



World Bank Africa Centre of Excellence
in Agricultural Development and
Sustainable Environment (CEADESE)



TRAINING MANUAL

International Shortcourse and Capacity Building

ON INTEGRATED AGRICULTURAL
PRODUCTION AND MANAGEMENT
FOR FARMERS AND YOUTHS

IN IWOYE-KETU AND ENVIRONS

18th - 22nd March, 2019

Venue: **Town Hall, Iwoye Ketu**

Resource Person:

Prof. (Mrs.) D. A. Adegbite

Director, Agricultural Media
Resources and Extension Centre (AMREC)

Host

Prof. O. D. Akinyemi

Director, Centre of Excellence in Agricultural
Development and Sustainable Environment

Chief Host

Prof. F. K. Salako FSSN

Vice-Chancellor,
Federal University of Agriculture, Abeokuta

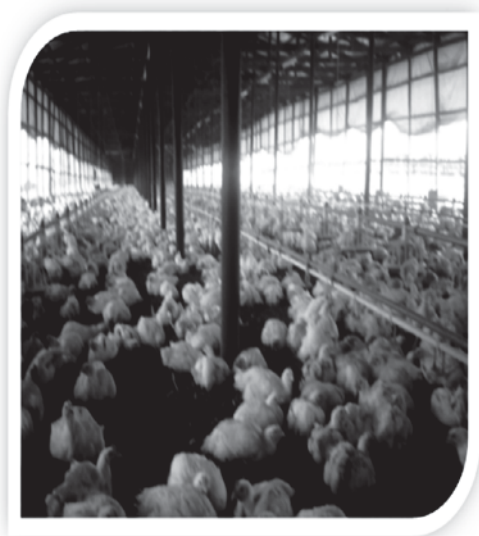


TRAINING MANUAL

ON

POULTRY(BROILER)
PRODUCTION
AND
MANAGEMENT

BROILER CHICKEN PRODUCTION AND MANAGEMENT



Kazeem Olajide BELLO, PhD, RAS

Institute of Food Security, Environmental Resource and Agricultural Research,
Federal University of Agriculture, Abeokuta
kazeembello19@gmail.com; belloko@funaab.edu.ng; +2348032204658

and

Oluwakemi Titilayo IREKHORE, PhD, RAS

Agricultural Media Resources and Extension Centre,
Federal University of Agriculture, Abeokuta
raykemi@yahoo.com; +2348033900920

TRAINING CONTENTS

Module 1: Overview of Poultry production in developing and under developed Countries: Importance and Challenges

Module 2:

- Types of Poultry
- Broiler Chicken Production: History, Types and Strains

Module 3: Management of Broiler Chicken:

- Site selection, housing and equipment
- Brooding Management
- Feeds and Feeding Management
- Water Management
- Litter Management

Module 4 : Health Management in Broiler Chicken:

- Medication and vaccination
- Rules of thumb for vaccination
- Bio-security issues in broiler production

Module 5 : Broiler Chicken Products and Marketing:

- Primary and Secondary Products
- Marketing: Channels, Information and Strategies

Module 6: Records Keeping in Poultry Production

Bibliography

MODULE 1

OVERVIEW OF POULTRY PRODUCTION IN DEVELOPING AND UNDERDEVELOPED COUNTRIES: IMPORTANCE AND CHALLENGES

1.1 Introduction

Poultry refers to domesticated avian species (birds) that are raised for their eggs and /or meat. It includes turkey, duck, geese, pheasant, quail, guinea fowl, pigeons and chickens. Chickens are the most abundant and commonly raised poultry. Food and Agriculture Organization (FAO) recommended that 35g out of the required minimum of 65-72g of reference protein should be obtained from animal products. However, the average animal protein intake per capita per day in Nigeria and other countries in Sub-Saharan Africa fluctuate between 7.6 and 13.26g and this is widely acknowledged to be inadequate. Poultry, because of its enormous potentials, can be explored to bridge the animal protein shortage gap.

1.2 Importance of Poultry

1.2.1 Food Supply

Poultry provides cheap and good quality meat. Chickens, being the most common and abundant of the poultry provide excellent animal protein (22.8% crude protein), with high bio-availability, low fat (0.9%) and high mineral content (1.2%). It is also rich in Phosphorus (240mg) and Vitamin A (200mg), among others (Table 1). Poultry meat has emerged as healthier substitute to beef and mutton.

1.2.2. Fast growth rate and high efficiency of Feed utilization

Poultry utilize high quality feed to produce meat and eggs in a highly efficient way and at a faster rate compared to cattle, sheep and goat. For instance, broiler chicken attains minimum of 2kg live weight in 49-56days and has high feed conversion efficiency.

1.2.3. Less Land use and environmental Impact

Poultry production requires relatively small area of land compared to other livestock. Also among all livestock, poultry contribute least of the green-house gases that have been blamed for aggravating global warming and causing climate change.

1.2.4. Soil fertility improvement and maintenance

Poultry manure is the most common and preferred fertilizer for soil amendments in organic operations. It is rich in soil essential nutrients (Nitrogen, Phosphorus, Potassium, Calcium, Sulphur and so on) that aid crop production. It is used to improve soil structure; increase the level of organic matter in the soil and increase the soil water holding capacity. It is economical and environmentally friendly (Table 2). Poultry manure could also be useful for fertilizing fish pond and methane gas generation for cooking or heating on the farm.

1.2.5. Job Creation

Through poultry production, jobs are created along the value chain. Jobs are created for attendants, marketers, processors, feed millers, poultry equipment manufacturers, feed ingredients marketers, transporters and a host of others.



Fig.1: Conventional broiler production showing Employee in a poultry farm

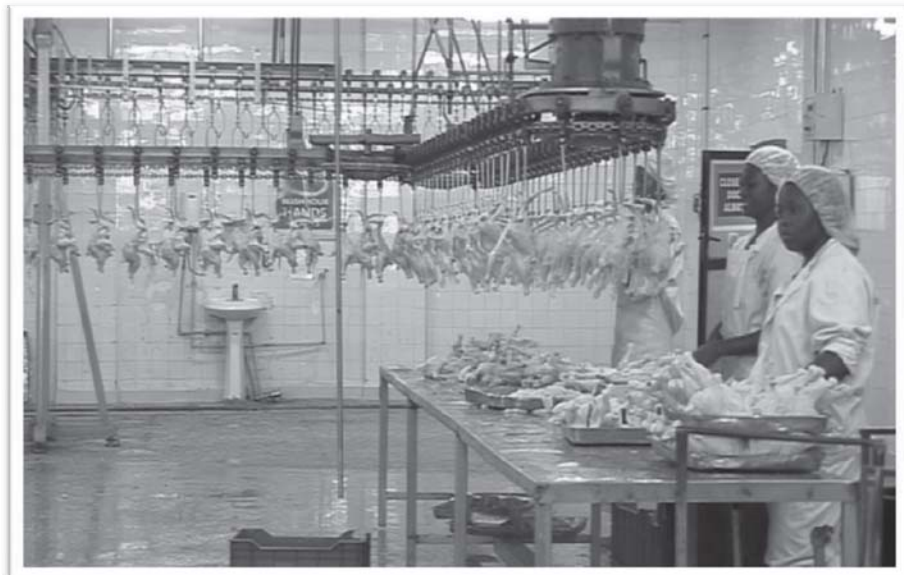


Fig. 2Chicken Processing and Processors



Fig.3:Feed milling



Fig.4: Feed and feed ingredients supply and transport services



Fig.5: Local Poultry Marketer

1.2.6. Social Security and Livelihood Capitals

Currently, Nigerian population is about 200 million and it keeps increasing by the day. Poultry has the potentials to provide cheap and reliable sources of animal protein like eggs and chicken to meet the animal protein needs of the ever increasing populace of the Nation as well as create jobs for different categories of people (both male and female) along the value chain. As demand for poultry products increase, production increases, more jobs are created and income lines increase through poultry production. Enough profits can be made from small stocks to allow for expansion. All these make poultry a veritable tool to enhance household security (social security), livelihood capitals and financial/physical asset and as well promote gender and social equity, therefore reducing the gap between the Rich and the Poor.

Nutrient Composition of the Meat of Poultry and Other selected Animal Species compared with Bread and F

	Energy (kJ)	Water (%)	Crude Protein (%)	Fat (%)	Ash (%)	Ca (mg)	Ph (mg)	K (mg)	Na (mg)	Fe (mg)	A	B1	B2	B6	Nitric Acid	Ca Pa
Meat	116	75	22.3	1.8	1.2	12	195	350	65	3	40	0.1	0.2	1.5	5	0.4
Meat	323	54.7	16.5	28	0.8	8	145	350	65	2.5	90	0.06	0.15	1.5	4	0.4
Meat	112	75.1	22.8	1.2	1	10	195	350	70	2.5	trace	0.85	0.2	0.3	4.5	0.5
Meat	472	41.1	11.2	47	0.6	9	170	350	70	2.2	trace	0.7	0.15	0.3	4	0.5
en	105	75	22.8	0.9	1.2	10	240	300	70	1.5	200	0.05	0.1	0.45	8	0.9
es	239	38.5	6.4	1												
ed)	72	78	1.9	0.1												

Composition of Poultry Manure With or Without Litter Materials

Con)	Total N	NH4 + N	P2O5	K2O	Ca	Mg	S	Na	Fe	Mn	B	Mo	Zn
	55.000	22.000	37.400	24.200									
	158.400	24.200	171.600	99.000	90.200	17.600	33.000	28.600	2.860	1.474	0.119	0.002	1.386
	160.600	26.400	165.000	99.000	94.600	18.700	30.800	28.600	3.520	1.628	0.108	0.002	1.496
	68.200	15.400	118.800	68.200	206.800	14.960	18.700	18.700	2.860	1.254	0.077	0.001	1.144
	79.200	17.600	176.000	74.800	118.800	17.600	26.400	13.640	3.300	1.298	0.090	0.002	1.210
	57.200	13.200	48.400	24.200									
	61.600	30.800	68.200	44.000	94.600	13.420	15.840	9.900	1.144	0.594	0.110	0.009	0.704
	83.600	39.600	123.200	66.000	189.200	13.200	19.360	11.000	3.960	1.144	0.106	0.001	0.814
	136.400	92.400	129.800	81.400	77.000	14.960	18.040	11.660	6.380	0.924	0.088	0.040	
	57.200	17.600	202.400	28.600	156.200	15.840	26.400	9.240	4.840	5.060	0.180	0.031	
	176.000	154.000	45.000	266.000	25.000	7.400	52.000	51.000	2.000	0.240	0.370	0.020	0.700

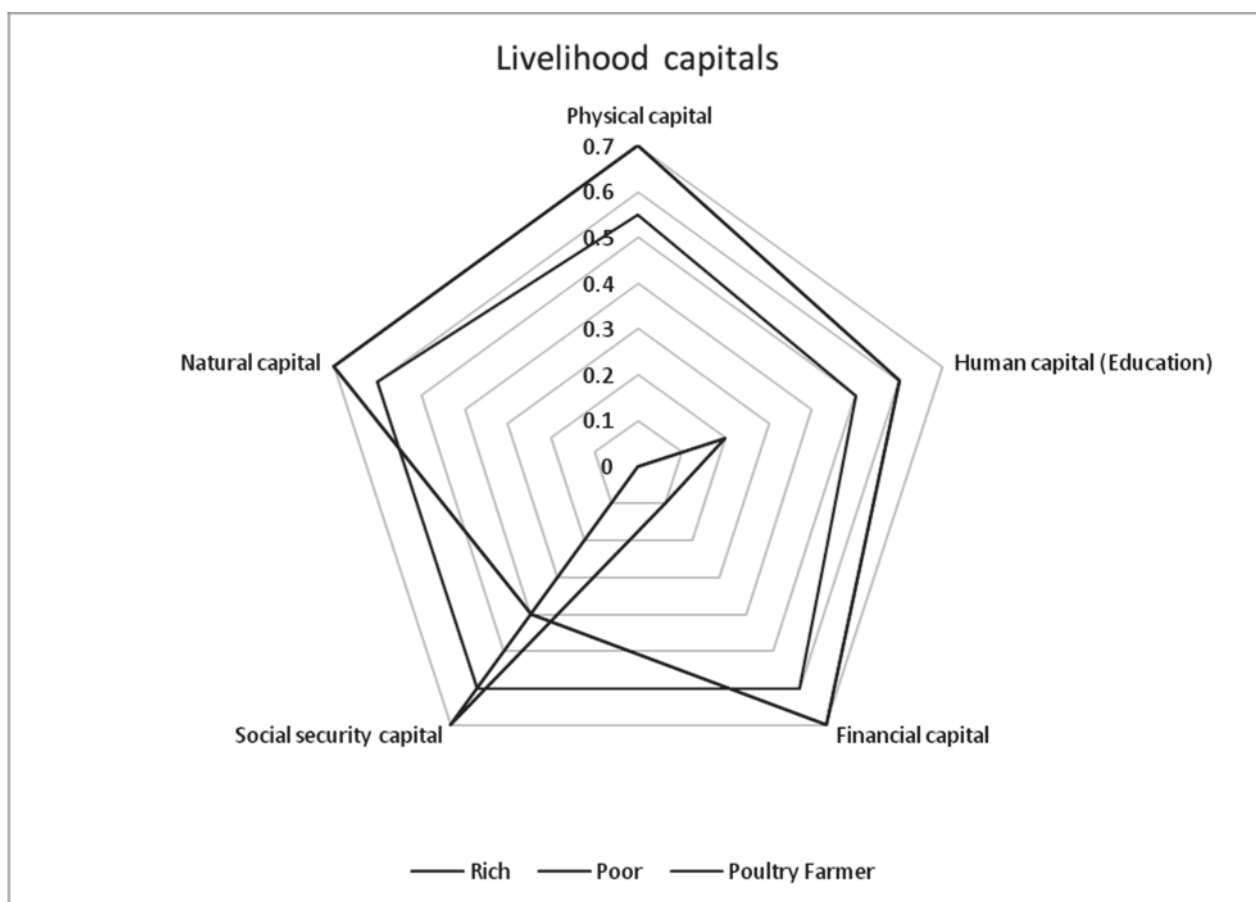


Figure 1: Livelihood capitals as indicators of human and social security
Source: Adiku, 2012

1.3 Problems of Poultry Production

1. Consumer market could be limited by poor purchasing power, poverty and low employment levels
2. Global conspiracy and competition with very fast developing economy (China, Brazil, India)
3. Climate change and erratic production plan for grains
4. Inadequate supply and high prices of inputs (especially feed) and the consequent high cost of production
5. Inadequate capital and/or credit finance, and high interest rate of commercial banks loans
6. Inadequate extension or advisory services to support developing farms
7. Outbreak of diseases
8. Poor breeder stock and Day Old Chicks (DOC)
9. Poor policy and political will for implementation of government intervention
10. Poor regulation of the poultry Industry
11. Poor production standard for export oriented market
12. Problem of central processing unit for adequate cluster formation
13. Problem of Land Tenure and delayed allocation of land for poultry farm Estate
14. Small holder keeping and associated problems
15. Weakened value of currencies compared with major world currencies (poor exchange rate)

MODULE 2

TYPES OF POULTRY

2.1 Introduction

Poultry is categorized into two (the meat and egg types) based on their primary product(s). The meat type in Nigeria and developing countries context is further classified as heavy and medium meat type. Broiler is an example of heavy meat type while cockerel is the example of medium meat type.

In developed climes, emphasis is usually on the broilers as the meat is usually soft and tender. Broiler could be chicken, turkey and duck. Therefore, it is not out of order to talk about broiler chicken, broiler turkey and broiler duck. Broilers irrespective of the type of poultry (chicken, turkey, and duck) refer to products of intensive selection over past decades for rapid growth and high feed efficiency as explained earlier above. Broiler chickens are marketed under different trade names.

2.2 Broiler Chicken Production : History, Types And Strains

2.2.1 History of Broiler Chickens Selection and Production

Broiler chickens are meat type chicken that have been selected for very fast growth rate and high feed efficiency. Broiler production started in early 1920's in the USA as a result of observation of farmers and the increase in demand for meat birds. Farmers noticed that some birds were better suited for laying eggs while others were better producers of meat and therefore began to raise single purpose chickens (used for one reason). That is, either for egg or meat production rather than dual purpose chickens used for both egg and meat production and were just average in production.

Selection of birds created special opportunity for farmers. In 1940s, birds were selected using several factors, including growth rate, feed conversion efficiency and meat yield (the amount of meat on breasts and drumsticks). The intensive selection efforts for decades has resulted in today's fast growing birds that have the ability to reach markets weight within 6 weeks with high meat yield. Consequently, today, we know about breeder strains such as Marshal, Ross and Anak within our immediate environment. In other climes, we hear about Peterson, Vantress, Cobb, Hubbard, Pilch and Arbor Acres. All these have become brand names and established market brands.

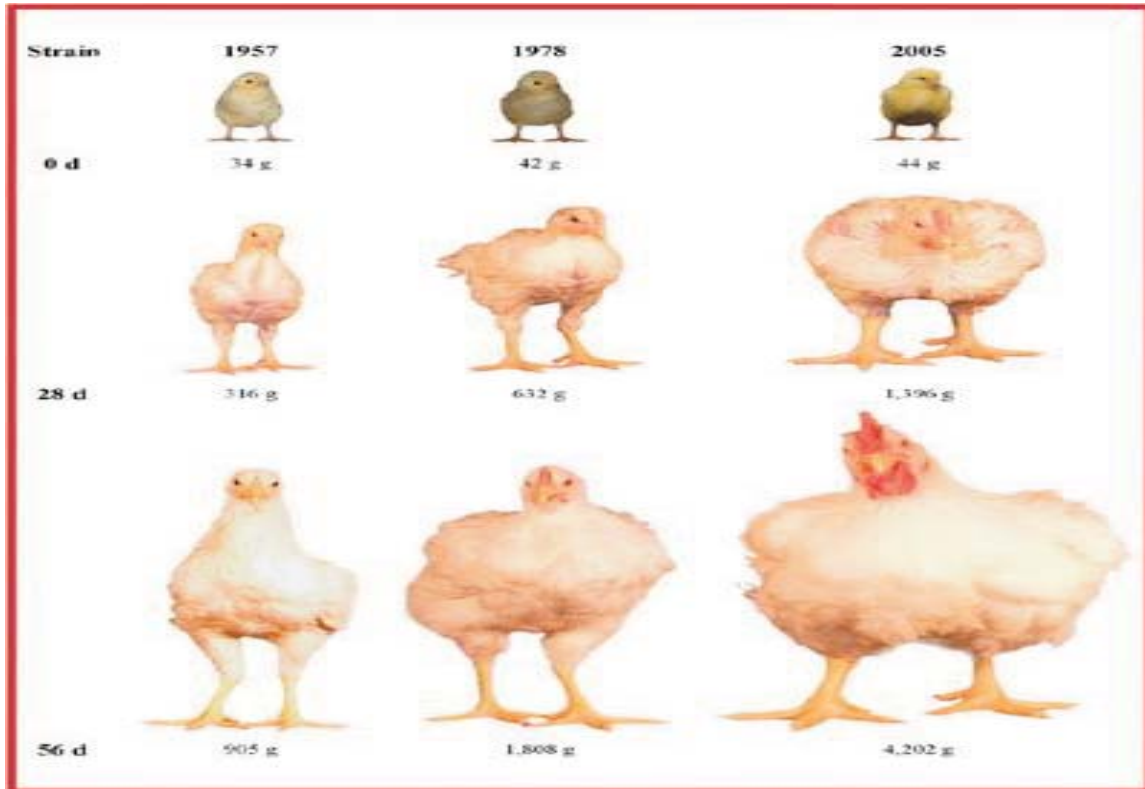


Fig. 6: Improvement in Broiler Size over the years
Source: Watson and Davis (2015)

In spite of the achievements, efforts continue in the area of modern production strategies and needs for long-term sustainability of the industry without comprising:

- i. Animals health and welfare;
- ii. Human health and food safety;
- iii. Financial success of the customer; and
- iv. Friendly environment.

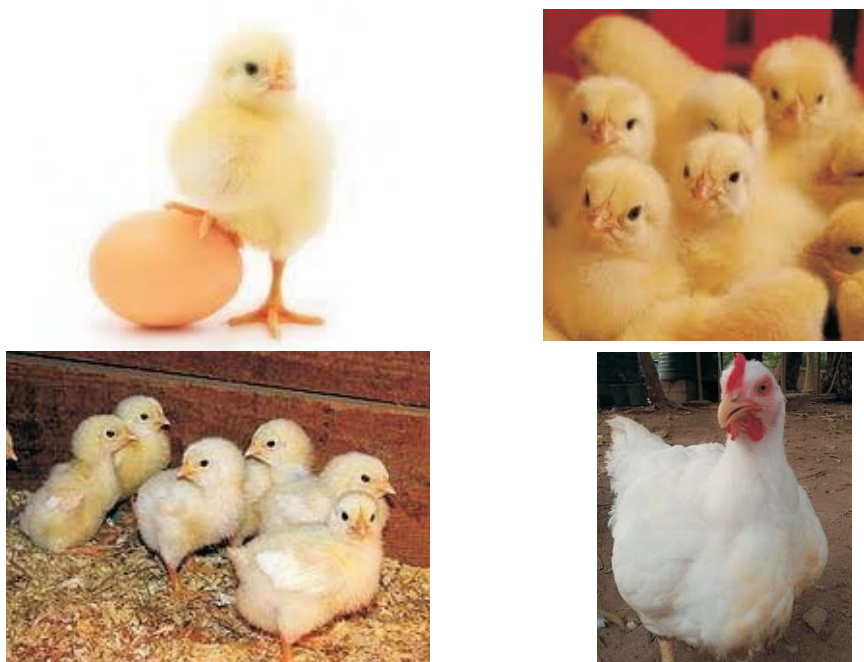


Fig. 7: Stages of Development

Again, broilers chickens are selectively bred for meat. They have fast growth rate and attain market weight between 35 and 42 days. Broiler chickens are relished for their softy muscle and good taste. In fact, they are common in fast food joints (Super Foods, Sweet Sensations, Tasty Fried Chicken, Mama Cass, Mr. Big, Chicken Republic etc.), standard restaurants, open markets (Kuto, Oyingbo, Sango, Lafenwa, Omida, Bodija and other Farm Gate outlets). They are common and found in standard shopping mall (ACE, ShopRite, Palm Shopping Mall etc.).

2.4 Strains of Broiler Chickens

Broiler chickens are predominantly the same in terms of growth rate, high meat yield and other genetic qualities. However, they are produced and marketed by different breeders or companies under different trade names such as Marshal, Abor Acre, Abor Acre Plus, Anak, Anak Titan, Hubbard, Cobb, Ross, etc. Broiler chickens regardless of the strain are produced basically using the same management techniques.

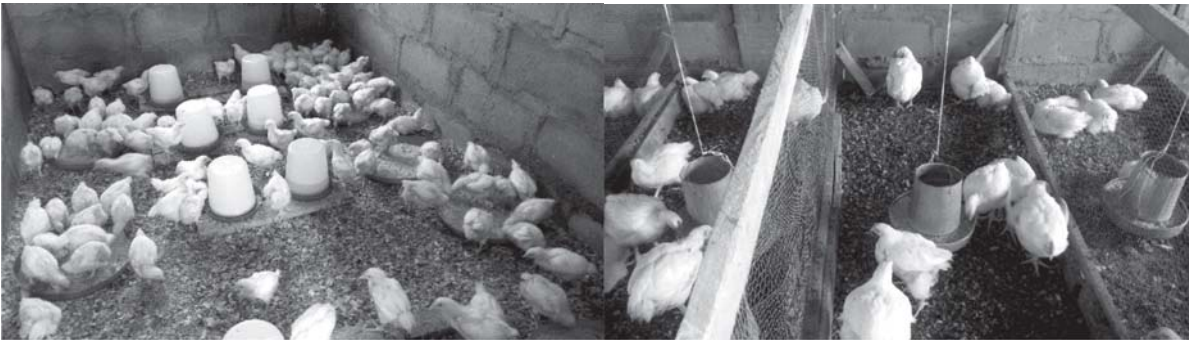


Fig. 8 : Atypical Deep Litter system of Housing

MODULE 3

MANAGEMENT OF BROILER CHICKENS

3.1 Introduction

Management of chicken refers to the entire husbandry practices/processes involved in raising birds from chick at a day old to the time of achieving the primary purpose of production or that help achieve and maximize production target and efficiency. Good management practices is important and it includes siting and housing construction, purchase of equipment and installations, purchase and stocking of birds, brooding, feed and feeding, water utilization, litter and health.

3.2. Site Selection, Housing and Equipment

In order to achieve good growth and optimal health of birds and profitable venture for the farmer some consideration must be given to site selection and housing. Broiler house (pen) should be sited on a well-drained soil. Waterlogged area should be avoided. The pen should not be sited very close to major road to prevent disturbances from traffic. It is essential to ensure that the land area is sufficient for establishment and possibly, expansion. Where possible, the farm could be sited in a relative cool but easily accessible area, not too far from sources of inputs and market outlet. The farm should be situated where there is regular supply of good water. Also, as much as possible, poultry pens should be some distance from human living areas.

The housing is a function of size of production (rearing) system, purpose and financial strength of the farmer. Deep litter housing type is most suitable for broiler production (see photos below) as it helps prevent leg problem. Housing should protect the birds from harsh environmental conditions and social vices. They are built to have East – West orientation (i.e. the length faces the North – South direction).



Fig. 8 :Backyard Deep Litter Housing



Fig. 9: Simple Backyard Deep Litter Movable Pen at Salawu Comprehensive High School, Abeokuta



Fig.10: Commercial Deep Litter Housing

Similarly, equipment for poultry production are of different types. They are necessary for successful poultry farming. They include heaters, feeders and drinkers among others (as indicated in the photo below).



Fig.11 Simple Poultry Equipment

In industrialized commercial broiler production, tunnel system is used. This system uses more sophisticated equipment such as automatic feeder, drinker, fogger, humidifier, brooding equipment among others

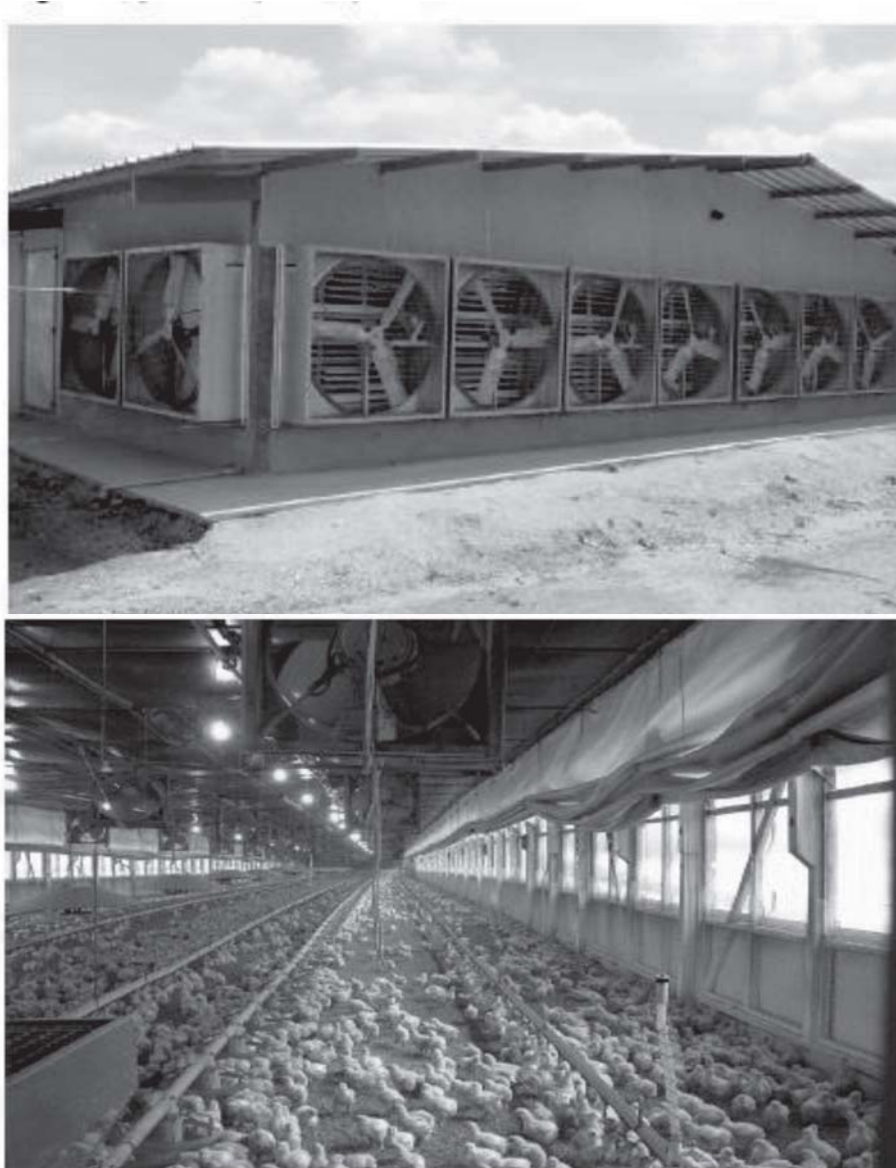


Fig. 12: Industrial Deep Litter Housing Type for Broiler Production (Tunnel system)

3.3 Brooding Management and Illustrations

The poultry house and all equipment should be thoroughly cleaned and washed to rid them of all visible dirt and disinfected and dried a few days before arrival of birds. The floor should be covered with dried litter material, preferably wood shaven to a depth of about 5cm while the brooding area should be well covered to prevent drought and escape of heat.

Adequate warmth in the first 10-14 days is very critical and important in the life of chicks. This therefore, emphasizes the need to provide additional heat for maintenance and rapid growth and development. The chicks at day old have just been hatched from the eggs and do not have enough feather cover to conserve body heat and fluid. Hence, they need gentle acclimatization in their new environment. Delays in placement into a conducive new environment (brooding area) can lead to dehydration of chicks, resulting in early chick mortality and reduced growth rate. Chicks must be carefully placed and evenly distributed near feed and water throughout the brooding area. The farmer is required to start the heating system at least 2 hours before chicks are stocked and to ensure that all equipment are in good working condition.

Farmer should also monitor the chicks' behavior and distribution relative to the heat supply. The brooding temperature is good if the shank is warm. Where thermometer is available, 33°C is recommended. The temperature can thereafter be reduced by 2°C every 3 days and depending on the season. Under very good brooding, temperature could be reduced to 27°C by the 14th day. It is important to note that the behaviour of the birds could be used as indicator of suitability of brooding temperature as illustrated below. Under correct brooding temperature, the birds will be evenly distributed within the brooding area.

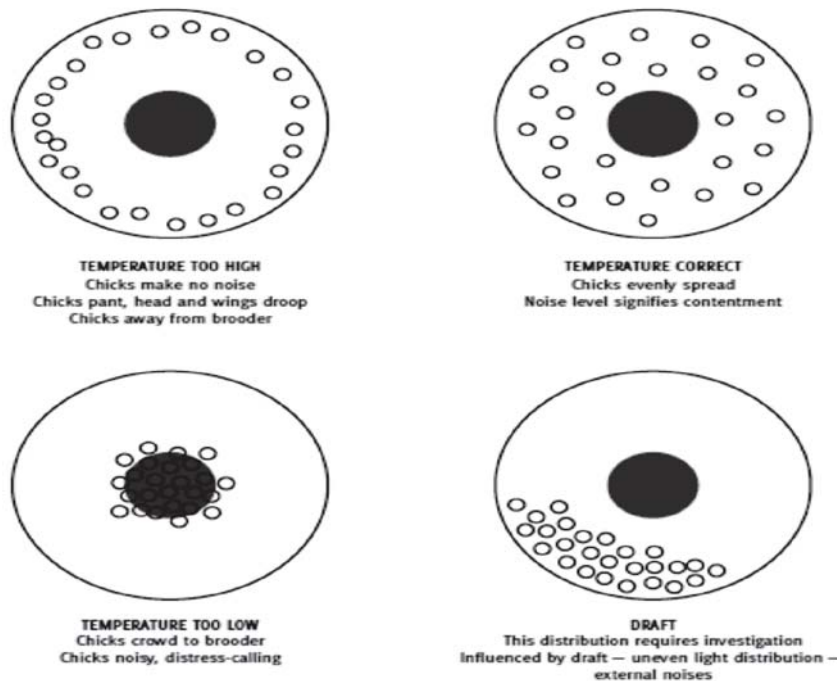


Fig.13: Reactions of Chicks to Temperature in Brooding Management

4 Feeds and Feeding Management in Broiler Chickens Production

Feeds for Broiler chickens, other poultry or livestock refers to materials which when ingested provide the animal with basic nutrients such as energy, protein, vitamin and mineral. Feeds vary in terms of quality or quantity of the nutrient supplied. Feed type depends on the class and/or physiological stage of the bird. Starter feed for instance refers to feed given to broiler chickens between 0-4 weeks of age, while finisher feed refers to feed given between 4-8 weeks.

Feed cost is the largest single item in broiler chicken production in particular and poultry as well as other livestock in general. It accounts for 65 to 75% of the total production cost. For a profitable broiler production, the conversion of feed to meat must be done efficiently and economically. Adequate nutrition and balanced diet is essential. Crude protein requirement for starting broiler is 22-23%, crude fibre is 4-5%, fat is 4-4.5% and the metabolizable energy is 2800-3000kcal/kg. Similarly, crude protein requirement for finishing broiler is 19 - 20%, crude fibre 5 - 6.5% and the metabolizable energy is 3000-3150kcal/kg (Table 3).

When chickens are provided with high quality feed in the required quantity, it promotes body maintenance, improves production (growth and body weight), and it gives energy and confers good health and vitality. Maintenance of the body is the first consideration in good feeding and production follows thereafter.

Two (2) feeding regimes: starter (0-4weeks) and finisher (4-8weeks) diets for broiler production and management are considered suitable for most farmers. However, it is important to note that there are up to four feeding regimes for broiler production. They are pre-starter, starter, grower and finisher. The feeding regime utilized is a function of the production targets (very fast growth for quick market or slow growth for later market).

Table 3: Feed Guide for Broiler and Cockerel

Bird Type	Age (weeks)	Feed type	Crude (%)	Protein	Metabolizable Energy (KJ/kg)
<u>Broiler</u>					
Starter	0-4	Broiler Starter	22-23		2800-3000
Finisher	4-8	Broiler Finisher	19-20		3000-3150
<u>Cockerel</u>					
Chick	0-8	Chick Mash	20		2800
Grower	8->20	Grower Mash	17-18		2750-2800

3.5 Water Management

Water is very essential in broiler chicken production. Birds drink more than the feed they consume therefore, water should be provided in good quantity and must be of good quality. Well or bore hole water is preferred and where it is not available, rain or tap water could be used. Clean, fresh water should be presented so that birds can drink with minimum effort. Water and the source should be checked for quality on a regular basis and treated as required. Bird should be provided water at least thrice the quantity of feed they consume.

3.6 Tips in achieving a high Feed Efficiency in Broiler Chicken Production

1. Adequate feeding space should be provided at all times, ensuring that about 75% of the birds can feed at the same time.
2. Feeders should be well designed to prevent feed wastage.
3. Feeders should be filled to not more than ½ full capacity.
4. Feeders should be placed at the appropriate ground level or be properly hung as the case may be to avoid feed contamination and wastage.
5. Attendants should minimize feed spillage during the process of serving feed.
6. Use the right type and size of feeder per stage to ensure that birds have good access to consume the feed without straining.

Table 4: Feeding Guide for Broiler Chickens

Age (Days)	Feed intake (g/bird/day)	Body weight(g/bird)
1	20	45-55
2	22	55-95
3	24	95-135
4	26	135-175
5	28	175-215
6	30	215-255
7	32	255-295
8	34	295-335
9	36	335-385
10	38	385-425
11	40	425-465
12	42	465-505
13	44	505-545
14	46	545-585
15	48	585-625
16	50	625-665
17	52	665-705
18	54	705-745
19	54	745-785
20	56	785-825
21	58	825-865
22	60	865-905
23	62	905-945
24	64	945-985
25	66	985-1,025
26	68	1,025-1,045

7. Do not store feeds for too long or in damp places, otherwise they become moldy and create problem when fed to birds.
8. Use correct stocking density (0.07m² at starter phase; 0.09 – 0.1 m² at finisher phase)
9. Ensure good lighting programme; provide lighting for 6 – 8 hour in the Pen.
10. Change the litter regularly. Do not allow caked litter in the pen.

Note:

If there is any need to change from one type of feed to another, it should be done gradually for a period of about four days.

3.7 Litter Management

Broilers are often reared in deep litter system. Wood shavings are the preferred bedding materials. Alternatively, maize cobs and straws could be used. Wood shavings should be laid to about 5cm height and must be cleaned up regularly, at least once a week. Poor litter management results in microbial and ammonia build-up and can lead to diseases like coccidiosis and respiratory infections. Litter management is paramount and important for good health.

MODULE 4

HEALTH MANAGEMENT IN BROILER CHICKEN

4.1 Introduction

Health is wealth. The health of birds must be well managed for better profit. Prevent disease occurrence because prevention is better than cure. Good health management and disease prevention starts with construction, preparation of the pen; cleaning, washing and disinfection of the pen and equipment; good chicks, appropriate litter management and bio-security. It also involves giving appropriate medications and vaccines as recommended by the Veterinary Doctor or manufacturer/service provider. However, sample medication and vaccination programme is shown in Table 5.

4.2 Medication and Vaccination

Table 5 Medication and Vaccination Prototype for Broiler Chickens

Age (Day)	Vaccine	Mode of Administration	Comment/Remark
1	Intra ocular (i/o)	through the eye	The eye is well developed at Day old
1-5	Multivitamin + Antibiotics	Oral	Good antistress
10	Infectious Bursal Disease (IBD) Gumboro	oral	Reconstituted in chlorine free water. Birds must be starved of water for about 6 hours so that the vaccines could be taken and finished within a period not more than 30 minutes
13-16	Coccidiostat	Oral	For 4 days initially
17	New Castle Disease Vaccine Lasota (NDV – Lasota)	Oral	As indicated in day 10 Vaccination remarks
19-21	Coccidiostat	Oral	For 3 days. Repeats in 13-16 and 19-21 days order fortnightly till the birds reach market weight. However, this can be avoided if the litters are changed weekly and dry bedding is maintained.
27	IBD – Gumboro 2nd (booster) dose	Oral	As indicated in day 10 Vaccination remarks
35	New Castle Disease Vaccine Lasota (NDV – Lasota) – booster dose	Oral	As indicated in day 10 Vaccination remarks
42	Dewormer	Oral	For one or two days depending on type. Please find out from the Veterinary Doctor. Repeat after 2 weeks

4.3 Rules of Thumb For Effective Vaccination

There are basic rules that guide vaccination process. These include the rules on the vaccine, bird and vaccinator (the person).

Vaccine

- Appropriate vaccine should be used for appropriate disease type
- Use vaccine(s) that are locally produced where it is available
- Use correct and equal dose for correct and equal number of birds (right dose)

Bird

- Do not vaccinate sick birds
- Sick birds that could not be vaccinated should be culled
- Treat secondary disease infection before vaccination

Vaccinator

- Use chlorine free water (where it is available) for oral administration otherwise add skimmed (powdered) milk to the water
- Maintain the cold chain from point of purchase of vaccine till use
- Once the vaccine has been reconstituted, there should not be delay in time with use reconstituted vaccines must be utilized within 30 minutes
- Birds should be administered with anti-stress 1-2day before vaccination and 2days after vaccination with effect from the very moment the flock is vaccinated.
- The vial of used vaccines must be appropriately disposed.

4.4 Bio-Security Issues in Broiler Production

Poultry farm is an integral parts of so many interactions and components. The components are the people/staff, materials, birds, environment, and other extraneous substances outside the immediate environment such as inputs suppliers, products markets and vehicles among others. All the components have to be well managed through bio-security measures. Therefore, bio-security/quarantine is an integral part of health management in any successful broiler production system and very essential in poultry production.

It refers to those measures taken to prevent or control introduction and spread of infectious agents to a flock. Diseases, whether proven or not significantly reduce the productivity of birds, and the profitability and long term financial viability of a broiler business. Biosecurity helps to prevent disease causing organisms from establishing themselves on farm site, prevent the spread of disease agents from an infected area to an uninfected area and prevent the spread of infection within the farm.

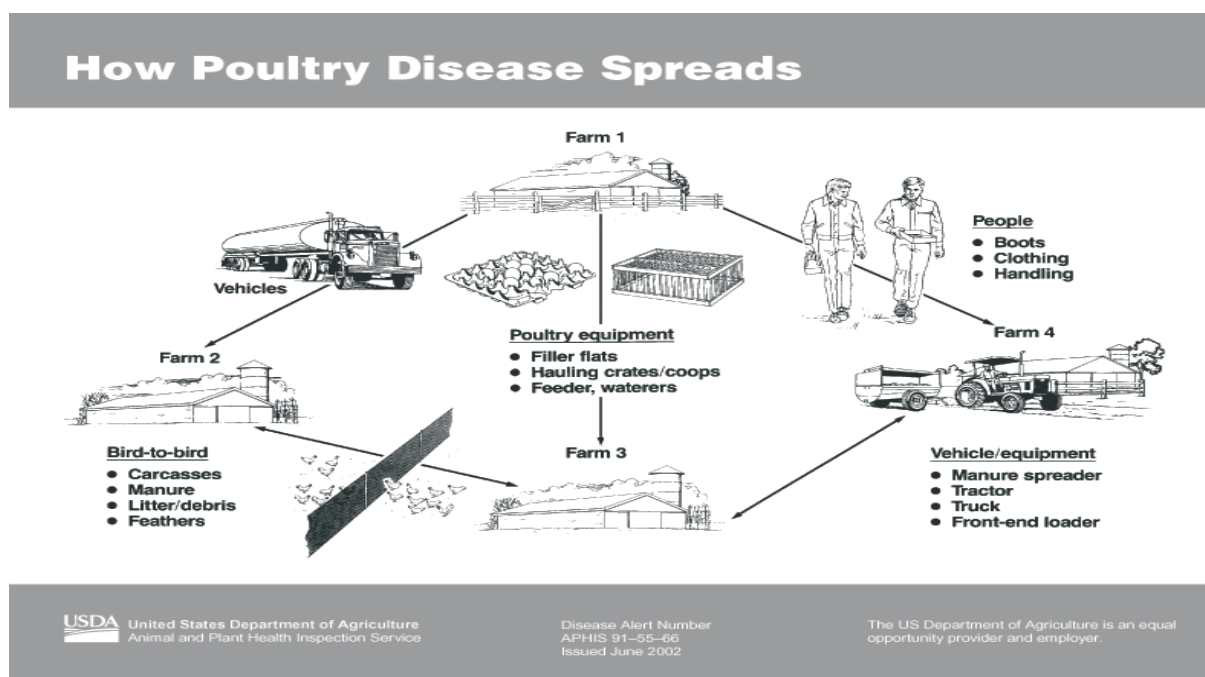


Fig. 12: Avenues of Poultry Diseases spread and Bio-Security

4.4.1 Objectives of Bio-security

- (a) To prevent introduction of infectious diseases to livestock.
- (b) To prevent the spread of disease from an infected area to an uninfected area
- (c) To prevent disease spread from one farm to another
- (d) To safe guard the health of the livestock
- (e) To enhance profitability of the Food Animal business

4.4.2 Components of Livestock Farms that contribute to Diseases Spread/Transmission

- Livestock
- Other animals
- People
- Equipment
- Vehicles
- Air
- Water Supply

Livestock

- Transfer of birds from farm to farm
- Dead bird disposal

Other Animals

- Wild birds/ducks
- Feral and domestic animals and pets
- Insects
- Rodents – rats/mice
- Domestic birds

People

- Contractors, maintenance personnel, neighbours, servicemen, friends
- Disease can be transmitted by, for example, hands, boots, clothing, and dirty hair

Equipment

- Feeders
- Waterers
- Hauling crates/coops

Vehicles

- Up and off-loading (roundabout/utility) vehicles come onto the farm with microbe loads
- Tyres of the vehicles are microbes loaded
- Low cleanliness of the Farm vehicles
- Poor regular disinfection of Farm vehicles

Air

- Transmission as an aerosol or dust

Water Supply

- Surface water attracts waterfowl, birds ingest contaminated water

4.5 Important Considerations for Bio-Security and Success Tips

Location, layout of farm, disease status of the district, proximity to other farms with avian species and interface with the processor are some of the various inter play in farm localization and disease management and control. Others include pick-ups, serviceman, day-old chicks and feed deliveries.

4.6 Tips for Successful Bio-Security

4.6.1 Farm Layout

Farm Layout is an important consideration in poultry business. It helps for plan and movement of activities, loading and off-loading of products, farm administration and operations and more importantly, structural and operation bio-security for disease management and control.

Therefore, the entire farm must be well planned (good farm layout) to reduce stress on handlers and birds. And the pens would be constructed with good orientation (East-West).

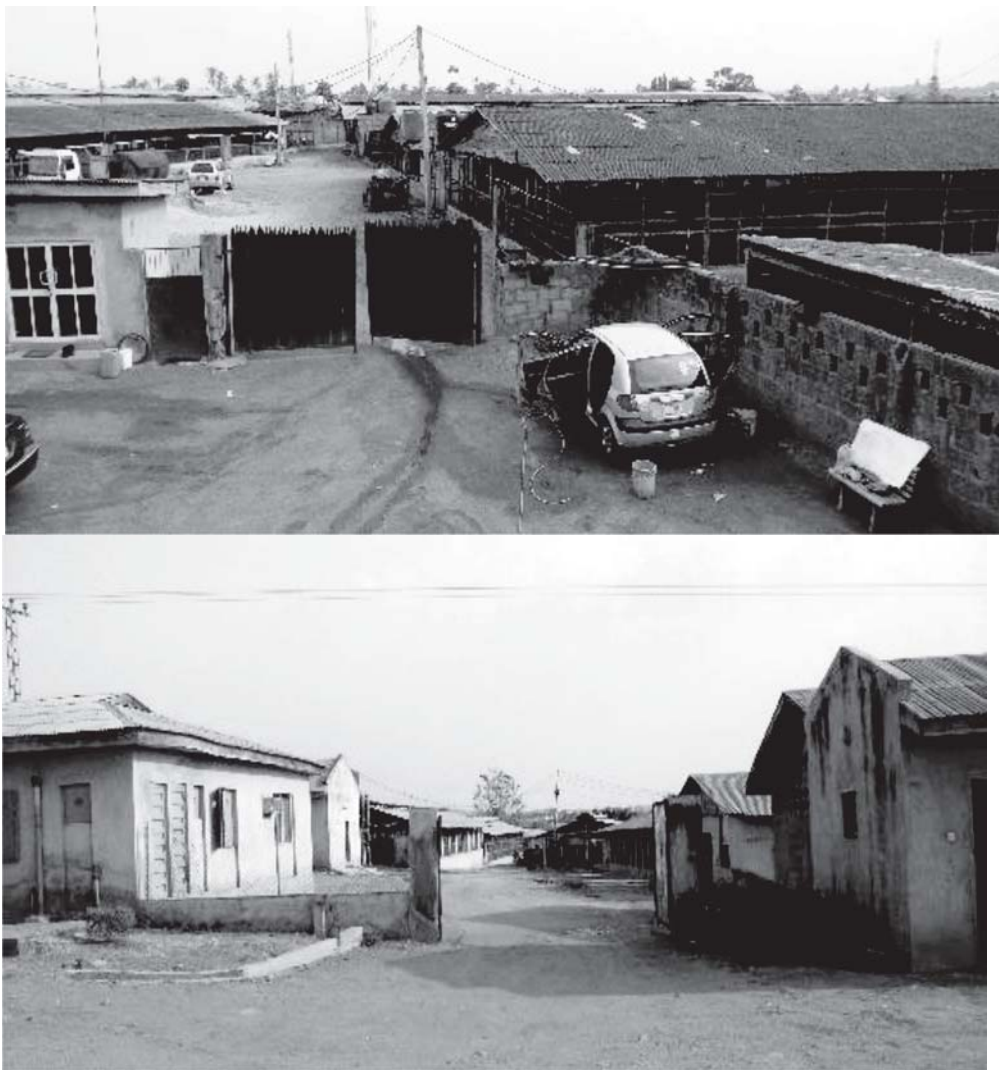


Fig.13 Approach of a Typical Poultry: Farm Layout

Provision for structural bio-security is made with restriction gate



Fig. 14: Internal Plan of a Typical Poultry Farm

Growing Pens are independent with 15m distance maintained between Pens



Fig. 15: Foot Dip plae at the entrance of Broiler Pen.

It is important that any person given the approval to enter the pen must dip his/her feet in the foot bath (dip) containing disinfectant. Some farms also have tyre bath through which any vehicle entering into the farm passes through. All are efforts to reduce micro organism load into the pen and prevent disease transmission.

Table 6 :Bio - Security Score Card

Yes No

A. Distance between farm and potential disease transmission Threats			
1	The next poultry farm is 1.5km or more away as the crow flies.		
2	The processing plant is a 1.5km or more away as the crow flies.		
3	The main route by which trucks travel to the processing plant is a 1.5km or more as the crow flies.		
4	My farm is more than a kilometer from a standing body of water (pond, lake) as the crow flies.		
5	The nearest rendering facility is a kilometer or more away as the crow flies		
B. Movement Restrictions			
6	I do not take farm vehicles off the farm		
7	I do not lend or borrow equipment from other poultry operators.		
8	I have a gate that restricts vehicle access to the poultry houses.		
9	My poultry houses are surrounded by a fence.		
10	All visitors to the farm must sign a log book.		
11	I permit no visitors on the premises except authorized personnel that is, people who need to be there.		
12	I check vehicles coming onto the farm to see if they are clean.		
13	I ask and ensure vehicle operators have disinfected their tires prior to coming on the farm.		
14	I ask visitors where they have been prior to coming on the farm		
15	My poultry houses are locked to discourage unauthorized entry.		
16	I have erected signs indicating that access is restricted.		
17	No one except me, my employees, service personnel, and veterinarians are permitted to enter my poultry houses prior to load out.		
18	Load-out crews are not permitted to go anywhere else on the farm except for where they are assigned to work in.		
19	I never visit other poultry farms		
20	I never visit the liveside of the processing plant.		
21	Feed truck drivers are not permitted to enter poultry houses.		
22	I have a box for feed tickets on the feed bin so that the driver doesn't have to enter the house.		
23	Feed truck drivers are not permitted to enter the poultry houses.		
C. Flock Management			
24	I only have one age of birds on the farm during a given production cycle.		
25	When there are multiple ages of birds on the farm, the order of care is youngest to oldest.		
26	I have different employees caring for different ages.		
D. Rodents and Migrating Birds Control			
27	I have a rodent control plan.		
28	I regularly check bait boxes and traps to be sure that the bait is fresh and to remove rodents.		
29	I regularly check for rodent activity e.g., active holes near the foundations, chewed wood and insulation, rodent droppings on sills and in ante - rooms		
30	I do not let trash and junk pile up in my ante- room.		

MODULE 5

PRODUCTS AND MARKETING

5.1 Introduction

Poultry production targets basically two primary poultry products (Meat and egg). With modern production system, many other products could be derived and are referred to as secondary or derived products. These include manure, feather, slaughter house waste, empty sacks where commercial feeds are used among others. These products collectively and individually generate basic or additional income to the farmer depending on production targets.

For example, broilers are reared purposely for their meat. They are sold in live bird markets and other channels or to other processing units and various consumers in various forms and sizes such as dressed, cut parts and organs e.g. gizzard. Where additional techniques are employed manure, feather, and slaughter house waste amongst others are converted into organic fertilizer for crop production.



Fig. 16a:Dressed Chicken



Fig. 16b:Decayed Manure



Fig. 16c:Manure bagged for sale

Fig.16d:Broiler Chickens and Products

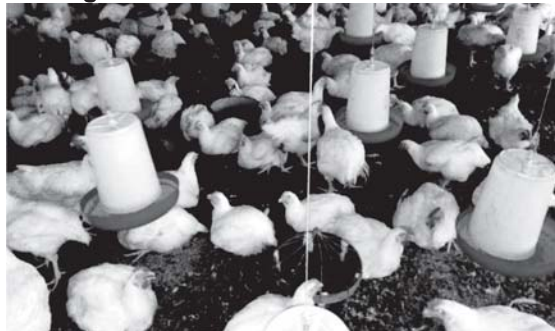


Fig. 16e:Live birds



Fig. 16 f :Whole Chicken

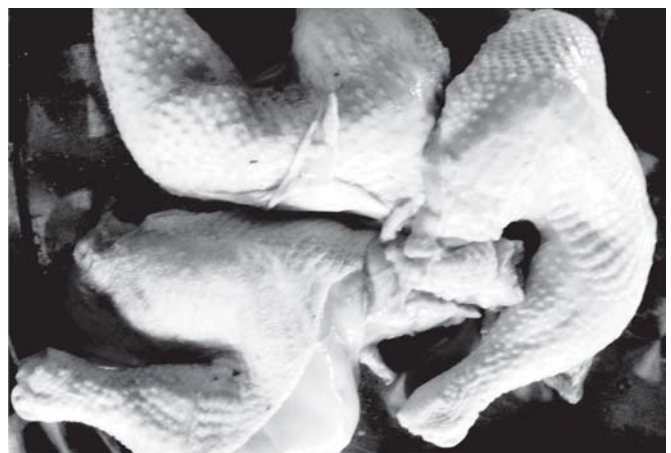


Fig. 16g Choice Cut part (thigh + drum stick – Cut 4)



Fig 16 h :Broiler primitive cuts (shanks, head)

Broiler Products and Marketing

Broiler chickens may be sold whole or retailed in choice cuts. Some customers prefer tender meat, some prefer cured meat. Customers taste (market targeted) is important when producing broiler and the market should be satisfied. For example, most restaurant want soft meat and small cuts e.g. cut-4 while open market may want whole chicken or cut parts but not so soft. Some customers prefer the wings, shanks, head and neck. All the customers should be well catered for.



Fig. 17 :AtypicalBroilerMarket



Fig. 18 :Sales Opportunity in a typical Local Market



Fig. 19 :Broiler chicken slaughtering and processing



Fig. 20 :Broiler Chicken slaughtering and processinglocal Market

MODULE 6

RECORDS KEEPING IN POULTRY PRODUCTION AND MANAGEMENT

6.1 Records Keeping and Good Observations

It is very important that adequate records of activities are kept. This helps to identify problem areas. Records also help to measure performance. In big farms, records could be used to seek for funds from Banks. Records of feed intake, growth, mortality and overall performance should be adequately kept. Example of production and performance record/chart is given below.

6.2 Examples of Records Kept in Poultry Farms

GOFRAVAS FARM, OSIELE, ABEOKUTA, OGUN STATE PRODUCTION RECORD CHART

Bird Type

Strain

Hatchery

Date of Stocking

Date	Day	Opening Stock	Mortality	Stock Balance	Qty. of Feed (kg)	Medication (drug use and mode)	Vaccination (type and mode)	Remarks
	1							
	2							
	3							
	4							
	.							
	.							
	.							
	30							
	31							
	32							

**TOPMOST FARM, OBALENDE, OSUN STATE
STOCK PERFORMANCE RECORDS**

Type

Strain

.....

Date of Stocking

Day	Opening Stock	Blnce.	Qty of Feed (kg)	Medication/Vaccination	Cost of medication/Vaccination (₦)	Remarks
1						
2						
3						
4						
5						
6						
.						
.						
.						
.						
.						
42						
43						
44						
45						

6.3 Avoiding Pitfalls in Poultry Production

1. Maintain good distance between farms and other structures. Distance between farm and potential disease transmission treats should not be less than 1.5km
 2. Engage in bio-security measures – restrict movement in and out of the poultry
 3. Flock Management – Maintain one age of birds on the farm during a given production cycle; practice all in, all out
 4. Control rodents and migrating birds in and out of the pen
 5. Do thorough cleaning as appropriate
 6. Sick birds should be isolated while dead ones should be burnt or buried in deep pit (or incinerator)
 7. Obtain stocks from reputable hatcheries/farms
-

Bibliography

- Adiku, S. G. K. 2012. Keynote Speech on Sustainable Livelihood and Development in Africa. International Conference on Sustainable Livelihoods and Development. Held at the Institute of African Studies, Yiri Lodge, University of Ghana, Legon, Accra, Ghana on Tuesday 27 November, 2012
- Allison-Oguru E.A., 1992. Econometric analysis of aggregate demand for fish in Nigeria 1980- 1987, Delta Agriculturist. 1(1), 1-1
- LITA 2012: Livestock Transformation Agenda: Sheep and Goat Action Plan. FMARD, Abuja
- National Bureau of Statistics (2007). General Household Survey Report, 1995 – 2005. Federal Republic of Nigeria. March 2007
- National Research Council (NRC) 1994. Nutrient Requirements of Poultry 9th rev.ed. National Academy Press, Washington, DC.
- Okuneye, B. 2002. Livestock Sub-sector in Nigeria: Challenges and Prospects Bullion, Publication of the Central Bank of Nigeria. 26 (3): 16-22
- Peace Corps 2015. Practical Poultry Raising. Peace Corps Publication No. M0011. Peace Corps Overseas Programming and Training Support Knowledge and Learning Unit 1111 20th Street Washington, DC 20526 Tel: 202.692.2640 Fax: 202.692.2641
- Watson, A. J. and Davis, D. 2015. More cluck for the buck: Genetics hatch larger chickens that require less feed. <http://alfafarmers.org/stories/news-detail/more-cluck-for-the-buck-genetics-hatch-larger-chickens-that-require-less-fe#.XH-rezNKjIU>

TRAINING MANUAL

ON

FISH PRODUCTION AND MANAGEMENT

DR. O. J. OLAOYE

*Agricultural Media Resources And Extension Centre (AMREC)
Federal University Of Agriculture, Abeokuta, Nigeria (FUNAAB)*

FISH FARMING PRODUCTION AND MANAGEMENT

INTRODUCTION

Nigeria is still generally considered as an agrarian economy despite the country's reliance on the oil sector for her revenue. This is because as agriculture remains the mainstay of the nation's economy. It provides about 70 percent of the nation's population, especially those in the rural areas, with employment opportunities, and acts as a source of food for the nation's teeming population (Ogen, 2007; CBN, 2010). The fishery subsector plays a notable role in the Nigerian economy as it continuously ranks third after the crops and livestock subsectors which ranked first and second respectively in terms of contribution to the Gross Domestic Product (GDP) (Bassey et al., 2014). Aquaculture, which is the rearing of aquatic organisms including fish under controlled environment for the benefit of mankind, is the fastest growing livestock industry in the world (FAO, 2009; Ozigbo et al., 2014). Fish farming is therefore a subset of aquaculture.

In Nigeria, the demand for fish is being met through two main sources which are domestic production and importation from foreign countries. The domestic production is from artisanal, industrial and culture fisheries with artisanal fisheries accounting for as much as 85% of total fish production, while industrial and culture fisheries accounted for 1% and 14% respectively. Due to the insufficiency of domestic production of fish, importation of fish and fish products accounts for more than half of fish supply in the country.

Fish farming development is following the poultry industry and is facing similar challenges in its development, the challenges include: 1) the need to educate farmers, 2) the need for quality stocks of fish of known origins, 3) the need for high quality feeds, 4) the need for record keeping among fish farmers and 5) the need for quality extension service.

This training will focus on the areas of fish farming and general aquaculture practices as a means to diversify income for the target groups.

TRAINING CONTENTS

MODULE 1

INTRODUCTION TO FISHERIES DEVELOPMENT

- Definition of Fish Farming
- Importance of Fish farming
- Identification of important fishes in Nigeria suitable for culture
- Obstacles of Fish Farming
- Hazards and Challenges involved in Fish Farming Business
- Types of Production Methods used in Aquaculture

MODULE 2

FISH FARM DESIGN AND CONSTRUCTION

- Fish farm site selection
- Different types of fish ponds and their designs
- Mapping and Pegging
- Construction of Earthen fish pond, Concrete tanks, Vats, Cages, etc
- Material estimates for fish enclosure (Concrete tanks and vats) construction.

MODULE 3

FISH POND PREPARATION

Neutralization/Liming

Types of liming: Organic and Inorganic

Pond medium impoundment and monitoring of water quality

Fertilization/Manuring

Types of fertilizer: Organic and Inorganic

Mode of application

MODULE 4

POND STOCKING

- Identification of culturable fish species
- Stocking density
- Precautions to be taken in fish stocking
- Monitoring of fish status

MODULE 5

FISH NUTRITION

- Identification of mode of feeding in stocked fish (carnivorous, herbivorous and omnivorous)
- Examples of each types of mode of feeding in stocked fish.
- Classes of food
- Fish feed ingredients
- Organic feeding, use of live feeds such as maggot, termite, earthworm, etc
- Techniques of live feed production
- Application of fish feeds (Conventional and live feeds)

MODULE 6

FISH FARM MANAGEMENT

- Water quality management
- Fish enclosure management
- Fish management
- Fish sampling
- Fish feed management
- Predators prevention and control

MODULE 7

FISH HEALTH MANAGEMENT

- Identification of causative organism
- Causes of fish diseases
- Symptoms of sick fish
- Treatment of fish diseases
- Prevention and control of fish diseases

MODULE 8

FISH FARM RECORD KEEPING

- Farm account
- Cash and non-cash records

MODULE 9

MARKETING IN FISHERIES BUSINESS

MODULE 10:

HOW TO SUCCEED AS A FISH FARMER

METHOD OF TRAINING

This Training will be run both in the class and field demonstration) as well as visit to notable private fish farms.

MODULE I: INTRODUCTION TO FISHERIES DEVELOPMENT

- Introduction to Fish Farming

Aquaculture is the rearing of aquatic organisms (fish, molluscs, crustaceans and aquatic plants) in enclosed water bodies such as ponds, dams, cages, raceways, tanks, reservoirs.

Fish farming is a part of aquaculture but sometimes the two are used interchangeably because majority of output from aquacultural production comes from fish farming. Fish farming/culture is the growing of fish in a controlled environment (concrete or earthen ponds), vats (wooden or fibre glass) and plastics (Osawe, 2007, Nwokoye et al., 2007).

Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.

Aquaculture has the potential to become a sustainable practice that can supplement capture fisheries, eliminate fish importation and significantly contribute to feeding the world's growing population.

- Agriculture vs. Aquaculture
- Variable body temperature
- Better converters of foodstuffs
- Requires less energy for body support

Aquaculture Requires

- Land
 - Water in sufficient quality and quantity
 - Money
 - Training (Technical knowledge)
-
- Relevance of Fish farming
 - i. Employment Opportunity
 - ii. Economic
 - iii. Nutritional (high-quality protein) and Food security
 - iv. Income generation
 - v. Earning foreign exchange
 - vi. Health benefit
 - vii. Ecotourism and Leading to poverty relief

□ Identification of important fishes in Nigeria suitable for culture



Figure 1: Warmwater fish: Catfish



Figure 2: Tilapia



Figure 3: *Heterotis niloticus* (Slap water), Aikaodo

- Obstacles to Fish Farming
 - (i) Lack of experts mostly needed in areas of pond design and construction, fish genetics and
 - (ii) Breeding, fish feed and nutrition, fingerling transportation management, fish pathology etc.
 - (iii) Shortage of trained professionals and technicians to carry out advisory extension and training services;
 - (iv) High capital cost in pond construction;
 - (v) Supply of poor genetic fingerlings which leads to reliance on fingerlings from the wild;
 - (vi) Inadequate supply of inputs;
 - (vii) Poor communication network in the producing area affecting fish distribution, marketing and extension work;
 - (viii) Dishonesty of some farm labours;
 - (ix) Management problems;
 - (x) Lack of efficient fish farmers' cooperatives societies to benefit from government financial assistance schemes;
 - (xi) Poor maintenance facilities and spare parts;
 - (xii) Lack of adequate infrastructural facilities and
 - (xiii) Declining productivity.

- **Hazards and Challenges involved in Fish Farming Business**
 - (a) Sources, frequencies, qualities and quantities of water available.
 - (b) Difficulty in sourcing for healthy and quality fish seeds.
 - (c) No organized marketing platform.
 - (d) Inability to process fish for wider market consumption.
 - (e) Up till date, funding for farmers has remained a night mare.
 - (f) A major challenge that scares fish farmers is problems associated with farm staff.
 - (g) Finally, poaching and direct stealing of fish from the ponds are still going on unabated.
- **Types of Production Methods used in Aquaculture**
 - **Production Methods**
 - Ponds and Tanks
 - Cages and Pens
 - Raceways
 - Closed re-use systems
 - Raft culture
 - Close high-density culture



Figure 4: Earthen fish pond

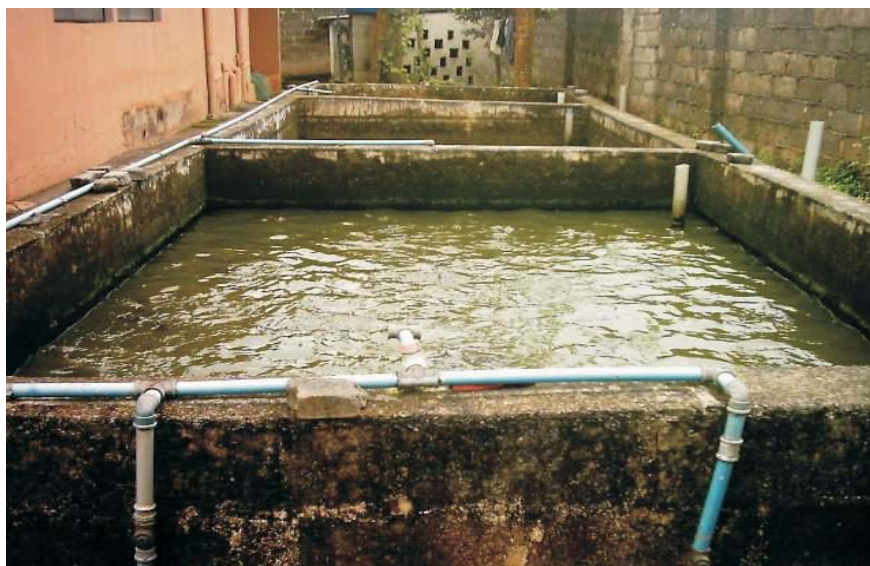


Figure 5 Concrete Fish Tank

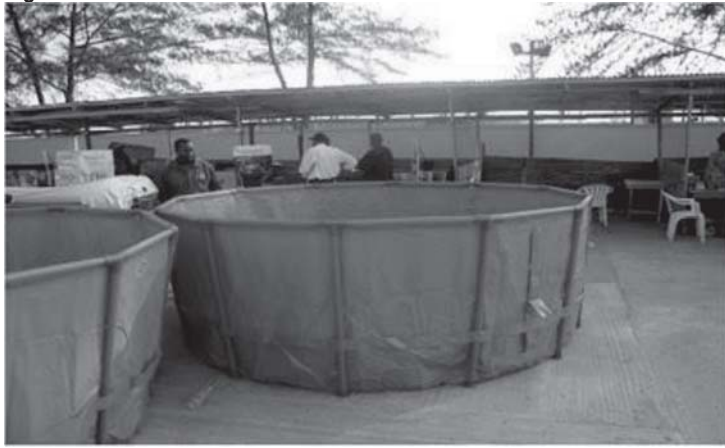


Figure 6: Movable circular holding tanks



Figure 7: Circular holding tanks



Figure 8: Wooden trough



Figure 9: Recirculating Aquaculture Systems (RAS)

MODULE 2: FISH FARM DESIGN AND CONSTRUCTION

- **Fish farm site selection**

The success of a fish farming project largely depends on your project site conditions. Site conditions determine whether your fish farm will competitively produce. Correct selection of the site, and correct design of your fish farm in this site, can 'make-or-break' your new business.

Site selection process takes into account the biological traits of the target fish or Shrimp crop, the intended production capacity, the facilities required to achieve optimal and cost effective production.

Factors to be considered for selection of Fish Pond Site

- i. Water availability (adequate quantity and good quality);
- ii. Land topography;
- iii. Accessibility;
- iv. Soil type;
- v. Vegetation cover;
- vi. Proximity and size of market;
- vii. Availability of inputs; and
- viii. Bio-security.

A Simple Test of the Suitability of a Soil for Pond Construction:

- (a) Dampen a handful of soil with water. Use only enough water to dampen the sample (Do not saturate it).
- (b) Squeeze the sample tightly in your hand.
- (c) Open your hand:
 - (I) if the sample keeps its shape, it is probably good enough for building a pond (i.e. sufficient clay present).
 - (ii) if the sample collapses and does not keep its shape, it is probably not good enough for building a pond (i.e. too much sand present).
- (d) The site should be in a region or area that is suitable and allowed for aquaculture production.
- (e) Well drained and away from flood-prone areas or at least having potential for flood control.
- (f) Allow for acceptable effluent disposal as required by Environmental Management Authorities.
- (g) Have a climate suitable for production of the intended species.
- (h) Have accessibility to a good and all-weather market.
- (i) Have easy access to services and technical assistance.
- (j) Have adequate room for intended investment and possible future expansion.
- (k) Not in a pollution prone area.

- **The final size of a fish farm is determined by:**

- Amount of water available for fish culture
- The technology to be employed; Intensive systems require less land compared to semi-intensive systems, to produce the same quantity of fish.

- The target production.
- Capital available for investment.

The number, size and the shape of ponds will be determined by:

- (a) Land size
- (b) Topography of the land
- (c) Intended use of the Pond
- (d) The Species to be produced
- (e) Frequency of Harvest
- (f) Target quantity per harvest
- (g) Whether juvenile production is intended etc.

- **Different Types of Fish Ponds and their Designs**
Pond Design

During the process of designing ponds, decisions on the following should be made:

- Total Area of the pond water surface (this is the actual pond size)
- The Length and the width of the pond water surface
- The water depth and the total pond depth at the deep end
- The slope of the dykes and the pond bottom
- The size of the free board (height of dyke above water level)
- The width of dykes

- **Steps of Fish Pond Construction**

- Reconnaissance survey: Visit to the site of the project to get first-hand information.
- Land clearing: The removal of the vegetation on the site.
- Land mapping: It is marking of the specific area for specific structure
- Excavation: It is the earth removal for specified structure e.g. pond, channel etc.
- Construction of associated structures e.g. monk, slice gate etc.
- Pond dressing: It the smoothening of the dykes to look good.
- Grassing: It is the planting of grasses on the dykes to prevent soil erosion.
- Pond impoundment: It is the introduction of water into the pond.

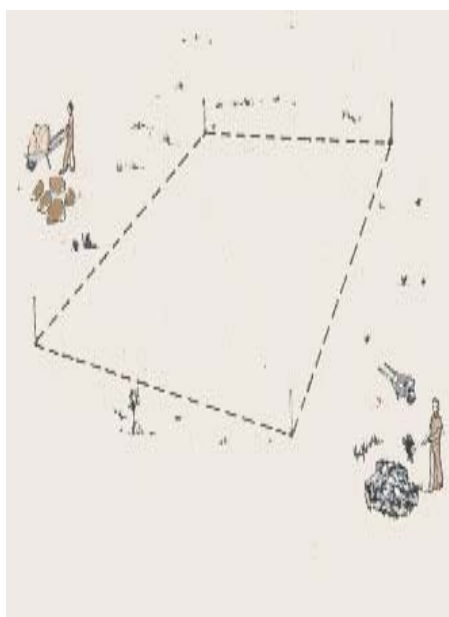


Figure10: Pegging on going now and land mapping

Design calculation:

- Dyke slope: 50% (0.5)
- Bottom slope: 1% (0.01)

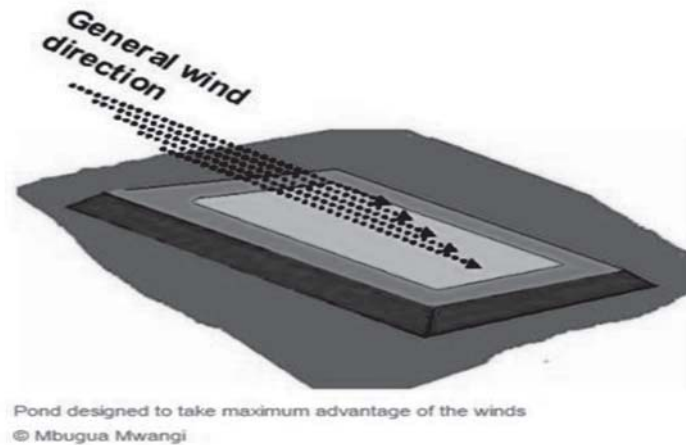
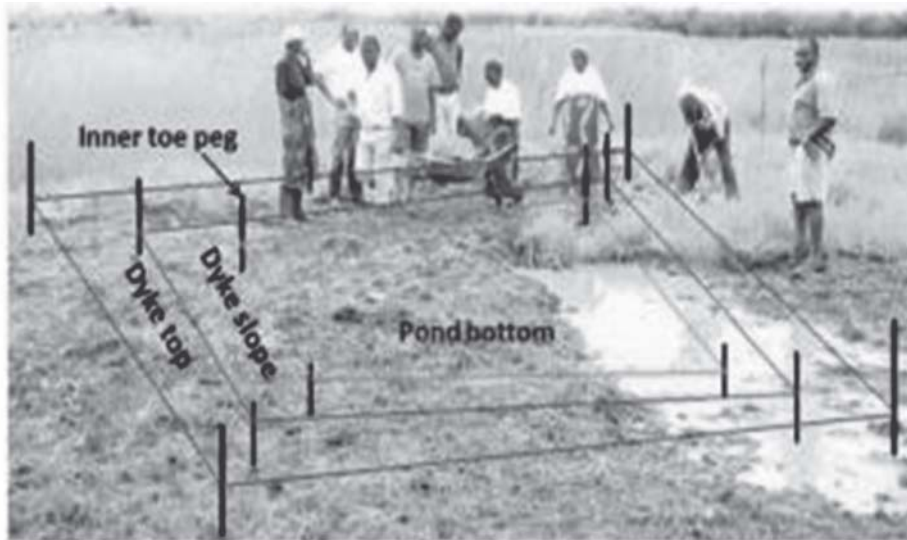


Figure 11: Pond Design to take maximum merit of the winds

Steps in the Construction

- Mark out the area that the pond will occupy using wooden pegs and strings and then remove all the vegetation
- Remove the top soil and keep it in a good location close to the site. It will be used to cover the pond bottom and the dyke tops to enhance fertility.
- Clear the area within the pond limit of all vegetation including the area within 10 m of dykes and pond structures and any access, water supply or drainage area.
- Establish a Temporary Bench Mark (TBM). A bench mark is a mark on the ground that establishes the elevation of a place and is used as a reference point for all other elevation.
- Using spirit level, measuring tape, pegs and strings, mark out:
 - The dykes
 - Dyke slopes



A site pegged ready for digging and filling

© Mbugua Mwangi, Kenya

Figure 12 Pond Pegging and Lining

- Using the determined pond depths and the actual elevations of the site, determine which areas need digging and which need filling. This is very important because it eliminates unnecessary movements of soil and thus keeps the construction cost at a minimum.
- Dig out the soil at the 'dig' areas and place it on the 'fill' areas. Most of the fill areas will be on the dyke position. Make sure to remove boulders and tree stumps from the pond area.
- Once the soil is placed on the fill area, make sure that this soil is properly compacted. To achieve good compaction, place soil in layers not exceeding 15 cm in height and compact back to at least 10 cm. When constructing dykes, soil layers are placed 20 cm inside on top of each other to reduce amount of work during dyke cutting.

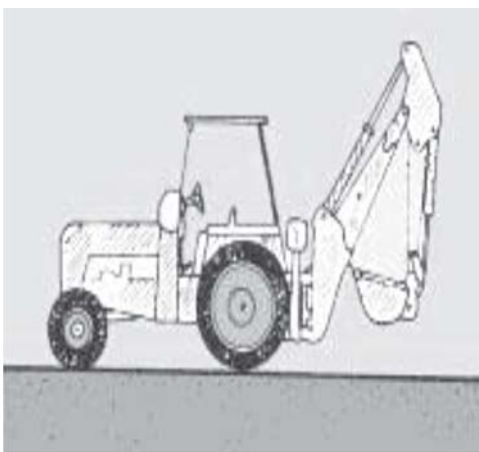


Figure 13: Pond excavation

Figure14: Constructing earthen fish pond



Characteristics of Pond Dykes

Any pond dike should have three basic qualities:

- (a) It should be able to resist the water pressure resulting from the pond water depth.
- (b) It should be impervious, the water seepage through the dike being kept to a minimum.
- (c) It should be high enough to keep the pond water from ever running over its top, which would rapidly destroy the dike.

Dyke slopes should be determined bearing in mind that:

- Steeper slopes erode easily
The more the soil becomes sandy, its strength decreases, and slopes should be more gentle
- The bigger the pond size, the stronger is the erosive power of the water waves
- As the slope ratio increases, the volume of earthwork increases, and the overall construction cost and the land area required for the ponds increases
- There are two common types of inlet structures used:
- Pipe inlets & Open inlets

When designing and constructing an inlet:

- (a) Place the inlet at the shallow end of the pond.
- (b) Make sure that the bottom level of the inlet is at the same level as the bottom of the water feeder canal and at least 10 cm above the maximum level of the water in the pond.
- (c) Design the inlet structure to be horizontal, without a slope.
- (d) Make it wide enough to fill the pond completely in reasonable time.
- (e) Make it such that water splashes and mixes as much as possible when entering the pond.
- (f) Provide a screen to keep unwanted fish and other organisms out.
- (g) Control mechanism e.g. gate valves

Pond Outlets

Pond Outlets are built to:

- keep the water in the pond at its optimum level, which should be the maximum water level designed for the pond
- allow for the complete draining of the pond and harvesting of the fish when necessary

A good Outlet should ensure that:

- the time needed to drain the pond completely is reasonable
 - the flow of the draining water is as uniform as possible to avoid disturbing the fish excessively
 - fish are not lost even during the draining period
 - water can be drained from any pond levels
 - allowance are made for overflow of excess water
 - it can be cleaned and serviced easily
 - construction and maintenance costs are kept at a minimum
- In most cases, outlets have three main elements:**
- water control plugs, valves, control boards, screens or gates
 - a collecting sump inside the pond, from which the water drains and into which the fish is harvested
 - a Conduit through the dyke through which the water flows out without damaging the dykes or the drainage canal
 - materials that can be used to construct pond outlets and inlets include
 - Bamboo poles,
 - PVC pipes,
 - Wood,
 - Bricks,
 - Cement blocks or
 - Concrete.

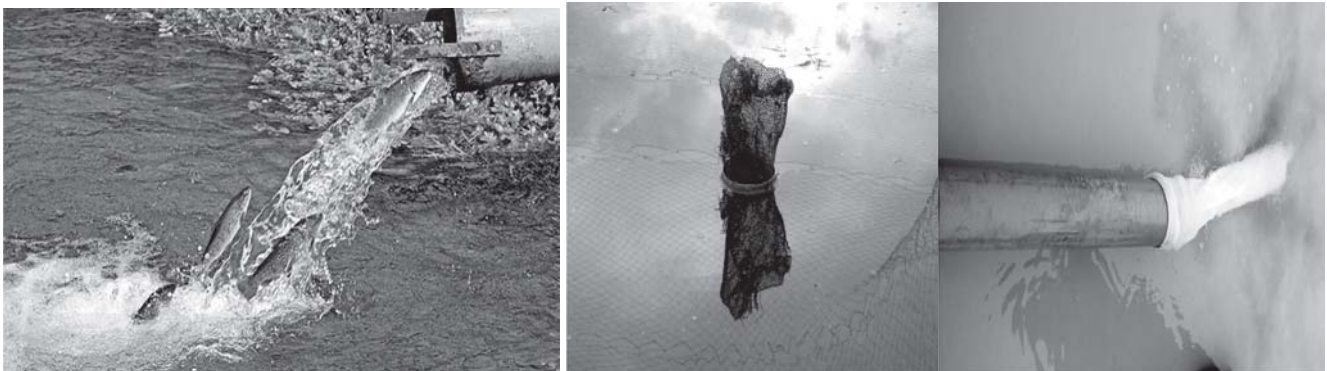


Figure 15 :Screened water outlet duct& Screened water inlet duct

Figure16: Pond dressing and Dyke dressing

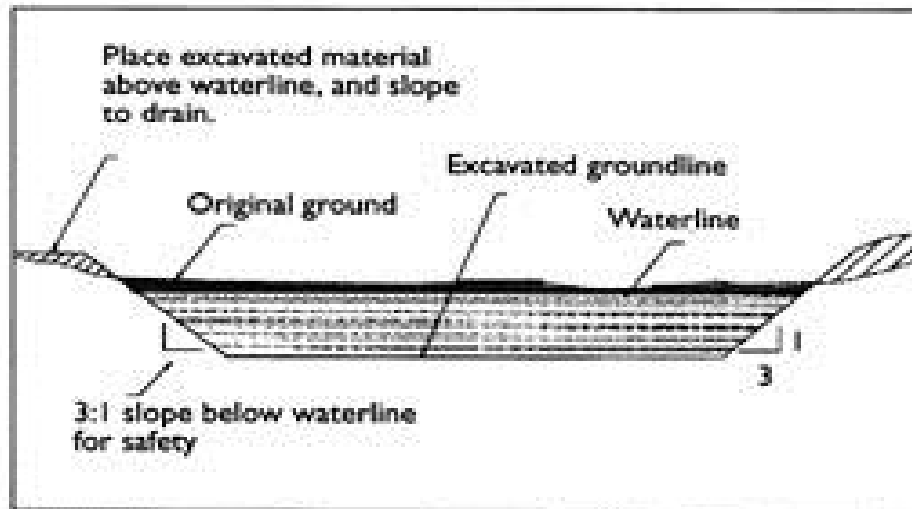


Figure 3. Typical section of an excavated pond (not to scale)



Figure 17 An excavated Fish Pond



Figure 18 Concrete fish tank





Figure 19 Plastic fish tank and Plastic Fish Pond/Tank



Figure 20 Collapsible Mobile Pond



Concrete trout race ways



Simple wooden cage

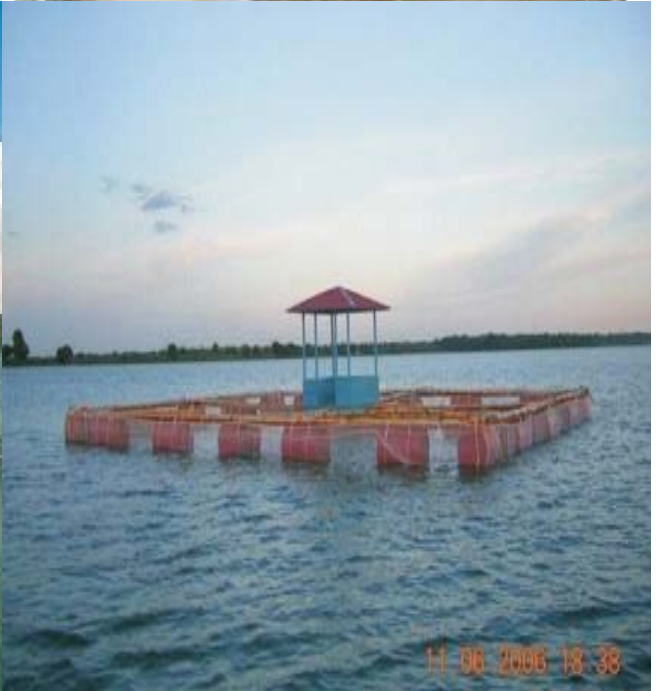


Figure 20: A Fish Cage and a

MODULE 3

FISH POND PREPARATION

LIMING (NEUTRALIZATION)

- Liming is the process of application of agricultural/industrial limes to fish ponds e.g. CaO , $\text{Ca}(\text{OH})_2$, CaCO_3 .
- Agricultural lime is the best liming material for fish pond.
- Lime corrects the acidity of pond water to the suitable PH range (Hydrogen Ion Concentration).
- Lime makes available phosphorus added in fertilizer for plant use.
- Lime acts as disinfectants of pond bottom, especially in newly constructed ponds or ponds in fallow.
- Lime helps in reducing water turbidity i.e. in settling soil particles in muddy ponds.
- It is applied by broadcasting or sacking.

Application of Lime (kg/ha)

S/N	Name of Neutralizers	New Pond (kg/ ha)	Old pond (kg/ha)
1.	Agricultural Lime	250- 500	200-300
2.	Slaked Lime	750-1,500	600-1,000
3.	Quick Lime	750-900	500-800
4.	Carbide Waste	250-500	100-250
5.	Wood Ash	2,500- 5,000	1,000 -1,500

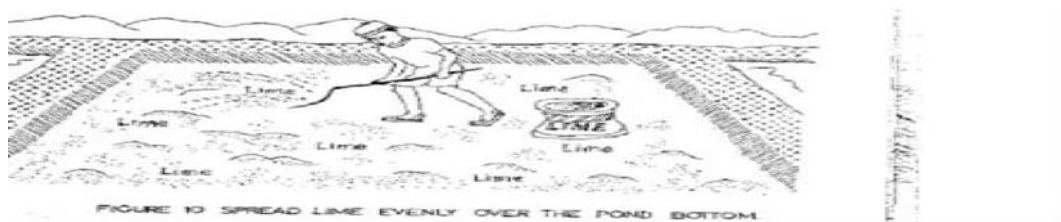


Figure 21: Limed fish pond

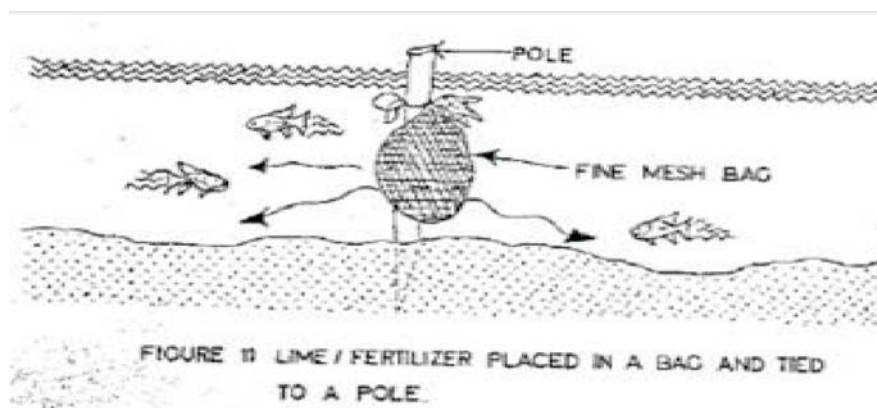
POND FERTILIZATION (MANURING)

- Two types of fertilizers can be used for pond fish culture (organic manures and inorganic or agricultural fertilizers).
- Application could be done before or after impoundment;
- It could be done through broadcasting or sack method (Fig);

Types of fertilizer: Organic and Inorganic

The following is the recommended fertilizer application rate:

- Organic: Cow dung – 500kg/Ha
Poultry dropping (Guano dropping) 112-224kg/Ha
Pig manure 560 kg/Ha
- Inorganic: NPK - 224 KG/Ha
Triple Super Phosphate - 57kg/Ha
- Fertilizer helps in enriching water nutrients for plankton production on which fish feed.



- **Mode of application**
- Broadcasting
- Spot placement

MODULE 4

POND STOCKING MANAGEMENT

- In any fish enclosure, healthy fingerlings of 5-7cm (2''3'') should be stocked. Juveniles of 7-10cm (3''-4'') are most advisable;
- Stocking densities should range between 10 - 50 fish/ depending on water conditions, size of fish seed, culture system and management, and specific specialist research-extensionist's advice;
- Procure your fish seeds from reputable sources and make allowance for mortalities (at least 10%);
- Fish seeds should not be fed for 24-48 hours before transportation as they survive better on empty stomach when in transit;
- Stocking of fish should be done early morning or late evenings in moderately cool weather & when fish are less active;
- Fish seeds should be transported and packed in water-filled oxygenated polythene bags or various containers used;
- Release fish fingerlings to their new home surroundings slowly to avoid shock due to temperature changes;
- Introduce feed into the fish tank/pond 6-12 hours after stocking;
- Stocked fingerlings should be sorted after 15 days (2 weeks) of initial stocking to remove shooters (jumpers) in order to reduce cannibalism and ensure even growth of fish;
- Sorting could be done as advisable, preferably in the morning (8-10am); and
- Sorted fish should not be fed for 2 hours minimum or 3 hours maximum. This will help to relieve the fish of handling stress and regain lost energy.

CULTURABLE FISHES: Fishes that can be raised in tanks or dugout ponds.

- Examples of Culturable fish include:
 - *Oreochromis niloticus* (Mango fish/Nile Tilapia - Epiya
 - *Heterotis niloticus* - Aikaodo
 - *Clarias gariepinus* (African mudfish) - Aro
 - *Gymnarchus niloticus* (Trunk fish) – Osan
 - *Heterobranchus sp* (African sharp tooth)
 - *Cyprinus carpio* (Common/Mirror carp)

CULTURAL FISH SPECIES



MODULE 5 FISH NUTRITION

FEEDING OF POND FISH

- Fish feed on a variety of foods. These include food produced from the natural pond environment and feeds given as supplement to the pond;
- Feed is placed in pond water by broadcasting, point placement or automation (Fig);
- Fish could be fed two or three times a day, at specific times;
- Quantity of feed depends on the size and age of fish;
- Pellet size of feed depends on the size of fish;
- Feed fish with high quality feed/diet.

METHODS OF FEEDING FISH: Manual or Mechanical

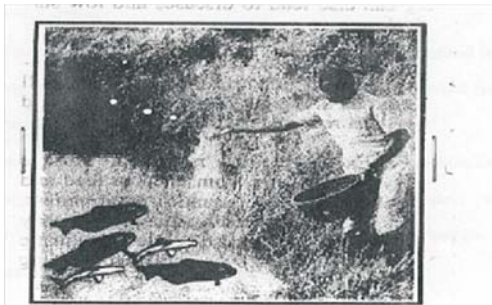


Figure 4. Feeding Fish in the pond by broadcasting.

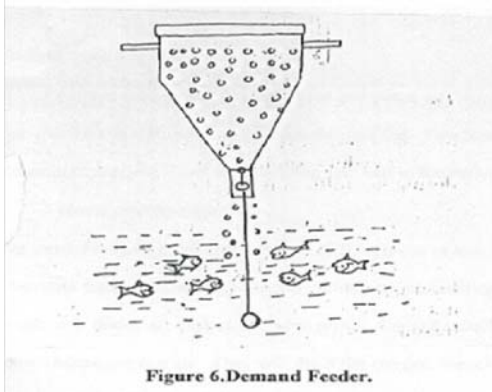
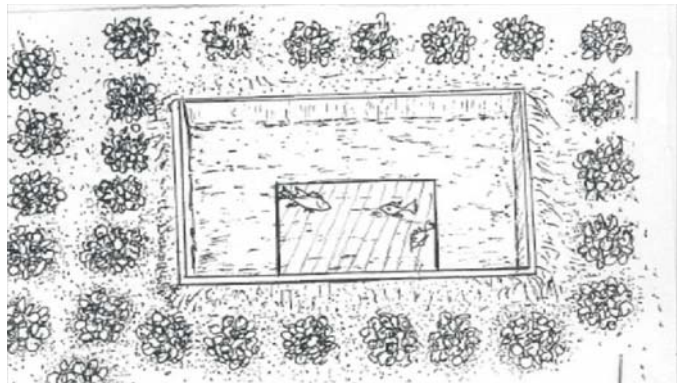


Figure 6. Demand Feeder.



Figure 7. Automatic Feeder.

23



MODULE 6: FISH FARM MANAGEMENT

- Water quality management
- Fish enclosure management
- Fish management
- Fish sampling
- Fish feed management
- Predators prevention and control

FISH FARM MANAGEMENT

- Management is responsible for organizing the elements of productive enterprise- money, materials, machine/equipment, and man/people – in the interests of economic ends (4M).
- Management of a fish farming system is aimed at increasing the survival and growth of the stock (i.e. fish) so that a high yield per unit area of land can be obtained.
- It involves the duties that are necessary for successful operation of fish in cost effective manner.
- Many measures have to be taken to combat all the harmful and limiting factors imposed by the natural environment and other extraneous factors in order to arrive at the expected high yield in fish farming system.
- These usually vary between species, different socio-economic and cultural settings.

TYPES OF MANAGEMENT TECHNIQUES

1. Fish Stock management
2. Water Quality management
3. Tank Management

FISH STOCK MANAGEMENT

Discussed in Module 4

WATER QUALITY MANAGEMENT

- This is the degree of excellence that given water possesses for the propagation of desirable aquatic organisms. The growth of the fish is dependent on the alter quality.
- The most important water quality to be monitored and controlled can be divided into physical, chemical and biological parameters of water.
- Allow fresh water into fish tank daily.

- Create water outlet to empty dirty water and tank bottom debris. Aerate concrete tanks by allowing a flow through system if possible or stirring the water
- Change water when you observe foaming or frothing, deep green or gray/black coloration, accompanied by foul odour/rotten eggs smell (Hydrogen sulphide).
- When fishes are swimming sluggishly, they are stressed, stop feeding and change water.
- Boil animal products before introduction into tanks
- It must not be too acidic or too alkaline (pH 6.5-9.0)
- It must contain enough dissolved oxygen. The dissolved oxygen level should be between 4-8 mg/litre and measures through use of secchi disc/hand.
- It must have an offensive odour
- It must be free of pollutants such as industrial waste (effluent, detergents and herbicides)
- Poor water quality can be improved through liming and fertilization
- Know hydrology of the water and ensure that all water parameters are in the right conditions for the fish production
- The desirable water temperature level varies between 21oc – 32oc.

CHARACTERISTICS OF WATER FOR AQUACULTURE

- It should be bottle-green in colour reflecting the presence of plankton
- It must neither be too acidic nor alkaline; best pH range for fish production is between 6.5 – 9.0.
- It must contain enough dissolved oxygen of at least 4mg/litre
- It must not have offensive odour, colour, surface foaming, or scumming
- Water temperature range should be between

FISH TANK MANAGEMENT

- Proper tank management after construction ensures the durability of the tank. It involves the maintenance of tank environment and tank itself. That is meal control, pond bottom restoration, predations and competitors' eradication, liming and fertilization
- Avoid cement toxicity in concrete tanks
- Allowed the tanks to stand for four weeks
- Wash concrete tanks thoroughly with hard brush or broom and allowed to dry for minimum of 24-48 hours before being impounded with water.
- Fill tank with water up to 50% volume wash again and discharge water.
- Fill tank with water up to 90% volume allow to stand for 7-10 days and discharge.
- Add dry poultry manure or inorganic fertilizer tied in a jute bag suspended in the water

- That tank is ready when the pond water turns “leaf green”
- Avoid over fertilization (deep green colouration and foul, odour and rotten egg smell).

POND MANAGEMENT PRACTICES

- STOCKING

- Stocking is the introduction of fish (fingerlings or juveniles) into the new pond environment;
- Fish seed can be collected from the wild (rivers, streams, lakes, etc) or from hatcheries/existing fish ponds where fish are already adapted to culture condition;
- The right type and the right number of fish is placed in a pond at the right time (cool hours of the day);
- Test stocking (pre-stocking) should be practised by introducing few fish into the new environment. Test stocking period range from two days to one week. If the fish survive well, then the pond can be fully stocked;
- The type of aquaculture influences the type of fish stocked;
- Acclimatize/allow fish to swim out into pond;
- Recommended stocking rate of fish (ratio of one species to another or male to female) and stocking density (number of fish per square metre of pond water) to avoid over-crowding, should be practised;
- This will ease management problems and enhance the success of the fish culture.

MODULE 7: FISH HEALTH MANAGEMENT

CONTROL OF DISEASES AND PREDATORS

Common Fish Diseases

- Fish diseases are caused mostly by fish parasites.
- Maintaining a hygienic pond environment is the best preventive method of checking diseases outbreak.

Diseases can occur in fish pond due to:-

- Overcrowding, i.e. high density stocking.
- Poor water quality resulting in fish kill
- Erratic feeding practices. Starved fish are highly susceptible to diseases attack.
- Intrusion of predators into the pond. Most predators act as intermediate host to fish parasites.
- Over fertilization of pond water leading to high density algal bloom can reduce the amount of dissolved oxygen (DO), affecting fish health.

Fish Predators

- Predators are natural enemies of fish. Common fish predators that should be prevented from causing fish losses in ponds include water snakes, turtles, frogs, water birds (king fisher and water duck, etc), crocodiles, crabs, et
- Wild carnivorous fish intruding into ponds are also predators and as such should be prevented.
- Ensure regular clearing of pond site. Predators hide in bushes.
- As much as possible, the farmer should fence the pond site.
- Most aquatic predators get into the pond through flood water.
- Measures should be taken to protect the pond from flood water.
- Hunt the predators, using traps or point blank killing.
- Keep pond well aerated to prevent disease outbreak
- Foot baths are provided for visitors at the entrance of the farm;
- Farm appliance/tools/equipment are kept clean and disinfected;
- Minimize stress/handling fish;
- Fresh fish stock are quarantined;
- In case of disease outbreak consult experts;
- Keep your surrounding clean;
- Maintain good water quality.



Figure22: Cannibalism in young catfish



Figure 23 Sand Bagging and Wire Mesh fencing that is expected to prevent flood





Figure 24: *Clarias* tumour & Cancer

Fish Farm Security

Important to prevent investment losses

- (i) Use of armed security guards
- (ii) Use of dogs
- (iii) Against Predator cover tanks with mosquito net/chicken wire mesh/Nets
- (iv) Wire fence round the earthen ponds
- (v) Local means



Figure 25 Staking of sticks and stringing to deter poaching

MODULE 8: FISH FARM RECORDS KEEPING

FISH FARM RECORDS KEEPING

- It is important to keep records in order to;
- afford evaluation of the profitability and general economic of fish farm investment
- provide vital management information for future planning, improvement and development of the farm
- provide necessary grounds to obtain credit or funding support from financial institutions

MODULE 9: MARKETING IN FISHERIES BUSINESS

- Producers who are ready to harvest their first crop of fish often ask the following questions: “Where will I sell them?”
 - Who will purchase my product?
 - Where do I have to deliver the product?
 - When do I have to deliver?
 - Upon what criteria will the product be evaluated?
 - What price will I pay or be paid and how is it determined?
 - To avoid certain failure of an aquaculture enterprise, producers must determine the market place as an initial step.
 - High potential market demand for farmed fish
 - Lack of systematic marketing of products – e.g 90% farmed fish are sold at farm gate.
 - Implication is that Price is solely controlled by marketers or buyer.

Marketing Plan

- Your marketing plan is your road map to implementing your business ideas and measuring your success along the way.
- But a plan is useless without implementation and then evaluation of the results.
- Year-end is a good time to determine where you are with this year’s business marketing plan while your sales numbers, weather conditions, and the successes and challenges of this production year are still fresh in your mind.
- It also helps you in filing information to use in year-end purchasing decisions.

Marketing Strategy

1. Co-operation of fish farmers’ association/group in the area of:
 - (a) Collective marketing of product to ensure farmed fish are delivered at cheaper prices.

(b) Collective procurement of inputs such as fish seeds, feed, fertilizers, lime, drugs etc. to reduce production cost.

2. For expansion of markets and maintenance of favourable prices – specific information on consumers, marketing channels, utilization of fish and fish products should be regularly provided by the relevant authority

Marketing and Market Information

Marketing Information is a broad concept that comprises information about the supply of, and demand for; commodities. It includes information about the availability and costs of farm inputs such as seeds, fertilizers, breeding stock, and value-adding. It is also data on prices and quantities exchanged, duly processed and available to market actors (e.g. agents, traders).

A Marketing Information system is a system that collects, processes, manages and disseminates marketing information using a variety of channels, which may include:

- An extension services, which may consist of public (government) and private-sector service providers.
- Institutions such as rural resource centers or commodity exchanges.
- The use of ICT's such as mobile phones, internet and radio.

Merits of Marketing Information

- Know what products the market wants so that you can plan well to meet the market requirements
- By pass middlemen and reach the market directly
- Improve your bargaining power with buyers in the marketing place
- Obtain better input and product prices
- Be efficient in your production and competitive in your marketing activities
- Reduce costs and improve revenue and profit.

Marketing Channels of Farmed Fish

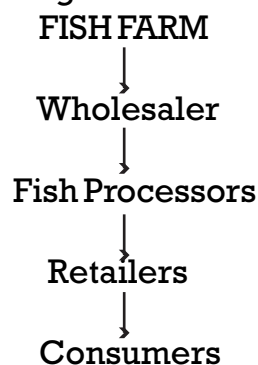


Figure 26: Matured Farmed Fish



MODULE 10

How to Succeed as a Fish Farmer

1. Know their Market before Starting Fish Farming.
2. Know the Market Demand.
3. Invest wisely, step-by-step.
4. Seek Advice only from Proven, Qualified Advisers
5. Do not cover up your mistakes but rather learn from them as well as from other farmers' mistakes.
6. Keep and use your records as management tools. Track your expenditure and losses.
7. Follow recommended Best Management Practices.
8. Use the best feed locally available to you correctly; closely monitoring their Feed Conversions and cost.
9. Owners are Managers: Owners are involved in the running and/or management of the farm.
10. Market Driven Management: Invest and manage your farms based on the market opportunities and their resource limitations.
11. Proper siting of the farms and adopt appropriate production technology.
12. Sell your fish to the market as soon as they reach market size and appreciate turnover.
13. Honor promises to your customers, even if occasionally it means they may have to make a no-profit sale or replace fish at no charge.
14. Are able to analyze your farm data yourselves and use the data you obtain to assess the farm's production and economic performance.
15. Use your own data as the primary basis for making management and investment decisions.



FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA.

P.M.B. 2240, Abeokuta, Ogun State - Nigeria.

Africa Centre of Excellence in Agricultural Development and Sustainable Environment (CEADESE)

OUR LOCATION

CEADESE, International Scholars' & Resource Centre, FUNAAB

OUR CONTACTS

Website: www.ceadese.unaab.edu.ng
Email: ceadese@funaab.edu.ng

Monday, 4th February, 2019

ADVERTISEMENT FOR ADMISSION INTO SPECIALISED POSTGRADUATE PROGRAMMES FOR THE 2018/2019 ACADEMIC SESSION

The Federal University of Agriculture, Abeokuta is pleased to announce that admissions into postgraduate training programmes at the Centre of Excellence in Agricultural Development and Sustainable Environment, are now open. Applications are invited from candidates of all nationalities.

The Centre of Excellence in Agricultural Development and Sustainable Environment (CEADESE) runs specialised postgraduate courses leading to award of Master (M.AgSE) and Doctorate (PhD AgSE) degrees in Agricultural Development and Sustainable Environment. The courses are designed to integrate academic and entrepreneurial skills with demand-driven research as follows:

- LIVESTOCK SCIENCE AND SUSTAINABLE ENVIRONMENT PROGRAMME**
-M.AgSE (Livestock Science and Sustainable Environment)
-PhD.AgSE (Options: Animal Nutrition, Animal Breeding and Biotechnology, Animal Physiology, Livestock Production System)
- AGRICULTURAL ECONOMICS AND ENVIRONMENTAL POLICY PROGRAMME**
-M.AgSE (Agricultural Economics and Environmental Policy)
-PhD.AgSE (Options: Production Economics, Resource and Environmental Economics, Agricultural Policy and Development, Agricultural Finance and Marketing)
- CROP / PASTURE PRODUCTION AND SUSTAINABLE ENVIRONMENT PROGRAMME**
-M.AgSE (Crop/Pasture Production and Sustainable Environment)
-PhD.AgSE (Options: Crop Production, Plant Breeding, Seed Technology, Crop Pathology, Crop Protection, Crop Entomology, Pasture Agronomy and Pasture Production).
- FOOD PROCESSING AND VALUE ADDITION PROGRAMME**
-M.AgSE (Food Processing and Value Addition)
-PhD.AgSE (Option: Food Processing and Value Addition).
- ENVIRONMENTAL SYSTEMS AND CLIMATE CHANGE PROGRAMME**
-M.AgSE (Environmental Systems and Climate Change)
-PhD.AgSE (Options: Hydrology and Climate Change, Environmental Geophysics, Remote Sensing and Climate Change, Environmental Safety).
- AGRICULTURAL MECHANIZATION AND SUSTAINABLE ENVIRONMENT PROGRAMME**
-M.AgSE (Agricultural Mechanization and Sustainable Environment)
-PhD.AgSE (Option: Agricultural Mechanization and Sustainable Environment)

Limited scholarships in form of tuition rebate and research supports are available. Admissions into CEADESE programmes are based on regional and gender balance. Non-nationals of Nigeria and Women are therefore encouraged to apply.

ELIGIBILITY

- Candidates of all nationalities within and outside Africa possessing qualifications equivalent to recognized first degrees in relevant disciplines are eligible to apply.
- The M. AgSE programme will generally be open to all Agriculture, Engineering and Science graduates of B.Sc, B.Eng, B. Agric, B.Sc Agric, B. Tech Agric and B. Eng Agric. etc with a minimum of Second Class Lower. Holders of HND and other Degrees/Classes of Degree with PGD in any of Agriculture disciplines with a minimum weighted average score of 60% (or CGPA of 3.0 on a 5point scale) shall also be eligible for admission into the programme, on the condition that both set of candidates met basic university matriculation requirements of five (5) O' level credits including English Language and Mathematics, and any other three (3) Science or relevant Social Science subjects.

Our Vision:

Developing self-reliant agripreneurs to feed our people, now and for the future.

Our Mission:

To conduct teaching, applied research, and extension for agricultural development in a sustainable environment within Sub-Saharan Africa.



FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA.

P.M.B. 2240, Abeokuta, Ogun State - Nigeria.

Africa Centre of Excellence in Agricultural Development
and Sustainable Environment (CEADESE)

OUR LOCATION

CEADESE, International Scholars'
& Resource Centre, FUNAAB

OUR CONTACTS

Website: www.ceadese.unaab.edu.ng
Email: ceadese@funaab.edu.ng

3. Admission into M.AgSE/PhD.AgSE for:

Agricultural Economics and Environmental Policy is open to Bachelor Degree holders in Agric. Economics or Economics

Livestock Science and Sustainable Environment is open to Bachelor Degree holders in Animal Science and related courses

Agricultural Mechanization and Sustainable Environment is open to Bachelor Degree holders in Agricultural Engineering, Mechanical Engineering and related disciplines

Food Processing and Value Addition is open to Bachelor Degree holders in Food Science related disciplines

Environmental Systems and Climate Change is open to Bachelor Degree holders in Civil Engineering, Water Resources and Environmental Engineering, Basic, Applied and Environmental Sciences and related disciplines.

4. The PhD AgSE programmes will be open to Master degree holders in courses that are relevant to the different options in the programme.

DURATION

M.AgSE

- Course work along with dissertation for a maximum of 4 Semesters.
- 2-3 months of Internship in collaborating industries, parastatals and institutions.

PhD AgSE

- PhD AgSE programme will be course and research-based, spanning maximum of 6 semesters.
- 2-3 months of Internship in collaborating industries, parastatals and institutions.
- Application for PhD AgSE is open all year round.

METHOD OF APPLICATION

1. All applicants from Nigeria should generate an invoice at the Post Graduate application portal of CEADESE-FUNAAB at <http://pg.unaab.edu.ng/pgc.html>. The invoice should be taken to any branch of Zenith Bank to make application payment of N15,000.00. exclusive of bank charges and thereafter complete the application form at the same portal.

Account No: as in on the invoice

Sort Code: 057170019

Account Name: Centre of Excellence in Agricultural Development and Sustainable Environment, FUNAAB.

2. Foreign applicants should pay US\$100 into the Centre's domiciliary account (Zenith Bank Account No: **5070318907**, Swift Code: **ZEIBNGLA**, Bank Sort Code: **057170019**). It is important to upload the telex copies to access the online application form.

Hard copies of completed application forms with teller and photocopies of credentials should be mailed by speedpost or by hand to:

The Director, CEADESE, Federal University of Agriculture, Abeokuta, P.M.B. 2240, Abeokuta, Nigeria.

All applicants must request their respective institutions (University) to forward their transcripts directly to CEADESE at the same address above.

DEADLINE

Applications for M.AgSE programmes close by **Friday, 3rd May, 2019**. For further information, please send your enquiries to the following contacts; **E-mail:** ceadese@funaab.edu.ng, **Website:** ceadese.unaab.edu.ng, **Facebook:** [ceadeseunaab](https://www.facebook.com/ceadeseunaab), **Twitter:** [ceadeseunaab](https://twitter.com/ceadeseunaab), **GSM Nos.:** +2348066333341, +2348079170018, +234 8038225891

Director,
CEADESE,
FUNAAB, Nigeria.

ENGLISH VERSION

Our Vision:

Developing self-reliant agripreneurs to feed our people, now and for the future.

Our Mission:

To conduct teaching, applied research, and extension for agricultural development in a sustainable environment within Sub-Saharan Africa.