh conditions, diseases and ability to utilize low-quality indigenous feed stuff thus can be promoted for selective breeding and improved rearing.

➢ Issues to address to improve indigenous poultry production

Poultry production should be looked at as a business which has to grow.

- If you are to start poultry enterprise develop a business plan
- It requires starting with a few pullets of the same age with a well selected cock
- Improve productivity challenges;
    - ✓ Very slow growth rate- requires using an improved cock with superior genes to cross with the local breeds
    - ✓ Laying few eggs-improved pullets tend to be better layers.
- Improve of management by;
    - ✓ Poor feeding- local chicken need a balanced diet with carbohydrates, proteins, minerals, vitamins and clean water.
    - ✓ Housing is essential
    - ✓ Health management- a sick bird will not eat even when the food is available
    - ✓ Hygiene and regular vaccination help to prevent diseases.
    - ✓ Taking away the eggs stimulates the chicken to continue laying

- ✓ Eggs for hatching should be handled very carefully with cloth and kept in clean trays
- ✓ Select good layers and good brooders from your flock.
- ✓ Chicks should be taken away from their mother immediately after hatching and taken to the brooder. This ensures quick return to laying by the mother (7-14 days).
- ✓ Local chicken need to be supplemented with grass, left-over food and clean water every time especially in semi intensive and intensive systems of raring.

- ➢ **Promotion of improved Kuroilers as alternative source of superior genetic resource**

This is a strategic intervention under the MAAIF to increase production of Kuroiler and indigenous chicken among the rural based poultry producers and in urban and peri-urban areas by 30% and 15% respectively by 2018. Consequently, NAGRC & DB is the implementing agency in pursuance of this agenda to multiply and enhance adoption and utilization of improved Kuroiler and indigenous genetic resources to improve household incomes and livelihoods in rural communities. Kuroiler has demonstrated good performance through field trials against the local birds in Uganda. Some of the good attributes associated with hybrid vigor include;

- ✓ They are tolerant to tropical conditions
- ✓ Some resistance to diseases
- ✓ Good feed conversion rate
- ✓ Dual purpose breeds (egg and meat)
- ✓ Fast growth and attains almost twice the body size 3.3kg versus 2kg in less than time for indigenous backyard chicken
- ✓ Good egg performance (150-200 eggs in a year versus the 40 for indigenous breeds)

4. How to handle poultry health care and diseases?

The challenges of poultry health are partly influenced by the poultry management systems. For instance modern systems of management (deep litter system), usually with

high poultry densities, poultry diseases are able to readily spread. Similarly, the traditional free-range, unrestricted mobility exposes birds to various diseases like Newcastle diseases.

In poultry health care, the farmers should be familiar with the behaviour of the bird order to be able to observe and tell that the birds are sick.

- **Normal appearance of chickens:**
- ✓ Combs and wattles are bright red, no swelling and wounds
- ✓ Neck is strong and holds head upright
- ✓ Nostrils are open and no discharge
- ✓ Beak is hard and closed, no swelling and missing part
- ✓ Eyes are bright and no discharge, no wounds and swelling
- ✓ Legs are strong, straight, no cuts, crusts or swellings
- ✓ Breast borne well-covered with muscle
- ✓ Feathers are clean and lie flat on the body except in frizzled breeds of birds.
- ✓ Feathers cover the whole body except in the naked-necked birds
- **Normal behaviour of chicken**

The common health and disease which can affect poultry are illustrated in the table 1 below:

- ✓ They come forward when provided with food
- ✓ Birds pass semisolid feaces appearing greyish and with whitish part
- ✓ Birds fight each other as a way of expressing territorial defence and establishing superiority
- ✓ Normally chicken walk without difficult and show clear steps during this. They usually move in company of each other
- ✓ Hens provide protection and care for their chicks
- ✓ Birds practice selective feeding when given feed, and prefer large to small particles
- ✓ Chicken have a body temperature and heart-pumping rate higher than that of mammalian animals

- ✓ Birds have telescopic sight; they are capable of seeing strange creatures from a far distance. when this occurs they make peculiar noises as a sign of concern
- ✓ Birds take water frequently especially in the dry season and when the type of feed provide is mash feed

Any change from the features and behaviour is an indicator of physiology gone wrong. By implication, there is structural and functional disorder expressed in clinical signs or symptoms.

- ➢ **Some of the frequent clinical signs include;**

loss of appetite, swollen abdomen, loss of weight, staggering gait, nasal discharge, cough, difficult breathing, ruffled feathers, inability to stand, dullness and sleepy, body weakness, drooping wings, eye discharge, excessive salivation, gasping, neck twisting, convulsion and tremours, chapping sounds among chicks, listlessness, poor growth, sleepiness, diarhoea, dirty feathers, sneezing, panting, panting, leg deformities, crusts, swellings or wounds scabs, nodules, and other swellings and wounds on the comb and wattles.

There are various causes of poultry health care challenges namely; bacteria, protozoa, virus, parasites, fungus, predators and trauma. In addition poor management (failure to provide good ventilation, hygiene, feeding/starvation etc), buying birds from infected areas, weather and or physical environment greatly contributes to death in poultry flocks.

Some of the common diseases in poultry are given in table 1 below:

Table 1. Common diseases and parasites in poultry

Name of disease	**Cause**	**Species affected**	**Signs and symptoms**	**Prevention and control**
Coccidiosis	Protozoa organisms-Eimera	All birds	Bloody diarrhoea, sometimes in mixed infection you have whitish-brownish diarrhoea, drooping wings, reduced production, unthriftness or poor growth,	Use of coccidiostats, proper hygiene
Fowl cholera	Bacteria	All birds,	Fowl cholera usually strikes birds older than	Antibiotics,

		especially domestic birds(turkey and chicken)	6 weeks of age. In acute outbreaks, dead birds may be the first sign. Fever, reduced feed consumption, mucoid discharge from the mouth, ruffled feathers, white diarrhoea, and labored breathing may be seen. As the disease progresses birds lose weight, become lame from joint infections, and develop rattling noises from exudate in air passages. As fowl cholera becomes chronic, chickens develop abscessed wattles and swollen joints and foot pads. Caseous exudate may form in the sinuses around the eyes. Turkeys may have twisted necks	sulfa drugs, control of rodents
Fowl typhoid	Bacteria	Chicken and turkey, All ages	Golden yellow-greenish diarrhoea, loss of appetite, death of chicks between 2-3wks and adult	Vaccination, bio-security measures, control of vectors like red mites, antibiotics and vitamins
Newcastle disease	Viral	All birds of all ages especially from 5 wks on wards	Hoarse chirps (in chicks), watery discharge from nostrils, labored breathing (gasping), facial swelling, neck twisting and paralysis, wet vents, trembling, twisting of the neck (sign of central nervous system involvement) and greenish diarrhoea. Mortality ranges from 10 to 80 percent depending on the pathogenicity. In adult laying birds, symptoms can include decreased feed and water consumption and	Vaccination of birds, restrict movement of birds, implement strict bio-security measures

			a dramatic drop in egg production.	
Avian influenza	Viral	All birds	**Mild form**: Listlessness, loss of appetite, respiratory distress, diarrhoea, transient drops in egg production, and low mortality, **severe form**: Facial swelling, blue comb and wattles, and dehydration with respiratory distress. Dark red/white spots develop in the legs and combs of chickens. There can be blood-tinged discharge from the nostrils. Mortality can range from low to near 100 percent. Sudden exertion adds to the total mortality. Egg production and hatchability decreases. There can be an increase in production of soft-shelled and shell-less eggs	Vaccination of birds, strict quarantine, strict bio-security, good nutrition, antibiotics
Worms	Worms (Ceacal, tape in intestines and gape worms in lungs)	All birds	Diarhoea, reduced egg production , loss of appetite	Good hygiene, regular deworming
Fowl pox	Viral	Most poultry from 5 wks	**Dry form**: wart-like lesions on unfeathered areas (head, legs, vent), loss of appetite, dullness **Wet form**: respiratory distress by obstructing the upper air passages	Spraying to kill mosquitoes, lice and red mites, vaccinations, and use of antibiotics plus vitamins

Infectious bronchitis	Viral	Chicken	Chirping of chicken, a watery discharge from the eyes and nostrils, and labored breathing with some gasping in young chickens. Breathing noises are more noticeable at night while the birds rest. Egg production drops. Eggshells become rough and the egg white becomes watery.	Vaccinations of flocks and use of antibiotics, biosecurity measures
Infectious coryza	Bacteria	Chickens, pheasants, and guinea fowl.	Swelling around the face, eyelid when open soft or hard pussy material is got, foul smelling, thick, sticky discharge from the nostrils and eyes, cough, labored breathing, and rales (rattles - an abnormal breathing sound) are common clinical signs. The eyelids are irritated and may stick together. The birds may have diarrhoea and growing birds may become stunted	Sanitation and hygiene, avoid mixing of flocks, antibiotics, erythromycin, sulphadimidime drugs
Swollen head syndrome	Viral (pneumo virus)	Chicken and turkeys	In chicks and poults, there is initial sneezing, followed by reddening and swelling of the tear ducts and eye tissue. Facial swelling will extend over the head and down the jaw and wattles. Adult chickens have mild respiratory disease followed by a few birds having swollen heads. Other signs include disorientation, twisting of the neck, and a significant drop in egg production.	Vaccination of birds, use of antibiotics and vitamins, biosecurity measures
Mycoplasmosis	Mycoplasma spp	Most birds	Sticky, serous exudate from nostrils, foamy exudate in eyes and swollen sinuses can occur, especially in broilers. The air sacs	Antibiotics. Erythromycin, tylosin

			may become infected. Infected birds can develop respiratory rales and sneeze. Affected birds are often stunted and unthrifty. **synovitis form** show lameness, followed by lethargy, reluctance to move, swollen joints, stilted gait, loss of weight, and formation of breast blisters **Poults**-Unthriftiness, respiratory distress, stunting, crooked neck and legs with deformity.	
Aspergillosis	Fungus	All birds	**Young birds** -trouble breathing and gasp for air. Occasionally there is paralysis or convulsions caused by the fungal toxin. Mortality in young birds averages 5-20 percent, but may be as high as 50 percent. **Mature birds**-respiratory distress, reduced feed consumption, and may have a bluish and dark color of the skin (cyanosis). Nervous disorders, such as twisted necks, may occur in a few birds. Mortality in mature birds is usually less than 5 percent.	Good ventilation, add a fungistat (mycostatin, mold curb, sodium or calcium propionate, or gentian violet) to the feed and use bentonite in feed(binders). Disinfect the brooding area between broods. Use only clean litter

Infectious Bursal Disease	Viral	Chicken	Three weeks of age- rapid onset of the disease with a sudden drop in feed and water consumption, watery droppings leading to soiling of feathers around the vent, and vent pecking. Feathers appear ruffled. Chicks are listless and sit in a hunched position. Chickens infected when less than 3 weeks of age do not develop clinical disease, but become severely and permanently immunosuppressed.	Vaccination of birds, restrict bio-security, quarantine of birds antibiotics and vitamins, sulfadimidine
Egg drop syndrome	Virus horboured by ducks and geese	Chicken of all ages	Reduced egg production and egg quality. Healthy-appearing hens start laying thin-shelled and shell-less eggs. Once established, the condition results in a failure to achieve egg production targets. Transient diarrhoea and dullness occur prior to egg shell changes.	Good bio-security program
Ompholitis/navel ill	Bacteria	Chicken	Affected chicks may have external navel infection, large unabsorbed yolk sacs, peritonitis with fetid odor, exudates adhering to the navel, edema of the skin of ventral body area, septicemia and dehydration	Effective hatchery sanitation, antibiotics and sulfa drugs
White bacillary diseases/pollorum disease	Bacteria	Chicken and turkey most susceptible	Death of infected chicks or poults begins at 5-7 days of age and peaks in another 4-5 days. Clinical signs including huddling due to fever, droopiness, diarrhoea (chalky white, foamy and sticky), weakness, pasted vent, gasping, and chalk-white feces,	Several sulfonamides, antibiotics

			sometimes stained with green bile. Affected birds are unthrifty and stunted because they do not eat. Survivors become asymptomatic carriers with localized infection in the ovary.	
Staphylococcus /bumble foot	Bacteria	All fowls	The septicemia form- similar to fowl cholera in that the birds are listless, without appetite, feverish, and show pain during movement. Black rot may show up in eggs (the organism is passed in the egg). Infected birds pass fetid watery diarrhea. Many will have swollen joints (arthritis) and production drops. Arthritic form follows the acute form- lameness and breast blisters, as well as painful movement (reluctance to walk, preferring to sit rather than stand). Bumble foot is a localized chronic staph infection of the foot, thought to be caused by puncture injuries. The bird becomes lame from swollen foot pads.	Use antibiotics, erythromycin, remove object that cause injury
Histomiasis	Protozoa	Turkey	Yellow dropping, ruffled feathers	Avoid mixing of chicken with turkeys, sulfa drugs
Avian	VitaminE	Chicken	Crazy chicken (torticolis),	Good nutrition,

encephalomalecia	deficiency			vitamins
Colibacillosis	Bacteria (E. coli)	Birds especially chicks	Huddling together(fever) some whitish diarrhoea, loss of appetite, breathing difficulties, body weakness and poor growth	Proper hygiene or clean environment, feeder and drinkers, Antibiotics
Flea, lice and red mites	Parasite due to poor hygiene	All birds	Reduced performance and pale combs	Dust floor, bird and nests with insecticide

5. Prevention and disease control methods:

Farmers are increasingly encouraged to pay more attention to prevention mechanisms, namely;

- ✓ Housing with adequate space and ventilation
- ✓ Proper feeding with due consideration of the nutrient requirements
- ✓ Proper disposal of chicken wastes
- ✓ Regular and or timely vaccinations
- ✓ Isolation or quarantine of sick ones or animals newly bought
- ✓ Ensure good hygiene in and around the poultry houses and feeding places
- ✓ Regular inspection of flock purposely for early detection of diseases
- ✓ Proper disposal of dead animals by deep burial, burning or dropping into deep pits
- ✓ Buying birds from sources known to be free of diseases
- ✓ for all in-all-out policy for whole site, there will be period of not less than 10 days between flocks
- ✓ feed delivery vehicles and visitor be kept outside the farm premises
- ✓ Clearly predators, rodents, snakes, pets and wild birds kept out of premises

In addition to the aforementioned mechanisms of diseases prevention and control, biosecurity measures are equally important management practices on the farm to enhance disease control. The principles of biosecurity:

- ✓ **S**-separate sick birds from health flock (isolation/quarantine)
- ✓ **T**-take off all your attire (shoes and others) before entering the flock or disinfect them
- ✓ **O**-only authorized persons should access your flock
- ✓ **P**-protect any tools or implements from outside farm
- ✓ and
- ✓ **GO**- start from health flock to sick ones
- ✓ The recommended vaccination schedule as below:

  Vaccination schedule is normally developed in due consideration of the breeders recommendations and the disease situation in the farm locality. However, an example of a customized vaccination schedule for layers in Butaleja district is illustrated in table 2 below:

  Table 2. Vaccination program for common poultry diseases

Age	Vaccine	Route
1 day	Marek's disease	SC
7 day or	NCD	Coarse spray, nasal, eye, oral
14 days	Gumboro	Oral, coarse spray, nasal, eye
18 day or	Infectious bronchitis	Coarse spray, nasal, eye, oral
21 days	Gumboro	coarse spray, nasal, eye, oral
28-30 days	NCD	Oral, coarse spray, nasal, eye,
Every 2-3months	NCD + Gumboro	Oral
6-8wks	Fowl pox	Wing web injection
10-12wks-	Fowl typhoid	Injection –breast

16wks	Fowl pox	Wing web injection
17-18wks	Fowl typhoid	Injection –breast

Source: Higenyi James (author)

6. The value of record keeping in improved poultry production

Record keeping is the keeping of information about poultry enterprise (chicken and in puts). An Entrepreur should ensure that only relevant information about his or her flock is kept.

Importance of record keeping:

- ✓ helps a farmer to know whether he/she is making profits or loss
- ✓ helps a farmer acquire loan in case of need for expansion of the flock
- ✓ helps farmer take decision as to whether to continue with business or stop
- ✓ Guides the visiting vets to take a right decision on disease control in a farmers' flock
- ✓ helps farmers to decide which birds to sell or remove from the flock and those to leave for further production

Types of records

- ✓ Poultry vaccination records
- ✓ Egg production records-weekly or daily
- ✓ Flock inventory-weekly flock taking or daily basis
- ✓ Feeding records- feed given to birds and feeds bought for birds
- ✓ eggs given to hen for incubation/chicks hatched-help to assess hatchability
- ✓ Mortality rate or chick survival-help monitor progress of chick
- ✓ Labour record-daily payment of causal labour
- ✓ Egg or birds sales record
- ✓ Poultry disease control records-treatments
- ✓ Birds bought to expand the flock
- ✓ Batch/flock performance

Example of Records:

1, Poultry disease control

Date	4/3/16	5/05/16
Major signs seen	Eyes wounds and swelling, closed eyes	Whitish diarhoea, loss of appetite, nasal discharge
Treatment given	Tetracycline	Amprosulf
Route used	Drinking water	Drinking water
Days of treatment	5days	5
Remarks	Good recovery, 2 out of 40 died	Poor recovery 10 out of 50 survived

Such disease records help understand the disease diagnosis and also used in farm disease analysis

2, Weekly flock taking

Month	**April, 2016**	**April, 2016**	**Remarks**
Week	1	2	-
Hens	12	12	-
Cocks	2	4	Bought 2 extra cocks
Pullets	16	12	2 pullets sold, 2 died
Cockerels	2	6	4 chicks grew into cockerels
Chicks	32	20	8 chicks died of disease and 4 become cockerels
Total	64	56	Number reduced due to death

Count birds every morning and evening, this helps farmers know losses due to accident, predators, thieves, bad weather or death due to disease

3, Batch performance records

Batch no	Eggs incubated	Chick hatched	Marketable birds	Cost of feeds	Cost of treatment	Amount got	Gain made
1	62	48	30	23,400/-	7,000/-	60,000/-	29,000/-
2	39	31	22	32,000/-	3,000/-	44,000/-	9,000/-
3	72	58	16	32,000/-	4,000/-	32,000/-	(4,000/-)

This record is very important in evaluating the expenditure and incomes. The cost of various inputs and the incomes from outputs should be recorded

7. Brooder management

Brooding simply means artificial way of management of newly hatched chicks by provision of adequate supplementary heat source. Proper brooding and brooding temperature are key in the early life chick because it helps in the absorption of the yolk and prevent yolk sac infections.

The brooder needs a floor with 3 inch layer of clean and dry litter; preferably use of rough paper is encouraged and not smooth/slippery surface due to lack of traction increasing the risk of permanent leg damages. Sawdust and other fine litter material should be avoided to prevent excessive litter consumption by the chicks which result into choking or crop impaction.

Provision of adequate heat and space is important, and a chick guard 18-24 inches high and 6-10ft across is sufficient for 100chicks or in rural areas without electricity, 60cmx60cmx38cm wooden box hoover with a lid (a box constructed of 2cm thick wood or board) for ventilation is improvised for 100 chicks or brooding canopy (rim is 10-15cm above ground) containg heat source.

Effects of high temperatures include;

- ✓ Dehydration-body chick contain about 70% water, continous high temperatures cause loss of water for the body and at 10% dehydration rate the chick dies.
- ✓ Pasting- high brooding temperatures cause feaces to block the vent, pasting ultimately killing the chick

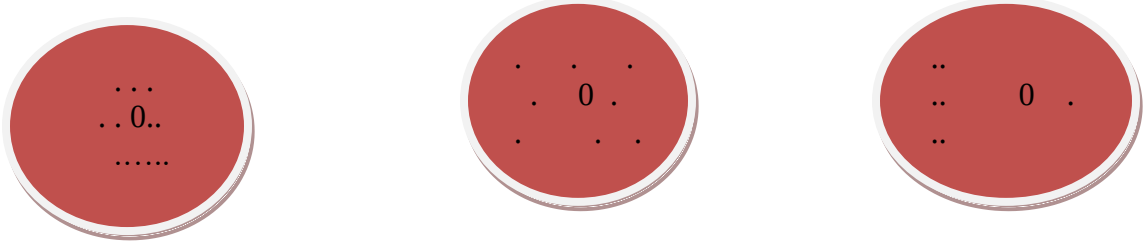
Low brooder temperature cause;

- ✓ Chilling or brooding pneumonia- low temperatures result into pneumonia and eventual death of chicks
- ✓ Smothering/suffocation- Under low temperature, chicks huddle together to maintain body temperature and results into smothering and death.

So in light of the above, it is important that chicks are put is a good brooder 12 hrs after hatching. However, this is often not met because of transport or long distances and as such chicks become stressed/ dehydrated. In such insistences, it is advisable that you rehydrate the chicks immediately on arrival using a rehydration solution constituted by adding 50gm of sugar, 1 gm of vitamin c into 1 litre of water, and give the chicks for the first 2 hours. In addition, the brooder should have been prepared a day before delivery or arrival of chicks such that the chicks are introduced at brooder temperature of 35˚c. The brooder temperature is gradually reduced at weekly interval by 3˚c, thus 2 rd wk-32 ˚c and 3rd wk-29 ˚c. Maintain the temperature at that level till you transfer them to grower unit.

Signs of compatibility:

Too cold **suitable temperature** **too much heat**



Chicks near heat source chicks evenly distributed chicks away from heat

Other brooder management issues:

- ✓ Ammonia- due to over putting curtains down for long hours leading to accumulation of ammonia
- ✓ Tannin or litter poisoning- not only ingestion of litter cause crop impaction but also expose chicks to some toxic substances like tannin in the saw dust causing mortality
- ✓ salt- poisoning- excess of salt in drinking water or feed kill chicks very fast

- ✓ Feed poisoning – especially the feeds contaminated by fungus cause toxins like aflatoxins which kills chicks
- ✓ Injuries-improper handling of chicks during operations like vaccinations cause injuries or death
- ✓ Predators like rats, cats are another problem unless they are properly mitigated
- ✓ Inadequate feeders and watering space causes competition and therefore become weak and die due to starvation
- ✓ Inadequate water- water is vital for health and performance maintenance
- ✓ Over-crowding causes dampness of litter material which become suitable for micro-organism multiplication especially coccidiosis, Colibacillosis and mycoplasma or respiratory diseases in 3-4 days or in the first week of life.

8. Basic feed formulation principles and mixing of different feed ingredients

The purpose of this session is to introduce farmers to the best practices in production of compounded balanced ration from local feed ingredients for poultry production. This is premised on the fact that feeding contributes a greater percentage in the cost of production (60-70%) and the efficiency of feed conversion, in turn, is dependent on the type of bird (breed) and type of feed given to the fowl. So when the farmer is uninformed on the importance of correct feeding, they are tempted to mix cheaper rations which inadequately meet the dietary requirements of the fowls. There is anecdotal evidence indicating that this wrong practice is on the increasing trend in the poultry industry. Thus this was perceived essential to equip farmers with good practices in production of compounded balanced rations so as to maximize on profitability of the poultry enterprise.

What should farmer know about feeding and feed formulation?

- ✓ Actively growing animals require some essential amino acids from animal sources such as fish meal
- ✓ The physiological relationship between all the nutrients, especially energy and proteins

- ✓ Feed consumption is regulated in most cases by energy content. Ie animal eat less of high energy feed rations. Therefore, high energy feed should also have high protein level
- ✓ Animals also eat less of imbalanced rations especially when amino acids are disproportionate
- ✓ Fibre content regulate feed intake ie if feed has high fibres there is lower digestibility
- ✓ Feed consumption in hot environment is reduced
- ✓ Anti-nutritional factors in some feed stuffs impact on their digestability and bio-availability of the nutrient- FEED STUFF PROCESSING IS KEY!

What factors determine the amount and type of feed that an animal requires?

They are varied including;

- ✓ Size of the animal
- ✓ Breed
- ✓ Environmental temperature
- ✓ Level of production or physiological status
- ✓ Management practices

Key principles in feed formulation include;

- Understanding the nutrient composition of local feed ingredients
- Understand the nutrient requirement of the animal
- Know the cost of local feed ingredients
- Scan the environment and identify the locally available feed ingredients
- You must specify the amounts or inclusion levels of protein, energy (carbohydrates and fats), minerals, and vitamins in the ration

- ➢ **Preparation and mixing of compounded feed**

In the training, this session will be hands on field demonstration and the farmers will be taken through the process of preparation and mixing of compounded balanced ration using local feed ingredients. Particular attention paid on ensuring adequate mixing of minerals/vitamins in the animal feeds through using a formula from nutritional expert, correct weight measurement of ingredients and premixing with a portion of the major ingredients in a good mixing facility. A trial method of feed formulation will be adopted

for purposes of this session to try and formulate a compound feed taking into consideration of the recommended inclusion levels (FAO, 2003);

- ✓ Cereal grains - 50-60 percent as the major source of energy;(maize bran- not more than 60%, sorghum not more than 40%, millet not more than 40%, broken rice or maize not more than 30%, rice bran not more than 20%)
- ✓ Vegetable protein sources like oil cakes meal - 20-25 percent
- ✓ Animal protein sources 10-12 percent (meat meal-0-4%, fish 5-10%)
- ✓ Agricultural byproducts -15-25 percent.
- ✓ Soya meal- 0-50 percent
- ✓ Sun flower 0-15 percent
- ✓ A mineral mixture for broiler mashes, chick and grower mashes - 2-3 percent
- ✓ Mineral mixture for layers -4 percent
- ✓ Calcium carbonate (calcite) or limestone- 5-6 percent
- ✓ Lake shells-5 percent
- ✓ Molasse not more than 4%
- ✓ Brewers grain not more than 10%

- ➢ **Feed ingredients commonly used in feed formulation or home mixed feeds**

Poultry feed ingredients used in ration mixing include;

1. Energy concentrates such as corn, oats, wheat, barley, sorghum, and milling by-products.
2. Protein concentrates include soybean meal and other oilseed meals (peanut, sesame, safflower, sunflower, etc.), cottonseed meal, animal protein sources (meat and bone meal, dried whey, fish meal, etc.), grain legumes such as dry beans and field peas. Grains are usually ground to improve digestibility. Soybeans need to be heated-usually by extruding or roasting-before feeding in order to deactivate a protein inhibitor (gossypol). Soybeans are usually fed in the form of soybean meal, not in "full-fat" form, because the valuable oil is extracted first.
3. Vitamin pre-mix is usually added but may be reduced by using vitamin-rich plant sources such as alfalfa. Other plants also provide vitamins in their leaves, hulls, and brans. Fish oil can provide vitamins A and D. Yeast provides some of the B

vitamins. Sunlight is a good source of vitamin D for ranging chickens (converting a precursor to vitamin D). Poultry in cattle pastures may obtain vitamin B12 when picking through dung pats for insect larva. Sprouting grains are used as source of vitamins when access to range is not possible. Sprouting can increase the amounts of carotene (vitamin A precursor) in the grain and as a source of year-round forage, this is an advantage to farmers in rural areas engaged in poultry production to reduce the amount of synthetic vitamins required in the diet and synthetic are expensive. Eating plants may provide a yellow color to the skin of slaughtered chickens and a deeper yellow color to egg yolks.

4. Trace mineralized salt is usually added to poultry diets, but other sources can provide minerals. Minerals, although not present in high levels in plants, are provided in fish meal. Meat and bone meal is an excellent source of minerals, particularly calcium and phosphorus, as well as being a good protein source. However, if a farmer does not want to use meat and bone meal, then dicalcium phosphate a commercial product can be substituted. Access to pasture can reduce the vitamins and minerals needed in the diet since the birds get vitamins from plants and both vitamins and minerals from insects.

- **Role of supplements**

Feed supplement takes care of nutrient deficiencies in the diets. These feed supplements may be minerals, vitamins and proteins which when added to diets avert structural and functional malfunctions in the bird. However, normal poultry rations can supply enough of the essential amino acids except the most critical animo acids;

- ✓ Arginine, Glycine, Lysine, Methionine and cystine
- ✓ Tryptophane,
- ✓ Other essential animo acids are : valine, threonine, isoleucine, histamine, phenylalanine and tyrosine

Although fish meal is an excellent source of most of the critical animo acids and it is often necessary to add it to feeds. Certain critical animo acids are artificially manufactured and can be added to poultry ration during mixing such as mineral and vitamin premix, lysine, methionine and others.

Ration-balancing of home-made diets is important to achieve the right amounts of nutrients. Although preparing a balanced diet can be a complex, possibly costly process, especially for farmers with little background in nutrition. Specialized knowledge is required about the nutrient requirements of chickens and the nutrients contained in feedstuffs. Therefore, farmers are always encouraged to work closely with a professional!

9. Feeding options and feeding of different age groups of poultry

Different rations are often used, depending on the production stage of the bird and location. Although the most convenient way of feeding chickens is with a balanced pelleted ration, whether the birds are confined indoors or allowed on range outdoors. Chickens are nibblers and make frequent trips to the feed trough for small meals, which requires energy. Pelleting reduces the amount of energy required for a bird to feed. Other commercial rations include;

- ✓ A starter diet is about 22-24% protein- Starter rations are high in protein-an expensive feed ingredient;
- ✓ Grower diet 18-20% protein;
- ✓ Finisher diet 18% protein;
- ✓ Layer diets generally have about 16% protein;
- ✓ Special diets are available for broilers, pullets, layers, and breeders;
- ✓ Whole grains can also be provided as scratch grains. This is a common practice with farmers in rural areas. An "old-fashioned" way of feeding chickens is the "mash and grain" method which is a two-feed system of providing whole grains along with a high-protein ration in order to reduce costs.
- ✓ Pasture-based model "natural"- many farmers in many districts keep local birds on free range

- ➢ **Why pasture-based models for improved type of chickens?**

This is a common practice in improved chicken world over, especially in rural areas. When raising birds in a pasture-based model, it is important to keep in mind that the digestive system of the chicken is geared towards the digestion of insects, seeds, and grain rather than the digestion of forage, and they will still need concentrate feed rations to produce well. However, chickens can make some use of high-quality forages,

particularly legumes. Forage is good at providing nutrients but forage height is important and keeps his pasture sward at about 2 inches. If the grass is tall, chickens in the confined field pens ("pastured poultry") tend to mat the grass down and it becomes unsanitary. Fresh, vegetative pasture provides more nutrients to poultry than fibrous, stemmy pasture, and a good sward pasture prevents muddy, unsanitary conditions.

Although feed requirements can be reduced by allowing access to range and the accompanying insects, benefits of ranging poultry may lie more in marketing and animal welfare rather than in the feeding.

- **Rations and daily intakes**

The following rations and quantities are recommended at different levels of growth and egg production-layer flock

Age in weeks	**1 bird eat approx. per day**	**Approximate weight per bird**	**Type of feed**	**Remarks**
1	6.5 gm	28 gm	Chick mash	Feed 24 hrs
2	16.5 gm	35 gm	Chick mash	Feed 24 hrs
3	23 gm	78 gm	Chick mash	Feed 24 hrs
4	33	170 gm	Chick mash	Remove light
4-8	50-80 gm	100-400 gm	Chick mash	Feed only day time
8-12	80-90 gm	500-800 gm	Growers mash	Feed only day time
12-16	90-100 gm	800gm-1 kg	Growers mash	Feed only day time
16-20	100-110 gm	1.5 kg	Growers mash	First egg expected
20-40	120-150 gm	1-2 kg	Layers complete meal	At 95% lay give maximum feed
40+	120-130 gm	2-2.5 kg	Layers complete meal	Decrease feed with decreasing laying

Source: Higenyi James (author)

Note: Between 20-26 weeks of age there is a sharp rise in egg- production from 5% to 95%. For best results, practice ‘challenge”.

10. Siting and design of poultry house

The adoption of intensive poultry husbandry despite the strain or breed has brought more challenges in housing, health and feeding. The design of structure should consider the human welfare, animal health and friendly environment. In structure construction ensure that birds of different age groups are housed separately and the brooder should be 90 m a distance or a way from other units. The design of the poultry house is in accordance with the size of the flock kept. Therefore, sitting and design of poultry house should take care of;

- ✓ Security of birds(protection from thieves and or predators)
- ✓ Avoid flooding sites(prone to water logging)
- ✓ Good drainage at the site
- ✓ Accessible for ease delivery of inputs(feeds) and removal of litter and poultry products
- ✓ Reliable source of water and power
- ✓ Ensure the best orientation of prevailing winds-direction of wind away from home stead
- ✓ Sitting should take advantage of air movements or not to obstruct air movement by buildings or natural features
- ✓ Orientation of structure should ensure that long walls face east and west to avoid direct sunlight and keeps the house cool
- ✓ Inside the house the environment should provide comfort, well ventilated, dry, clean and avoid direct sunlight, rain, excessive wind, heat and cold.
- ✓ Multi-purpose houses should be designed to such that they are easily adapted for brooding, rearing and laying

Houses may be constructed using simple materials like mud and wattle, timber, grass thatch. It is important to prevent rats, cats and birds from entering the house. Also the house protects the birds from bird weather.

- ➢ **Details of structural measurements**:

Width-Is the length from front to back of open sided poultry house. It is advisable that the width is atleast 5 metres and does not exceed 8-9metres. However, the recommended width is 8metres for growing, broiler and layer birds. This is because wider house are prone to poor ventilation.

Length- The length of poultry unit may take any convenient measure; however, some good practices normally do atleast 5xwidth and not exceeding 7xwidth.

Height and side walls:

- ✓ The height at pin =3.6metres of which 0.6metres from ground level is brick, and the upper part is wire mesh
- ✓ Height at eave is 2.4 metres to 2.8 metres of which 0.6metres from ground level is brick, and the upper part is wire mesh
- ✓ The eave is 0.7metres to 1 metre to avoid rain water splash
- ✓ Pillars 0.3m square should be constructed and placed at 1.2m intervals on top of the walls to hold the wire netting frames which are 1.2m high. The wooden frame is made of 5cm timber.
- ✓ End wall are solid block with door at one end

Roof

Thatch is cheap and good because does not conduct heat. However, they are prone to fire and less vermin proof. Other materials like iron sheet could be used. Modern commercial structure has gable roves with ridge opening providing good ventilation. And a good overhang of 0.7 to 0.9 m should be provided to protect the inside from rains.

Foundation and Floor:

The foundation is dependent on the nature of the soils. However, atleast 0.40metre depth is the minimum. A concrete floor is encouraged as it is easy to clean and disinfect. It also keeps away vermins and other pests found of barrowing under soil. I recommended floor level is 0.20-0.23meters above the ground level and 10cm well mixed concrete should be laid on well-tamped base.

Floor space per bird

The space requirement depends on the age, size of the bird and temperature. The chicks up to 10wks will require space ranging from 0.05 to 0.1m^2per bird, growing pullets 10 to 20wks 0.15-0.20m^2 per bird and layers 0.25 to 0.30m^2. Generally, adult layer chicken requires 1.5-2sq. feet per bird (5-6 birds per m^2) while broiler 1sq.feet per bird (8-10birds per m^2).

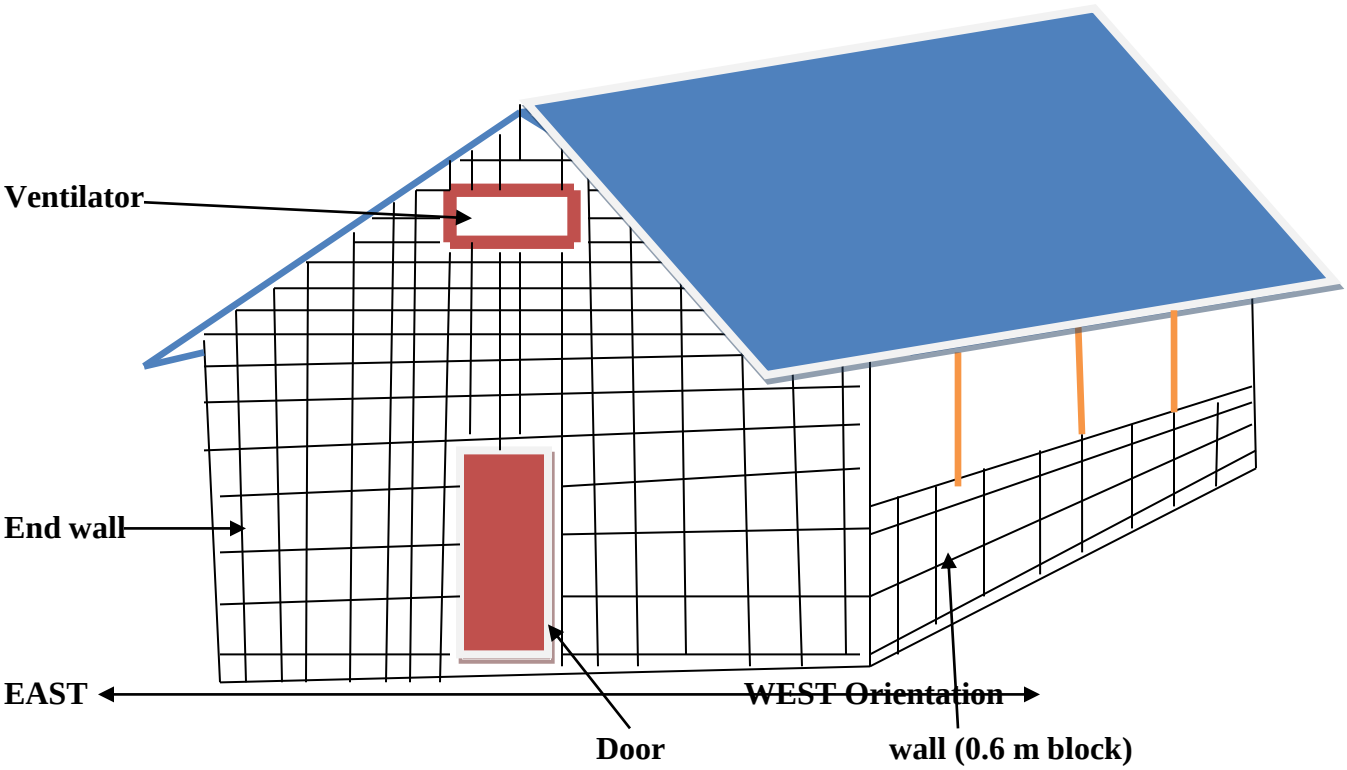


Fig 1: Sample of poultry unit (Side view)

11. Marketing in poultry production

- **Marketing of poultry and poultry products:**

Definition- Marketing is everything that happens between deciding what you are going to provide to consumers, through getting that product or service to them and not just selling. This means determining and serving the customer needs as they see them not your own. Marketing is therefore, key tool to the success of any business.

It is important to acknowledge that marketing of poultry and poultry products is not organized in Uganda. However, the government is now reviving the defunct cooperatives and promoting SACCO'S as a way of collective marketing. Even then, the farmers take the initiative to market their poultry and poultry products. Interestingly though, the poultry products such as eggs are delicate and perishable products. As such the principle objective of the farmer is to put the poultry product (egg) in the hands of the consumers with the least possible deterioration of product quality.

Currently, there are various actors in the poultry value chain and the different channels of marketing poultry and eggs in rural areas in Uganda are predominantly retail sales from the farm (farm gate) and sales to traders in secondary market (Higenyi *et al.*, 2014). However, other known channels include; retail sales from town markets and sale to large buyers (schools, hotels and supermarkets).

What tasks are involved in marketing of poultry and poultry products?

- ✓ Collection of poultry and poultry products from farms(assembling)
- ✓ Grading of the eggs and poultry
- ✓ Transportation to marketing centres/ town depot
- ✓ Provision of storage facilities
- ✓ Movement of poultry products through wholesale and retail channels
- ✓ Delivery of poultry/eggs to consumer at convenient place and time

These traditional activities are increasingly changing with happening trends in the poultry industry such as processing or value addition together with consumer preference in quality when purchasing. The implication of market dynamics is more new products coming on market and quality aspects of poultry and poultry products increasingly becoming a determinant of what to sale on market (Higenyi *et al.*, 2014). These notwithstanding, as entrepreneur in the poultry industry, you must be acquainted with the four essential elements (4P's) of marketing before you decide to market the poultry and poultry product namely;

1. Product
2. Price
3. Promotion
4. Place and distribution

These ***principles of marketing*** are so important to help you to determine and serve ***NEEDS*** of your customers while improving your sales and make a profit. As a consequence, it is imperative that you understand the following:

1. What product or service your customers want?
2. What price your customers are willing to pay?
3. Where/place your business should be to reach your customers?
4. How to distribute your products to the consumers?
5. How to promote and expand your business?-promotion you can use to inform your customers and attract them to buy your products or services.
6. Develop a simple marketing plan

Illustration of simple marketing of poultry product (poultry/egg) in rural setting:

Product	Poultry/egg
Price	8000/= per bird/100 per egg
Distribution(place)	Sale at home/farm (retail sales)
	Delivery to markets on vehicle

Sale to school/hotels/supermarkets

Promotion Poultry/eggs for sale here⟶

How promotion affects business?

Marketing problem: If you don't get customers coming to into your business premises, purchasing, leaving satisfied and returning for a follow up purchase then your business will not survive. Why?

Solving the problem!!!! Think along the 4P's to solve the problem: it could be problem of sales presentation, customer care /bad service (skills of sale person), display name it!

Importance of developing a marketing plan:

Business is not going to expand all by itself, various aspect of marketing knowledge must be brought together and action needs to be taken. The only business that develops a market plan, set targets and undertakes market research to find out who their customers are, what they want/ demand, at what price, place and budget for promotion as well as do competitor analysis will survive and prosper in this very competitive poultry business. Extra efforts also directed towards monitoring performance of business and re-invest or plough back money in business.