

**INVESTIGATION ON HANDLING AND
TRANSPORTATION IN POULTRY
PRODUCTION**

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JANUARY 2001

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**BEING A FINAL YEAR PROJECT REPORT SUBMITTED IN
PARTIAL FULFILLMENT FOR THE AWARD OF BACHELOR
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DEDICATION

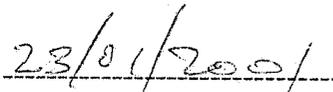
To my Mum, Mrs F. N. Okoye, without whom the acquisition of knowledge would have been impossible

CERTIFICATION

This is to certify that this project was carried out by Ebere Chigozie in the Department of Agricultural Engineering, Federal University of Technology, Minna.



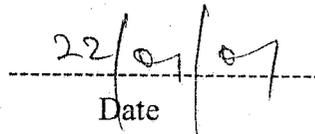
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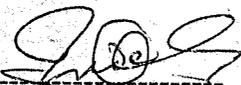
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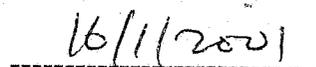
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CHAPTER ONE: INTRODUCTION

1.1 Background

The total population in the country today is estimated at about 120 million people. With this trend in population increase, it has become evident that the country's meat production from domestic livestock is not sufficient to meet the ever-increasing population demand. The situation is further escalated by the economic depression experienced in the country today. The income per head of an average Nigeria is so low that most cannot afford the purchase of meat from the market.

Due to this development, there has been intensive research on poultry production for increment and supplementation of the already obtainable protein source from domestic livestock.

The estimated national needs for livestock and poultry are more than what is produced now.

Kekeocha, C.C., in improving Rural poultry production in Nigeria reported that at present, there are 11 million heads of cattle, 870 thousand pigs, 8 million sheep, 22 million goats, and about 50 million poultry. As part of the government policy to increase the production of food, several programmes such as operation feed the Nation, the Green Revolution Programme were launched to inject a sense of urgency into normal programmes and bring home to all the need to produce more food.

1.2 Objectives of the study

The general objective of the study is to investigate on handling and transportation in poultry production.

Specifically the objectives are:

1. To identify the handling and transportation equipments in poultry production
2. To access the efficiency of these equipments in terms of handling losses and time elements involved.

1.3 Scope of study

The scope of this investigation will be limited to Minna, the study area, and as much as time permits. Minna, the study area; has high population pressure where poultry production is thriving.

Surveys will be carried out which will include survey 1 and survey 2. The survey 1 will be the questionnaire which will be distributed to both the commercial and backyard poultry farmers for information retrieval in terms of handling and transportation equipments used in poultry production. Survey 2 is the time study which aims at accessing the efficiency of these equipments in term of handling losses and time element involved.

CHAPTER TWO: LITERATURE REVIEW

2.1 Poultry

The word poultry refers to all kinds of domestic birds kept for meat or eggs. They include: chickens, ducks, geese, turkeys, and guinea fowl. Chickens are by far the most popular in most parts of the tropics especially in West Africa. Guinea fowls are wild birds whose eggs are marketed when in season in Nigeria and other West African countries. The range in most parts of the tropics. They may be provided with some form of housing but they are not usually fed. It is possible that under good management, these birds can produce reasonable yields of meat and eggs.

2.2 Breeds of Poultry

2.2.1 The wild breed: Jungle fowl

This bird originates from the tropics of Asia. In its natural state, it breeds only once a year, lays a clutch of up to 20 eggs, then sits on them to incubate them. It then broods them for as long as is necessary until the chicks are independent. From this breed have originated many different types of poultry with special characteristics and purposes.

2.2.2 Egg-laying breeds:

These lay most eggs but do not fatten well to make much meat, they are rarely broody, and make poor sitters and tend to be excitable. Examples are the white leghorn and the black leghorn. The white leghorn lays white eggs, and is a completely white hen, with yellow legs. The cock weighs about 2.5kg. The hen weighs about 1.5kg.

2.2.3 Heavy breeds;

These birds may not be such good layers, but have more meat. They are less excitable and make good mothers. An example is the Rhode Island Red (R.I.R)

2.2.4 Dual-purpose breeds;

These have a combination of the above characteristics.

An example is the light sussex.

2.2.5 Cross-breeds;

This is the name given to chickens whose parents are of different pure- breeds. The first crosses (that is, the first generation of off spring) are hardier and more vigorous than the pure-bred parents, and are called hybrids. Hybrids themselves are not used for breeding and so their eggs are only for eating. The offspring would not be strong as their parents nor would they have uniform characteristics.

2.3 Conformation of Chickens

Each recognized breed or stock of chicken has a characteristic shape and form. The configuration of the head is a good indicator of health and vitality. Birds that have strong and moderately long heads with bright eyes are often good egg producers. A flat top is preferred to a rounded skull. Smooth, wrinkleless face, soft-textured skin and bright red comb are attributes of a standard chicken for egg production. Large abdominal or internal capacity is necessary for efficient conversion of feed and, therefore, for high egg production.

Meat type chicken possess similar features but in addition, they have big heads and broad backs going carcass well lined with meat along the entire length of the bird. A standard chicken should possess a large abdomen and adequate heart-girth, i.e. width of the back and the depth of the body, this determines good health, vigour, longevity and sustained production.

The surface coloration of the feather of chickens can be used to identify a breed of stock. A uniform colour characteristic of the breed or stock is, therefore, desirable. Birds which do not conform to the general characteristics of a given stock are usually culled.

2.4 Poultry Branches

Poultry industry has many branches. Two main branches are egg and broiler production Other are the production of chick, lay pullets and poultry feed, the manufacture of poultry equipment and the processing or marketing of eggs and birds (Oluyemi and Roberts, 1979).

2.5 Poultry Production In Nigeria

Poultry as it was known in Nigeria several years ago, was never an industry but a side-line activity. That is, chickens were kept to obtain some money.

When the development of poultry started as an industry twenty to twenty-five years ago, research and extension services were established by the governments of the federation to teach farmers the modern techniques of agricultural poultry husbandry. The various governments of the Federation started the farm settlement scheme. These settlements were run as cooperatives with common marketing and purchasing facilities. On several of these settlements poultry were kept by the

settlers. One 96-layer cage unit was issued to each settler; their chicks and feeds were purchased in bulk. The aptitude of the settlers for poultry work naturally varied but many managed their small units with great attention and had much success and laudable results (Kekeocha, 1978).

Today, poultry production has become not only important but very challenging, as many have realized that it is a source of great income. Kekeocha (1978) also identified the existence of three groups of poultry production in Nigeria:

2.5.1 The Peasant/village Poultry Production;

The peasant/village poultry production is contented with 5 to 25 birds, which receive little or no care. The birds almost damage themselves, wondering about near their owner's houses in search of food. They find shelter near the house or perhaps in some crude structures provided around the building. Hens make their own nests near the house and lay their eggs, brood and hatch the chicks. The chicks feed for themselves at the mercy of such predators as hawks and snakes. Local breeds are used.

2.5.2 The Backyard Poultry Production;

This group keep from 25 to 200 birds. They provide some form of building for their birds and practice simple but inadequate husbandry methods. They supply some feed and use some simple equipments. The use of exotic breeds or improved strains is practiced. These farmers are members of the elite who keep poultry as a hobby and past-time enterprise. Some of the farmers in this category has discovered that poultry is profitable; and could be another source of family income.

2.5.3 Commercial Poultry Production

These new-style poultry farmers are successful businessmen or professional men whose basic income comes from other interests. Their poultry farms are investments to provide extra income and employment for relatives. It is a deliberate attempt to provide a better standard of living for the bulk of the people who have too little animal protein in their diets. These farmers are intelligent, educated and successful in some other careers. Although when they start, the actual running of the farm is left to a manager whose training makes him capable of running the business.

It is how ever difficult to demarcate between the backyard poultry production and the commercial poultry production. The backyard poultry production is nicknamed thus, because these poultry are kept within the residential areas whereas they are for commercial purposes. The responses obtained from questionnaire indicate this..

2.6 System Of Poultry Management

There are four distinct systems of management used in poultry production in the tropics: traditional poultry husbandry, free-range system, restricted range system and intensive (confined) system.

2.6.1 Traditional Poultry Husbandry

Traditional poultry keeping in the tropics depends on the extensive free-range system in which the birds find their own feed without any boundary limitation. In this system, very few farmers feed grains to their poultry and many do not provide night accommodation; the birds are obliged to

roost on trees, houses and fences. Male and female chickens mate at random. The hen lays her eggs in clutches of 5 to 10. She sits on the eggs for about 21 days and finally hatches the brood. The hen and newly hatched day-old chicks scorch a living during the daytime, and at night, the hen broods her chicks under her body and wings. No provision is made by the farmer for the chicks. Brooding continues for as long as 12 weeks unless the hen is harassed by cocks. In that case, hens wean their chicks at about 5 weeks.

Birds raised under the traditional system of husbandry continue to perform poorly. Whereas a local hen under this system produces about 60 eggs a year, a counterpart raised intensively produces about 128 eggs. A local cock may weigh about 800g at maturity whereas under intensive rearing it could reach 1400g. Birds raised traditionally are subject to disease infestations, parasitic load and predation. Although some exotic birds have been introduced to the village system, interbreeding has little effect and local chickens still maintain their small body size.

2.6.2 The Free-Range System

The birds are allowed enough open space to find additional feed in the form of herbage, seeds, insects and minerals. This system consists of some open space in which the birds are fed grains and, where adequate, accommodation for roosting at night is provided.

Well-fed free-range chickens seldom suffer from nutritional deficiencies. The system is very cheap in labour and other costs. Exotic birds reared under this system in the tropics do not produce many eggs and are susceptible to parasitic invasion and predations.

2.6.3 Restricted Range System

In the folding type, groups 25 to 50 birds are confined in movable netted-wire enclosed with attached housing which can accommodate each group at night. The birds can forage on a limited amount of fallow land during the day and are provided with an adjoining movable house to roost in at night. Each unit is moved to a fresh spot daily. The chickens can pick fresh herbage and the land is fertilized with their droppings. The system is useful for rearing chicks from 8 weeks of age, and, under certain conditions, for keeping layers. This system guards against parasites but it is inexpensive, labour intensive and little practiced in the tropics

Another type of restricted-range poultry keeping has permanent housing units capable of accommodating about 50 layers. Many permanent housing units are built over an entire range, each with two outruns in which the chickens have exercise alternatively. The chickens are fed all their requirements in the pens. This system involves heavy capital investment in housing, land space and daily labour input.

2.6.4 Intensive System

Birds are kept in a deep-litter or battery system of management.

In the deep-litter system, chickens are kept continuously indoors on an initial layer (5.08-7.6cm deep) of sawdust, wood shavings, chopped straw, etc, which takes on chicken droppings over a long period. The success of the system depends on efficient management of the litter to ensure that suitable micro-organisms multiply and break down the droppings. Fresh litter is added occasionally especially when there is persistent odour indicating the presence of ammonia. Feeding troughs and hoppers are hung well above the litter level at about 45.7cm high. Laying nests are placed at the east end of a deep-litter pen. Large number of birds can be accommodated

in deep-litter pens but it is recommended that the maximum capacity of any house should not exceed 5000 layers or 16000 broilers. The deep-litter system is, however, capital intensive for buildings and fittings and often exposes the birds to parasites and cannibalism. The merits of the system include low labour and land requirements, minimum equipments, easy fly control and flexibility of operations. This system is widely used for commercial poultry, which is probably the fastest developing sector of animal industry in the tropics.

The poultry battery consists of small wire cages grouped in single, double or multiple tiers to form the battery. The laying hens are confined singly, in pairs or threes depending on the size of the cages. This is an intensive system which is particularly suitable for commercial egg production. Under good management it is profitable because of higher efficiency of feed conversion, low mortality, absence of or greatly reduced infection and parasite burden, clean eggs and reduced egg losses.

The battery system permits thorough disinfection of the poultry house as often as necessary and has proved remarkably successful in the tropics. The minimum space per bird varies from 387cm² for small layer breeds like the leghorn through 452cm² for large breeds to 516cm² for dual purpose (heavy) breeds. This system of managing commercial or breeding layer provides the best opportunity for close observation of the productive capabilities of individual birds. Other merits of the system include the quiet and effortless accommodation afforded to the laying bird, which is conducive to maximum egg production. The battery system, however, is expensive to install, labour intensive for feeding and watering and where the cages are not properly installed, the loss of eggs through breakages can be very high. In contrast to the traditional poultry husbandry where

the chicks, growers, boilers, layers and breeding stock are managed together, intensive poultry management requires specific and separate management for the different ages and classes of birds.

2.7 Poultry Products

Chickens produce valuable protein foods: eggs and meat. Their feathers are also used in making soft pillows and manure is a rich source of nitrogen and phosphate for soils.

Chickens kept extensively help to pick up harmful insects and they also eat waste food, which would not otherwise be useful to man. They have no diseases, which are harmful to human beings. Kept extensively and on a small scale, they can be economic for the small farmer, and give a quick return on capital.

2.8 Transportation In Poultry Farms

The concept of transportation as applied to agriculture (which includes poultry production) is the relocation of poultry inputs and produce. These inputs and products have to be moved between the poultry house and a collection point usually the market.

The level of movement may be broadly divided into two categories:

- (i) Latent movement: This is for short distance usually associated with loading, unloading and picking operations. This may be referred to as handling.
- (ii) Long distance movement: This is usually for long distances between the poultry house and the market/storage point.

A general observation indicates that both latent/short and long distance movements are encountered in poultry production.

Recognizing that poultry products, especially the eggs are very fragile, the need for a very efficient and safe handling in both production and distribution becomes very obvious.

2.9 Handling In Poultry Farms

Poultry handling equipment has been broadly classified into two types. Those of general and those of specific application. The latter are used during specific ages of the bird while those of general application are used at all post-natal stages of growth. These consist mainly of feeders, drinkers and crates.

2.9.1 Feeders

Feeders and drinkers are the appliances used to supply feed and water respectively to the birds.

Feeders and drinkers are components of the cage system.

The construction of feeders should be such as to avoid waste, to prevent fouling of feed with droppings and litter, easy to clean or wash, and constructed of durable materials. If timber is used for the construction, preservatives like solignum should be used to prevent fungal or insect damage. Automatic feeders may become important with the increasing cost of labour in many tropical areas. One form distribute feed from the feed-hopper through a chain electrically driven and operated by a time switch. It activates feed and reduces crowding but it is expensive.

Two types of feeders are identified:

(i) Trough feeders:

The main part of the trough feeder is the feed container, with either the top and base widths equal or the top wider than the base so that the sides slope or may even give a v-shape in cross-section. The latter shape brings every particle of feed within reach of the birds and makes it easy to clean.

The top of each of the long sides is curved in to form a 'lip' as a means of limiting feed waste. A spinner mounted on top of the feeder gives sufficient access to feed and prevents fouling and wastage of feed by the birds.

The trough feeder comes in a variety of sizes; the length can be 0.6m to 1.6m. The base width of a sloping sided trough is about 8cm when the trough is for 8-week-old birds and 20-25cm for adults.

The feeders have legs, which lift them above the litter. Some feeder are placed on stands, which have perches. The trough feeders are shown in figure 1.

(ii) Tube feeders or hanging feeders

These are metal feeders, which are cylindrical in shape, and with a pan into which feed flows from the main body in which reserve feed is contained (fig 2). Another type of tube feeder has sloping sides, wider at the base than at the top. They vary from about 6kg to 14kg in the quantities of feed that they can hold. The lower pan may be detached and used as a chick feeder. Some of them have covers at the top end.

2.9.2 Drinkers

The commonest form of drinker in Nigeria is the water fountain (illustrated in fig 3),

which may be made of galvanized iron, aluminum or plastic. The latter is not durable while iron becomes rusty, in contrast to aluminium which is rust-resistant, durable but expensive. They are usually conical or partly cylindrical. They vary in capacity from, say, 2 to 6 or 8 litres. The shape should facilitate quick and thorough washing.

Some drinkers are trough-shaped, like feeders and made of galvanized angle iron. Bars spaced at 7.5cm prevent fouling of the water. The trough is placed on a slatted or wired platform over a drain, running along one side of the house.

The trough may be filled manually or by an automatic device based on a spring-loaded ball-valve attached to the supply pipe. This permits storage of water in a reserve tank from which water is supplied to the drinker.

Bamboo poles are not suitable for making drinkers because the drinkers will be difficult to clean and they provide crevices for ectoparasities.

Drinkers and trough feeders specially adapted for use under the range system are shown in figure 4. The modifications in construction are aimed at protecting the water and feed from radiant heat and they probably prevent the feed and water from being seen by wild birds.

The table below (table 2.1) shows the types and number of feeders and drinkers to be used per 100 birds for various ages of birds as stipulated by J.M Olomu (1980) in practical hints for backyard poultry production.

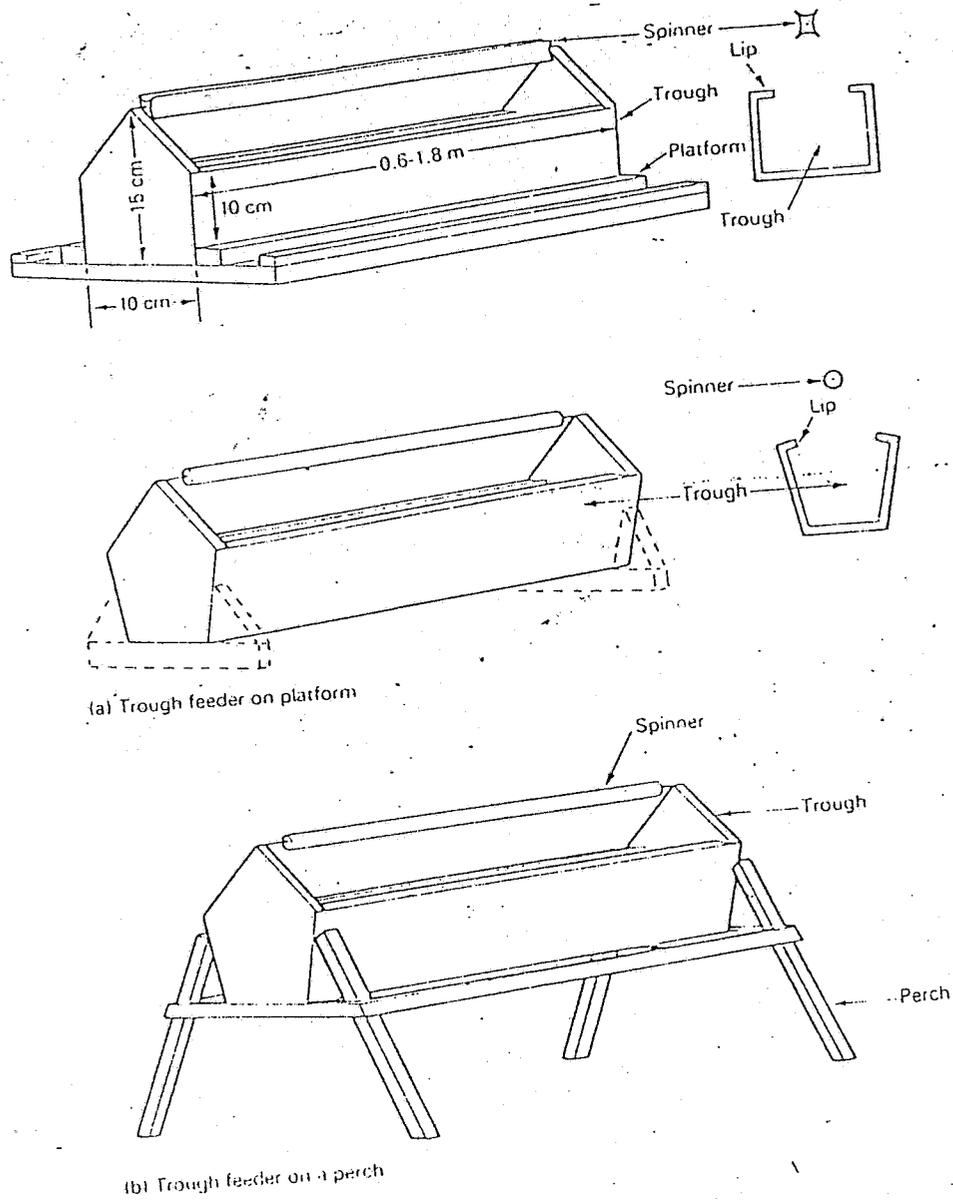
Table 2.1 Numbers Of Feeders and Drinkers per 100 Birds.

Age of Birds	Feeders		Drinkers
	Trough (2.5 m long)	Conical	Conical
0-4 or 6 Weeks	1	1	2 (4 liter capacity)
4-10 or 14 Weeks	2	2	2 (10-15 liter capacity)
14-20 Weeks	3	3	2 (10-15 liter capacity)
Laying Period	3 or 4	3 or 4	2 or 3 liter capacity

2.10 Egg Handling

Eggs handling is an important consideration in poultry production due to its fragile nature. Baskets are recommended for egg collection (fig 5).

Poultry products are transported daily from poultry farms to either the market or buyer's residence, but the transportation devices used are little known. Strong woven baskets with straw placed at the bottom and along the sides of the basket, and after each layer of the egg in the basket are recommended for use. The eggs can also be transported by packing them in clean egg trays.



(a) Trough feeder on platform

(b) Trough feeder on a perch

Figure 1: Trough Feeders

(Source:- Oluyemi and Roberts; 1979)

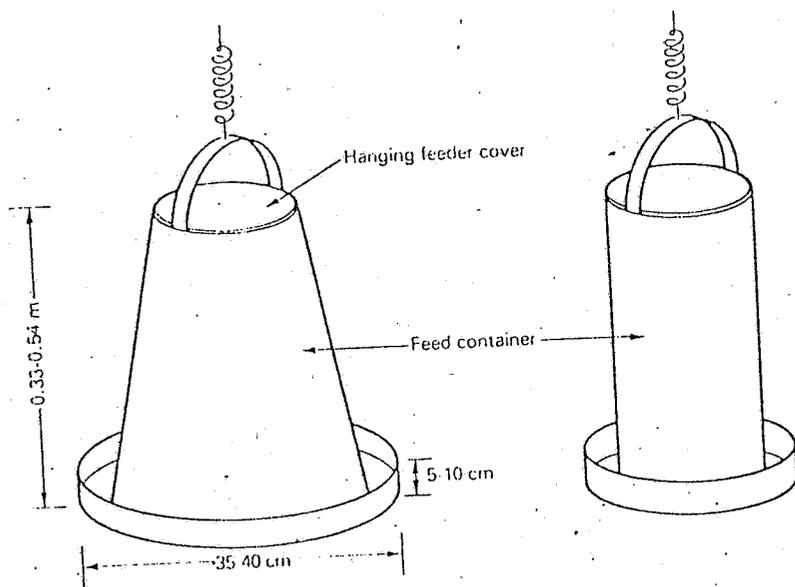
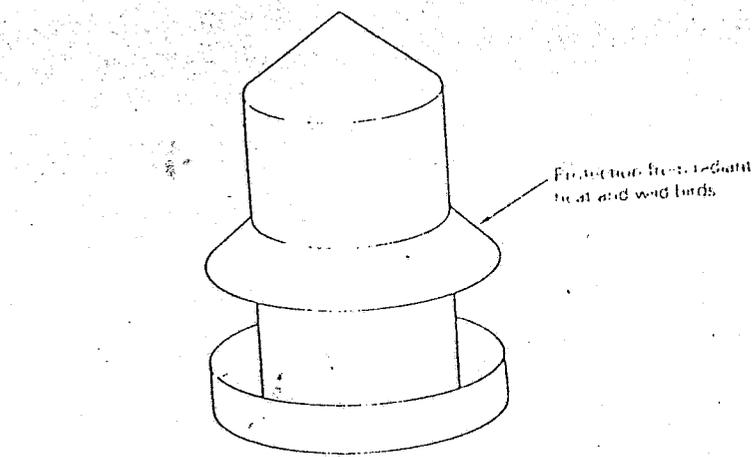
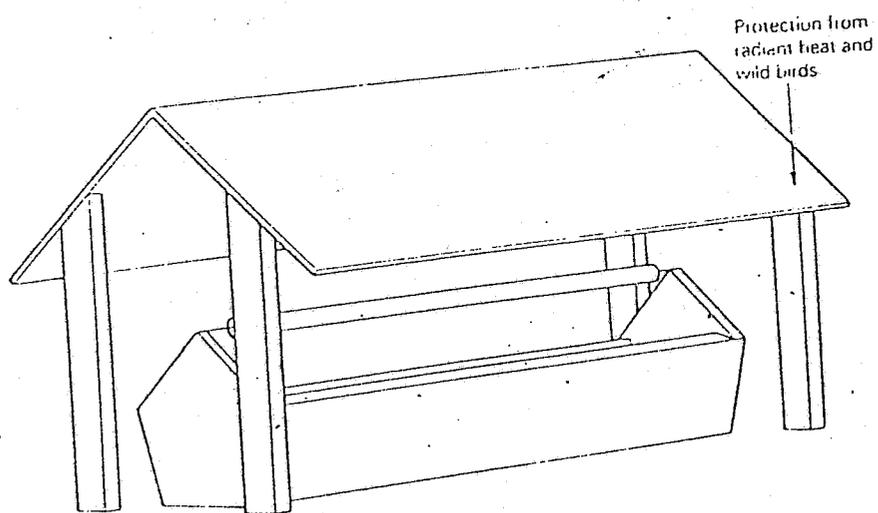


Figure 2: Tube feeders made of galvanized steel

(Source:- Oluyemi and Roberts; 1979)



(a) Range water fountain



(b) Range feed trough

Figure 3: Range drinkers and feeders
(Source:- Oluyemi and Roberts; 1979)

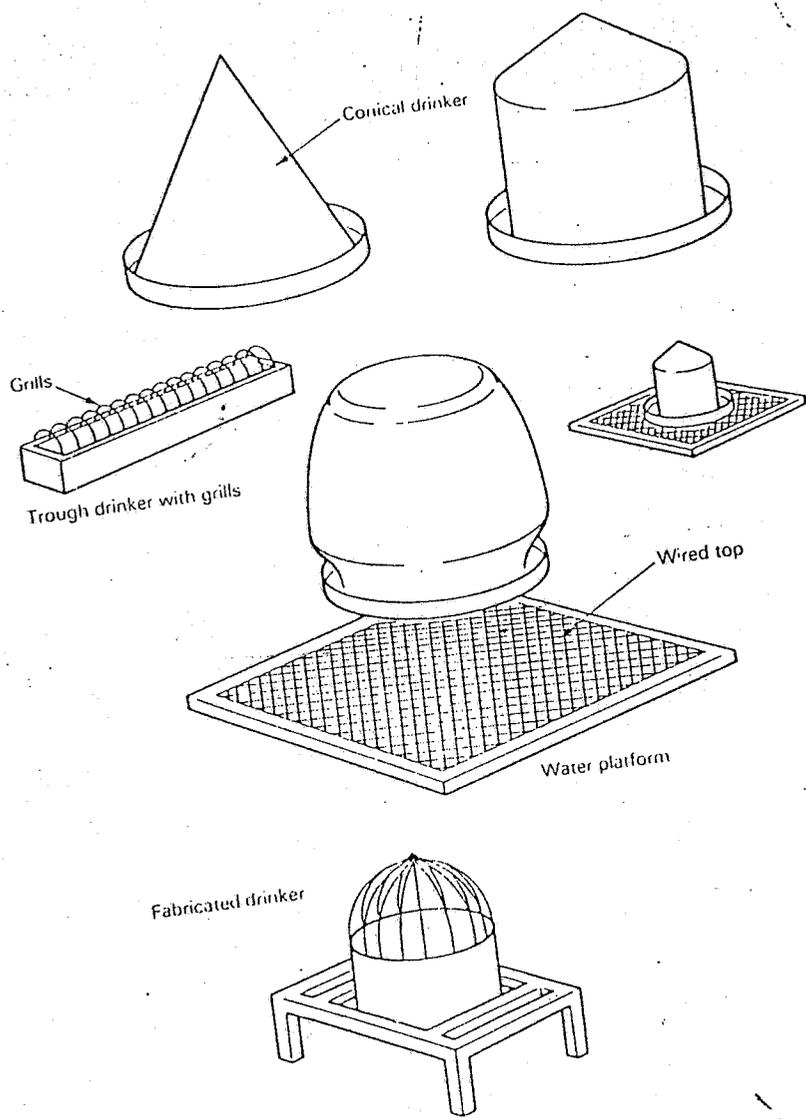
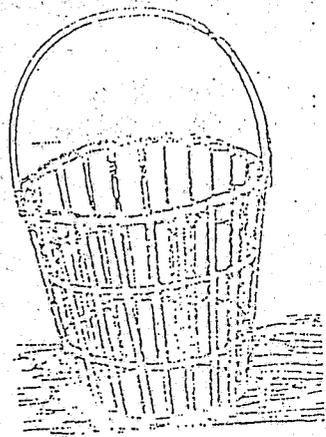
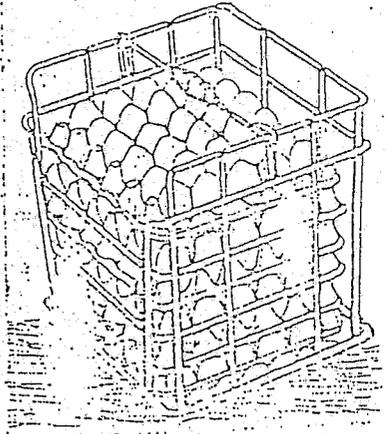


Figure 4: Water drinker or fountains
(Source:- Oluyemi and Roberts; 1979)



(A) Cylindrical basket



(B) Cubical basket

fig. 5: Egg collection baskets

Source:- Practical Hints for Backyard Poultry Producers)

CHAPTER THREE: METHODOLOGY

3.1 The Study Area

Minna is a typical settlement of Gwari tribe, but mixed with all other tribes that migrated from various towns and rural areas in search of jobs.

It is the capital of Niger state created in 1976, located on latitude $9^{\circ}30''$, and longitude $6^{\circ}30''$ in the southern guinea savannah ecological zone. It forms a society of Academicians, Politicians, Farmers, Technicians, Civil servants, Traders, Contractors and Labourers.

Minna, being an urban setting has a high population pressure. Its meat production is never sufficient to meet the ever increasing demands. Poultry production has always been a thriving business in this study area. As at the time of this thesis eggs sell at N240 per crate and an average broiler sells between N350 to N500.

The location of higher institutions and government establishments and ministries have attracted the migration of rural people and people from all parts of Nigeria to this centre. Most of these poultry farmers make use of the available resources and information in the study area.

Marketing and other social activities have improved greatly in Minna with the banks (First Bank of Nigeria Plc, Union Bank of Nigeria Plc etc) operating in the project area..

Land tenure system is less a problem for poultry business especially the backyard type in the study area because most of the poultry keepers are the workers in the institutions and government

establishments and these workers occupy residential quarters of the institution and government areas. Ample areas are provided to each quarter, which is quite suitable for backyard poultry type of business and gardening.

Niger Livestock and Abu Turab Farms are located at Bosso and David Mark road respectively. The economic hardships experienced generally in the country has caused many poultry farmers especially the backyard ones to fold up.

In spite of the economic hardships poultry production and consumptions has remained very high.

The author therefore found Minna as the most suitable area for the investigation because of the following reasons:-

1. Minna is already an area of high population pressure; with high demand for protein intake, and poultry production is already a thriving business.
2. Being an elite environment, it is envisaged that there will be no communication problem, especially in administering the questionnaires.

3.2 Data Collection

All the information used in this thesis were obtained through a primary source; that is by personal interview using two types of survey questionnaires.

3.2.1 Survey 1: The General Questionnaire

This questionnaires was designed to retrieve as much information as possible from the poultry farmers based on their past experiences. Questions were asked on both the present and past

experiences in keeping poultry. These include the aim and type of poultry farm practiced, the duration the poultry farmer has been in the business, labour force, size of the farm, handling equipment used in terms of egg collection, water application, feed application and refuse collection; and transportation equipment used in conveying inputs and produce from the market to the farm and vice versa (for details see Appendix 1).

The questionnaire were personally distributed by the author; generally between 4pm and 6 pm on working days, and 9 am to 5 pm on Saturdays. These periods were found to be most suitable in giving room for rest after the day's hardwork. The periods also provided an opportunity for the author to witness the handling methods of these birds, and take some necessary on the spot observations. The collection of completed forms was as promised by each respondent (for example, after 3 days, one week or 2 weeks). Time of collection on any particular day was as specified by the respondent. About four weeks were allowed for this exercise.

3.2.2 Survey 2: The Time Study

This survey is aimed at quantifying certain performance characteristics of handling and transportation equipments. It includes time study of the handling and transportation operations.

Specifically, the time for the various operations such as egg collection, water application and feed application were taken. The amount of water applied and the distances travelled were also measured to enable quantify some of the performance characteristics of the handling and transportation equipments encountered. See sample of data sheet in Appendix II

This survey was carried out between early and late part of October personally by the author. The author had to stay in these poultry farms as early as the start of work until closing time during the days of the experiment.

It was discovered that both commercial poultry farms and the backyard poultry farms used the same arrangement of birds inside the house. Both use "deep litter system". The deep litter system consists of a fixed building having suitable litter material spread on the floor.

3.3 Sample Selection

The author's areas of coverage are the institutional residential areas, staff quarters, Bosso Estate, housing the University lecturers, Tunga low cost, Bay Clinic Road, Top Medical Road, Maitumbi and Central Bank Quarters.

Since the number of poultry farmers is not too large, the general questionnaire was given to as many as were willing to complete it.

The time study was carried out in two commercial poultry farms namely; Niger Livestock Bosso and Abu Turab Farms David Mark Road.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

The followings are the findings from the general questionnaire and the time study data collected on site on the handling and transportation operation in poultry production.

4.1 Survey 1: The General Questionnaire

As at the time of administering the questionnaire many of the backyard poultry farms had closed down due to the economic situation and the cost of keeping a poultry farm. On the whole, out of the 50 questionnaires distributed, 21 completed ones were returned. Therefore the discussions below are based on 21 poultry farms

4.1.1 Distribution and Sizes of Poultry Farms

Tables 4.1 below contains the general distribution of the poultry farms in the study area, with a further breakdown of the distribution in terms of bird capacity of each type of poultry farm.

Table 4.1 Distribution and Bird-Capacity of the Poultry Farms

Type of poultry farm	General distribution (%)	Bird Capacity Distribution (%)				
		X<200	200<X<500	500<X<1000	1000<X≤5000	X>5000
Backyard	76	31.25	43.75	25	-	-
Commercial	10	-	-	-	50	50
Research/Teaching	14	33	-	-	67	-

Note : X = Number of birds

The table indicates that the backyard, commercial and research/teaching poultry farms are 76%, 10% and 14% respectively, in the study areas. 75% of the backyard poultry have less than 500 birds; however the commercial farms keep from 5,000 birds and above.

This shows that majority of the poultry farms in the study area are backyard types; keeping birds as a hobby for family consumption rather than a primary source of commercial income, while the commercial poultry farms have by sizes as expected. General comments from backyard poultry farmers indicated that they kept less than 500 birds because they could not cope with more than that within their free time and due to high cost of poultry feed at the time.

4.1.2 Labour Force

Table 4.2 below contains the size of poultry farms in terms of labour employed.

Table 4.2: Poultry Sizes and Labour Force.

Size of poultry	Labour force			
	Y<5	5<Y<10	10<Y<20	Y>20
X < 200	100	-	-	-
200<X<500	86	14	-	-
500<X<1000	67	33	-	-
1000<X<5000	67	33	-	-
X>5000	-	-	-	100

Note Y= Number of poultry attendants

X=Number of birds

The table indicates that majority of the poultry farms have less than 5 persons attending to the birds; but as would be expected, the bigger the size of the farm the greater the labour force.

4.1.3 Feed and Water Application Equipments

The following equipments were identified

(a) Water Application Equipments

These contain water from which the birds drink. Various types were identified: -

- (i) Rubber plates: These are made of rubber material. They are cylindrical in shape with varying heights. Their selection depends on the age of the birds.
- (ii) Conical drinkers: These are also known as fountain drinkers. They are made of galvanized iron/aluminium sheets or plastic material. The plastic ones are used mainly in supplying broilers with water. They vary in capacity from 2 to 6 litres.
- (iii) Trough/long metal drinkers: These are constructed of aluminium sheets. The shape is same with trough/long metal feeders.
- (iv) Automatic drinkers: These are made of Plastic material and take the shape of plastic conical drinkers. They make use of an overhead water-tank as the water supply source. They are connected to the overhead tank by means of tubings/pipes with a tap in between. The flow of water to this type of drinkers is controlled by the tap. Their capacities vary from 2 to 8 litres

(Refer to plate 4.1 for water application equipments)

Table 4.3: Distribution of the identified Water Appliances

Equipment used	Distribution (%)
Rubber plate	27
Conical drinker (Metal)	37
Trough/long metal drinker	10
Automatic drinker	7
Plastic conical drinker	20

The table indicates that majority of the poultry farms use conical drinkers to supply the birds with water. This is as a result of the low cost of this type of drinker compared to other drinkers, since the majority of the poultry farms have average sizes.

(b) Feed Application Equipments

These contain the feed from which the birds eat. Several types were identified.

(i) Rubber plates: These are cylindrical in shape, and the height varies from 10 to 25 centimeters. They are made of either rubber or plastic material. Those used are selected according to the age of the birds.

(ii) Conical feeders: These are conical in shape, and are made of either plastic or metal sheet materials. The plastic type is also referred to as hanging feeders, because they are suspended by tying them to the roof by means of strings. The ones of metal materials are usually placed on the floor.

(iii) Trough feeders/ long feeding trays: These are made of either aluminium sheets to avoid rusting or are made of wood. The main part of the trough feeder is the feed contained with either the top and base equal or the top wider than the base so that the sides slopes or may even give a V-shape cross sections

(Refer to plate 4.2 for feed application equipments)

Table 4.4 Shows the distribution of the identified feeding equipment

Equipment used	Distribution (%)
Rubber plate	16
Conical feeder (metal)	35.5
Conical feeder (plastic)	22.5
Trough feeder (wood)	16
Trough feeder (metal)	10

The table indicates that majority of the poultry farms use conical feeders. The remaining identified equipments appears to be uniformly distributed

4.1.3/1 Feed Transportation Equipments

These equipments are used to carry feed from the market to the poultry house.

Table 4.5 shows the distribution of equipments used in poultry farms to transport feed from the market to the farms.

Table 4.5 Distribution of feed transportation equipment

Device used	Distribution
Head (Human)	-
Bicycle	5
Motor cycle	18
Van (Lorries, cars, and truck)	77

The table signifies that majority of poultry farmers use vans to convey feed from the market to their farms. Since these poultry farms are owned by working class people, they can afford to

have at least a motorcycle. However, these equipments were not bought primarily for poultry production.

4.1.3/2 Rate of Water and Feed Application

Table 4.6 contains the distribution of feed and water application per day.

Table 4.6 Feed and water filling distribution per day.

Size of poultry farm	Feed				Water			
	1	2	3	4	1	2	3	4
X < 200	-	83	17	-	12.5	62.5	25	-
200 < X < 500	-	83	17	-	-	50	25	25
500 < X < 1000	-	100	-	-	-	-	100	-
1000 < X < 5000	-	50	25	25	-	75	14	14
X > 5000	-	40	40	20	-	-	50	50

Note: X = Number of birds

1,2,3,4 = Number of times container is filled per day.

The table indicates that majority of the poultry farmers refill the feed containers 2 times in a day; and the frequency of filling the water container of 2 and 3 times per day appears to be uniformly distributed to all sizes of poultry farms.

Other observations show that the supply of feed to the birds depends on: -

- 1) Age of the bird
- 2) Target -production level

3) Size of the container

Birds take more food at younger stages and when laying. Also they take more food when high production of eggs is required. The number of times of refilling the container is greatly influenced by the size of the container used; containers of small sizes have to be refilled for several times to ensure that feed is always available to the birds.

The supply of water/refilling of water containers depends on: -

- 1) Size of the container used
- 2) Number of birds drinking from the container
- 3) Weather conditions: Birds take more water during hot weather seasons.

4.1.4 Egg Handling and Transportation

(a) Equipments

These are used to collect eggs in the poultry houses and transport the collected eggs to the storage houses. Numerous types were identified: -

(i) Hands.

In cases where only a few eggs are produced at the various times of collection, only hands (human) are used in collecting them.

(ii) Egg trays/filler flats

These are made of either plastic or soft paper. They have depressions in the shape of eggs for maximum holding ability. They normally carry 30 eggs at full capacity.

(iii) Egg baskets

They are made of either rubber or iron materials. They are of different shapes such as cylindrical and cubical. The choice of selection depends on the poultry farmer.

(iv) Buckets and Bowls

The buckets are either made of iron or plastic materials. Bowls are made of rubber and iron materials as well. The shapes of buckets and bowls are both cylindrical, the only difference being the bowls have both top and bottom width equal.

(v) Wheel barrow

These are made of either iron or steel materials

Table 4.7 below shows the distribution of egg collection appliances.

Table 4.7: Distribution of Egg Collection Appliances

Equipment used	Distribution (%)
Hands (human) only	16
Egg trays	32
Egg baskets	24
Buckets and Bowls	24
Wheel barrow	4

The table indicates that majority of the poultry farmers used egg trays to collect the eggs. However, other equipments such as hand, baskets and bucket/bowls also featured prominently.

(b) Rate of egg collection

Table 4.8 shows the distribution of egg collection per day.

Table 4.8: Poultry size and distribution of egg collection per day.

Size of poultry farm	Distribution of egg collection per day (%)			
	1	2	3	4
X<200	-	80	20	-
200<X<500	20	40	40	-
500<X<1000	-	50	50	-
1000<X<5000	-	40	40	20
X>5000	-	-	100	-

Note X = Number of birds

1,2,3,4 = Number of egg collection per day.

The table indicates that in majority of the poultry farms, eggs are collected 2 or 3 times in a day. Egg collection could be done more than 3 times in a day since in some poultry farms egg collection depends on the type of birds in the farm. Some birds form the habit of breaking and eating up the eggs, so in such a situation eggs could be collected as frequently as possible to avoid losses.

(c) Egg breakages during collection

Table 4.9 represents the distribution of egg breakage during collection in a day.

Table 4.9: Poultry size and distribution of egg breakage per day

Size of poultry farm	Distribution of breakage per day (%)				
	Y=0	Y<5	5<Y<10	10<Y<20	Y>20
X<200	33	67	-	-	-
200<X<500	33	67	-	-	-
500<X<1000	-	25	25	25	25
1000<X<5000	-	-	67	-	35
X>5000	-	-	-	-	100

Note: Y = Number of eggs broken during collection per day
 X = Number of birds

The table indicates that majority of poultry farms of sizes less than 500 birds suffer egg breakages during collection of less than 5 eggs. In poultry farms over 100 birds, majority encounter egg breakages of more than 10 in a day during collection. This is true that the larger the poultry size, the more the number of eggs broken during collection per day.

(d) Causes of egg breakages during collection

Table 4.10 below enumerates the various reasons and their distribution of egg breakage during collection.

Table 4.10: Distribution of reasons for egg breakage during collection

Reasons	Breakage Distribution (%)
Rough handling	36
Type of handling equipment	20
Carrying large number of eggs at a time	20
Thin shells due to poor feed quality	24

The table indicates that the main cause of egg breakages during collection is rough handling. The other reasons such as the type of handling equipment; carrying a large number of eggs at a time (per trip) and due to thin shells as a result of poor quality of feed appears to be uniformly distributed. The high number of breakages due to rough handling is as a result of untrained poultry attendants; coupled with handling equipment. Generally the equipments were not soft padded.

(e) Precautive measures against breakages during collection

Table 4.11 Shows the distribution of precautionary measures taken against egg breakage during collection.

Table 4.11: Distribution of measures taken to prevent breakage of egg during collection

Measures taken	Distribution (%)
Change the labourer	11
Change the collection equipment	11
Reduce amount of eggs collected per trip	19
Education of poultry attendants on careful handling of eggs	11
Apply rich feed	15
Add more soft grass to the collection	7
No measure taken	26

On the whole six basic precautionary measures taken were identified as seen from the table above. Majority of the poultry farmers did not take any adequate measure against the losses. Some were non-challant about it, while others felt the cost of employing a new method will be higher than the losses. This is true in the sense that majority of the poultry farms have small bird-capacity (of less than 500), thus the number of eggs produced are small as well and the resultant breakages during collection being very small in number. However, table 4.9 is only for one day; the quantity of egg breakages becomes substantial over one year

(f) Egg transportation to the market

Table 4.12 below shows the distribution of the devices used in egg transportation by poultry farmers and their customers

Table 4.12 Distribution of egg transportation devices

Device used	Distribution (%)
Head (human)	16
Bicycles	12
Motorcycles	38
Van (buses, cars and pickups)	34

The table indicates that in majority of the poultry farms use is made of motorcycles and vans in transportation of eggs. This is as a result of the long distances between poultry farms and market/customers residence and because of high cost of eggs these days, which

make eggs accessible to only average/high class people who own at least a motorcycle. Also majority of middle-men who buy the eggs for resale own motorcycles.

4.1.5 Refuse Handling and Transportation

Refuse handling is of great importance in poultry farms since diseases affecting poultry are mainly associated with refuse.

The collection of refuse in poultry houses is done mainly by a shovel and a wheel-barrow or any other container

The collected refuse from poultry houses is either used in crop farms as manure or is burnt as waste materials.

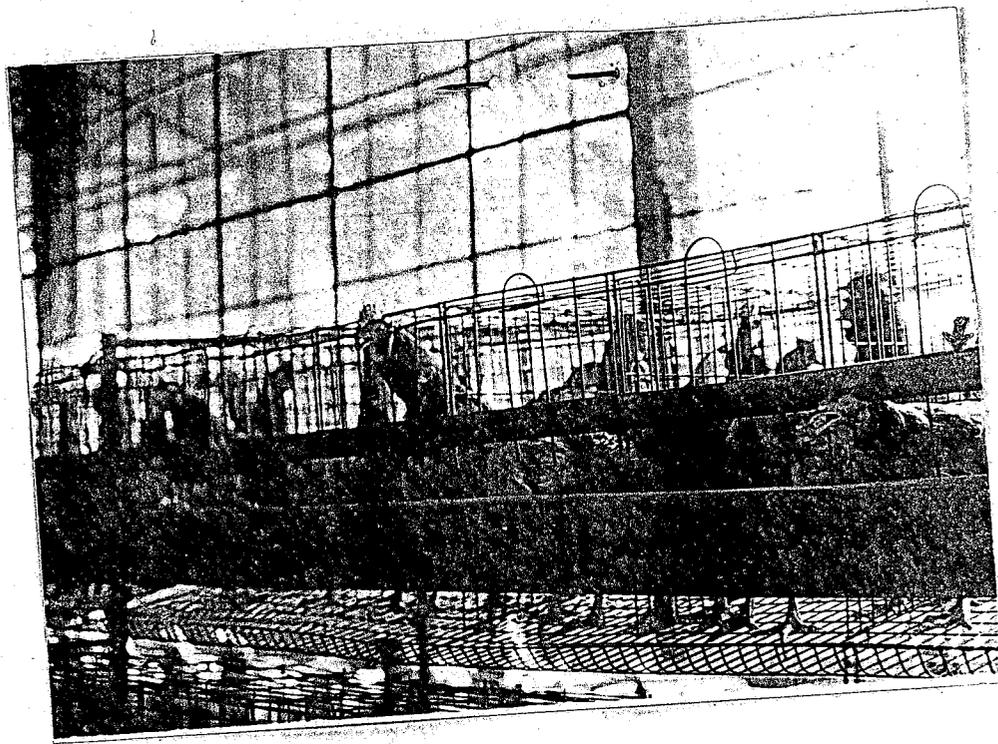
Table 4.13 below shows the distribution of refuse transportation devices used for disposal of refuse.

Table 4.13: Distribution of refuse transportation devices

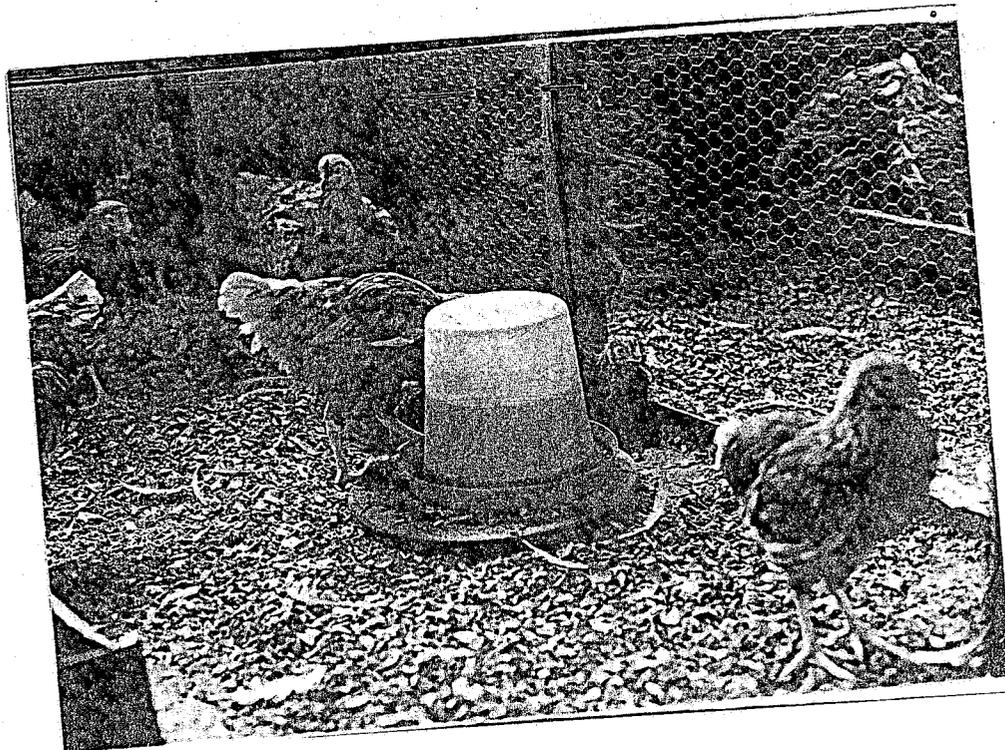
Device used	Distribution (%)
Wheel-barrow/cart	13
Van (tractors, trucks, buses	33
Head (human)	10
Donkey	4
Motorcycles	20
Bicycles	20

The table indicates that majority of the poultry farmers use vans such as tractors (trailers), trucks and buses for the disposal of refuse. Since refuse transportation consumes a lot of time and

the quantity of refuse to be handled is usually large, in order to save time large capacity devices are used. The low use made of donkeys is a result of most poultry farmers being unable to get donkeys.



(A) Long Metal / trough drinker

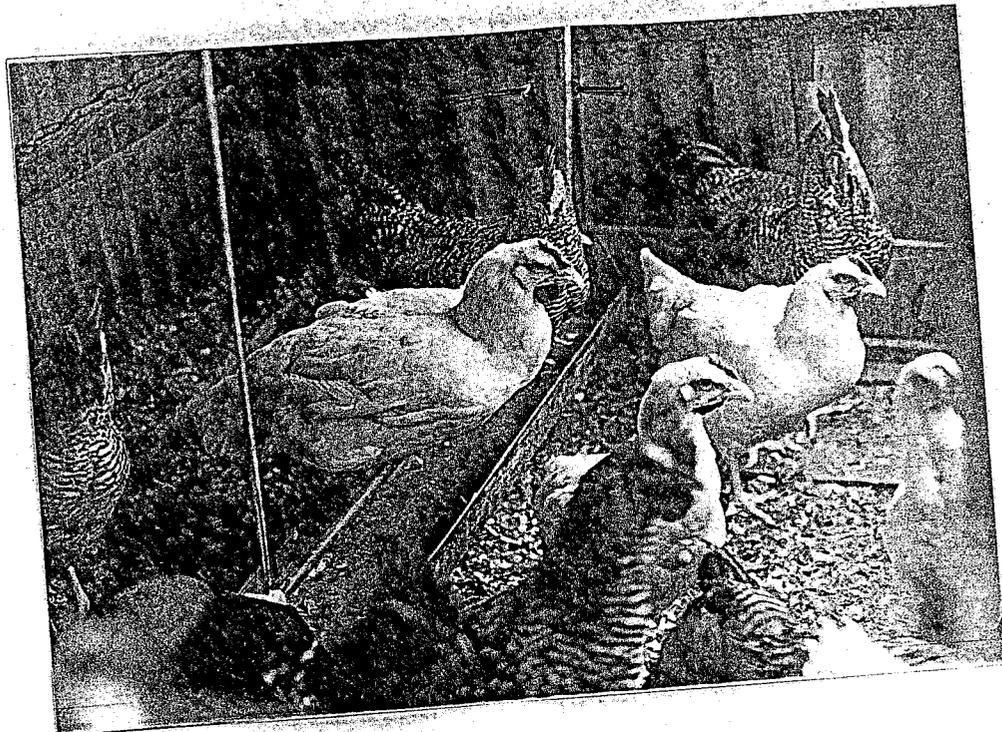


(B) Plastic conical drinker

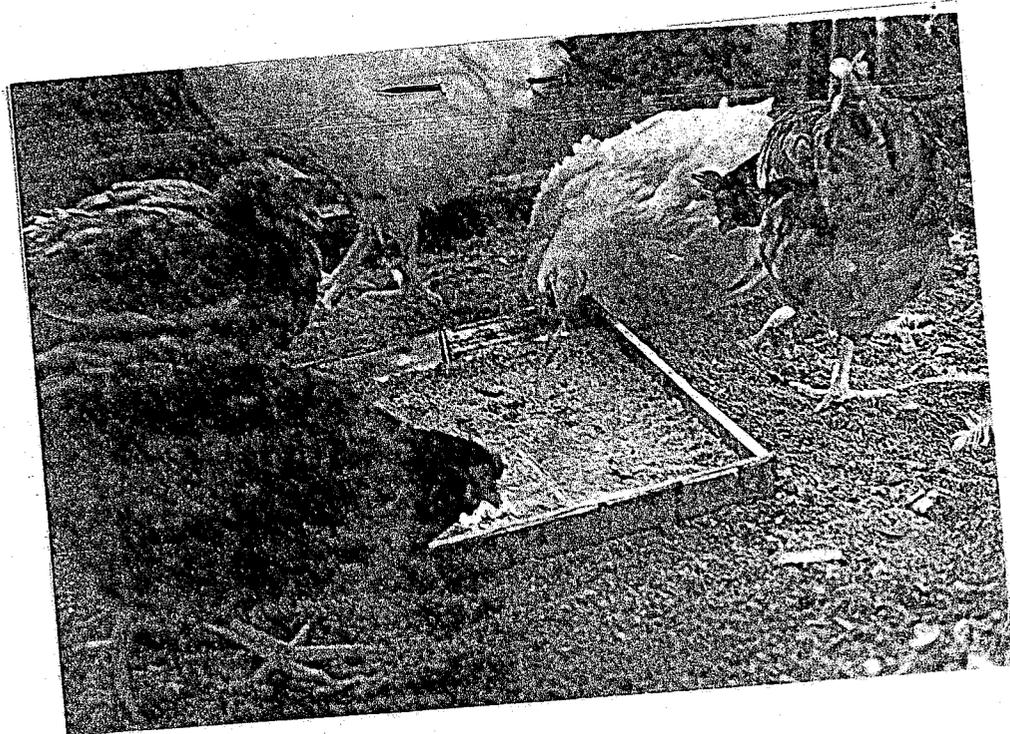
Plate 4.1: Water application equipment

ABSTRACT

The shortage of protein product to meet the high population pressure especially in the urban or suburban centers has prompted the growth of poultry production. Research efforts in different aspects of poultry production have been intensified. However, very limited work has been and is being done in the area of handling and transportation in spite of the fragile nature of poultry products. An investigation of handling and transport equipment was carried out. Those found in use include rubber plates, bowls, buckets and wheel- barrows. These equipments were not originally designed nor produced for poultry production. They were found inappropriate, unsafe and inefficient. This report therefore recommend for intensified research into the aspect of handling and transportation in poultry production.



(A) Trough Feeder

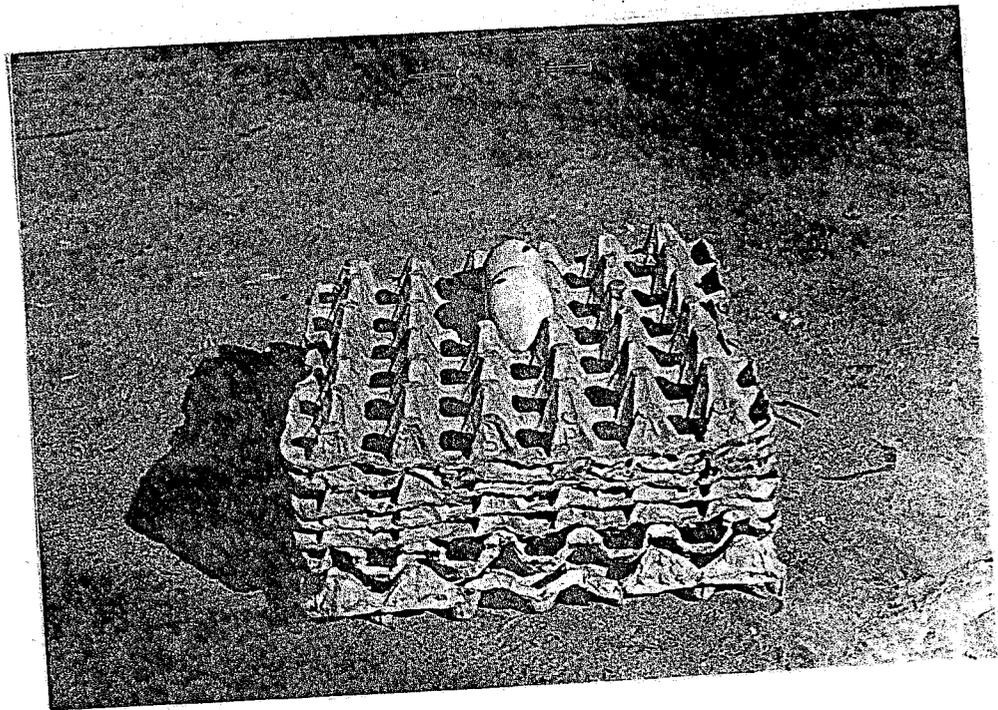


(B) Feeding tray

Plate 4.2: Feeding application equipment.



(A) Egg trays / filler flats made of plastic

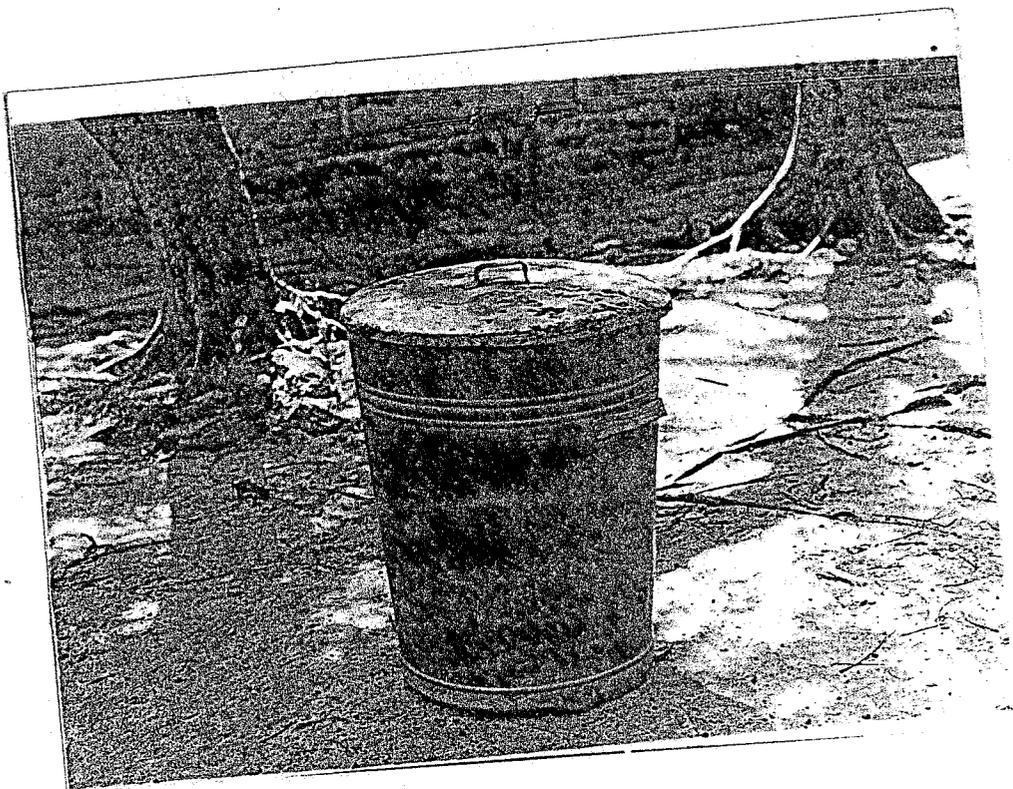


(B) Egg trays / filler flats made of soft paper

Plate 4. 3: Egg collection equipments



(A) Wheel barrow, shovel and bucket



(B) Metal dust bin

Plate 4. 4: Refuse collection equipments

4.2 Survey 2: The Time Study

This survey was conducted in two commercial poultry farms: - Niger livestock Company Limited and Abu-Turab Farms. In Niger Livestock Company there are four poultry houses but only one as at the time of the study is functional and use was made of the one poultry house. One house of laying hens was used in Abu-Turab farms. In Niger Livestock the poultry house is attended to by two poultry attendants while in Abu Turab farms the poultry house is attended to by many poultry attendants and laboureres since shifting methods of workers is practiced there.

4.2.1 Feed Application

Feed applicaion methods in the two poultry farms differ. In Niger livestock, feed bags kept in a store near the poultry houses were taken into the houses and the feeders (feed containers) were filled by pouring feed directly from the bags into the feeders. In Abu-Turab farms, a feed bag was placed just at the entry into each pen and by means of rubber plates, feeders (conical/metal) were filled with the feed. Feeders were refilled with the feed 1 and 2 times in a day for Niger Livestock Company and Abu-Turab farms respectively.

Table 4.14 below represents the summary of the time study for feed application in the two poultry houses used for both Niger Livestock Company and Abu-turab farms

Table 4.1.4 Summary of time study for feed application

Treatment	Niger Livestock Company		Abu-Turab Farms	
	S		Y	
	Total time for applying feed (min:sec)	Filling time per feeder (Min:sec)	Total time for applying feed (min:sec)	Filling time per feeder (min:sec)
1	5:55	0:18	4:53	0:29
2	6:05	0:18	5:20	0:32
3	4:35	0:14	4:11	0:25
4	7:33	0:23	5:28	0:33
5	6:06	0:18	4:49	0:29
Average	6:03	0:18	4:56	0:30

Note: S= Poultry house used in Niger Livestock

Y= Poultry house used in Abu-Turab Farms

S and Y both contained 10 feeders respectively.

The table indicates that, the time of applying feed to one feeding appliance in houses S and Y were 18, 14 and 30 seconds respectively.

Poultry house Y has the highest time; this is due to the method practiced-feed bags are kept near the entry to each pen and a rubber container is used in taking feed from the bags to refill the feeding appliances

4.2.2 Water Application

Niger Livestock company which has an over head storage water tank, has water taps installed in the poultry houses. Large buckets (plastic containers) are taken to the tap, filled with water that is used in refilling the drinkers (water containers). In the case of Abu-Turab farms, water tanks placed outside the poultry house are used in refilling the drinkers with water. In both cases drinkers (conical metal) are taken to the water source for refilling. In each case water was supplied (drinkers refilled) three times daily.

Table 4.15 contains the summary of the time study for water application.

Table 4.15 Summary of time study for water filling

Treatment	Niger Livestock Company		Abu-Turab Farms	
	S		Y	
	Total time for supplying water (min:sec)	Filling time per one container (min:sec)	Total time for supplying water (min:sec)	Filling time per one drinking container (min:sec)
1	19:18	1:45	12:37	1:16
2	23:55	2:10	12:37	1:16
3	21:26	1:57	12:28	1:15
4	22:01	2:00	13:21	1:24
5	23:57	2:11	12:27	1:15
Average	22:07	2:01	12:42	1:17

Note: S = Poultry house used in Niger Livestock

Y = Poultry house used in Abu-Turab Farm

S and Y contained 10 drinking containers respectively.

The table indicates that the time taken for water filling of one drinking appliance in poultry house S and Y are 2 minutes 1 second, 2 minutes 10 seconds and 1 minute 17 seconds respectively. The time for water application depends on:

1. Distance of location of water supply source from the poultry house
2. The method of water application

The difference in time taken to refill one drinker in house S greatly differs with house Y, this is as a result of the type of water source used. At certain times when the column of water in the tank is very low, the flow rate is very small and that results in high time usage while in the case of the open tank used in house Y, it was easier (it took a shorter timer) to refill the drinker.

4.2.3 Egg Collection

Egg handling and transportation in the two poultry farms varied in the methods practiced.

In Abu-Turab farms, egg collection was done up to four or five times a day; using a rubber container and wheel barrow. Eggs are collected from pens (these are the apartments made in a poultry house where a number of birds are confined in them) by the use of a rubber plate and are deposited in front of each pen. At the end of the day or the following morning, the eggs are transported to the storage house by means of a wheelbarrow after recording. In Niger Livestock Company, eggs were collected two or three times a day by the use of egg trays.

Table 4.16 below is the summary of the time study for the two poultry farms used.

TABLE 4.16: SUMMARY OF THE TIME STUDY FOR EGG COLLECTION IN NIGER LIVESTOCK COMPANY AND ABU-TURAB FARM

Poultry house	Equipment Used	Average Time of collection and transporting Eggs to the Storage house (min:sec)	Average number of eggs collected	Average weight of eggs collected (kg)	Average no of breakages during collection and transportation	Average time to collect and transport 1 egg (secs.)	Distance between poultry and storage house (m)	Walking speed with eggs (m/sec)	Walking speed with empty container (m/sec)
S	Egg trays (10 per trip)	31:34	424	23.1	3	4:50	132.00	1.02	1.12
Y	Wheel barrow and rubber plate	29:48	622	34.2	8	2.90	81.00	0.74	1.57

Note: S denotes poultry house in Niger Livestock Company
Y represents the Poultry house used in Abu-Turab Farms.

The table indicates that 3 eggs each were broken during handling in house S, and 8 were broken in Y. House Y could have more breakage than the 8 as seen from the table: But the fact that eggs were left in the equipment, the breakages due to carrying large number of eggs could not be recorded. The major difference during the eggs handling is the equipment used. In Niger Livestock company egg trays were used where as in Abu-Turab Farms buckets, wheel-barrows were used.

The time of collecting one egg from the poultry to storage houses were 4:50 seconds and 2:90 seconds for poultry houses S and Y respectively. This disparity is also due to the equipment used.

The walking speed with loaded eggs were 1.02 meters per second and 0.74 metres per second for houses S and Y respectively. The walking speed with empty containers were 1.12metres per second and 1.57metres per seconds for houses S and Y respectively. The poultry attendants in house S using the egg trays walked faster without incurring egg breakages though in all cases the attendants walked faster without eggs.

From the above results one can estimate the time it will take to collect a specified number of eggs from one poultry house to another. For example for a poultry attendant carrying 10 crates of 300 eggs per trip, the time involvement is 22 minutes 30 seconds and 14 minutes 30 seconds for houses S and Y respectively.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

An investigation on handling and transportation in poultry production was carried out in two surveys. Survey 1 which was the questionnaire was aimed at retrieving information from poultry farmers in terms of handling and transportation equipments used in poultry production. Survey 2 which was the time study was aimed at accessing the efficiency of these equipments in terms of handling losses and time elements involved.

The followings are the major findings from the study:- There are 76%, 10%, 14% for backyard, commercial and research/teaching poultry farms respectively.

The water application equipment in use included rubber plates, conical drinkers, trough/long metal or wood drinkers, and automatic drinkers.

Similarly, the feed application equipments were rubber plates, conical feeder and trough feeders.

The egg collection equipments included egg trays, egg baskets, buckets and bowls; and wheel-barrow.

The major cause of egg breakages during handling was identified to be rough handling coupled with inappropriate equipments. Others are carrying a large number of eggs at a time, and thin shells due to poor quality of feeds.

The time study showed that for water and feed application, the long times taken for the operations are due to poor layout of the poultry houses and improper handling of the appliances by the poultry attendants coupled with the equipment used. Various equipments such as buckets, bowls and wheel-barrow used in egg collection made poultry attendants to move at a very slow speed since these equipments are inadequate, unsafe and inefficient.

Although, the number of egg breakages per day may appear small; it becomes substantial when viewed over long production period. The same holds for the efficiency of the equipment used in terms of time involved in egg handling.

The investigation therefore shows that most of the equipments presently used in handling and transportation in poultry production are inadequate. This also shows from the fact that most of the equipments identified were not originally meant for poultry production.

5.2 Recommendations

In view of the above findings, the followings are recommended:

- (i) Poultry attendants should be well trained so as to minimize egg breakages during handling.
- (ii) There is the need for planning poultry layout in order to avoid/reduce travel time between one house and another. For example in Niger Livestock company due to close layout of poultry houses the time involvement in transportation is less
- (iii) The present poultry feeds in the markets produced by various firms in the private sector be monitored and analysed to check that it contains the correct quality and quantity of the required poultry ingredients since poor quality feed leads to eggs with thin shells which are easily broken during handling.
- (iv) Since most of the handling equipments were not originally meant for poultry production, neither were they found appropriate, there is therefore the need for designing and producing appropriate handling equipments in poultry production. These equipments should have the small-scale poultry production in view.

In the absence of appropriate equipment for egg collection, poultry farmers can prevent/reduce the breakages during handling by padding the present equipments in use.

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APPENDIX 1

The introductory letter and the detail questionnaire used for survey 1 are shown below.

Agricultural Engineering Department,
School of Engineering,
Federal University of Technology,
Bosso – Minna.

.....
.....
.....
Dear Sir/Madam,

QUESTIONNAIRE AND TIME STUDY ON TRANSPORTATION AND HANDLING IN
POULTRY PRODUCTION

The bearer, Mr Chigozie Ebere is one of our B. Eng (Agric) students. He is working on transportation and handling in poultry production for his final year project. As part of the project, he needs to carry out survey on the present status. This involves asking questions on past experience and time study during operations.

I shall therefore appreciate your kind assistance in

- (1) Answering the questions on the attached sheets.
- (2) Making your facility available to him during your normal operations to carry out time study on your handling operations.

Thanking you for you kind co-operation.

Yours sincerely,

A.C. Onuachu
(Supervisor)

DEPARTMENT OF AGRICULTURAL ENGINEERING
SCHOOL OF ENGINEERING & ENGINEERING TECHNOLOGY
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QUESTIONNAIRE

HANDLING AND TRANSPORTATION STUDY IN POULTRY PRODUCTION

SECTION A: GENERAL QUESTIONS

1. How long have you been keeping poultry?.....
2. Which type of poultry farm are you involved in?
 - (a) Backyard poultry farm
 - (b) Commercial poultry farm
3. What are your reasons for keeping poultry?
 - (a) As a hobby
 - (b) To provide extra income
 - (c) Mainly for commercial purpose
 - (d)
 - (e)
 - (f)
4. Do you work alone in your poultry farm?
 - (a) Yes
 - (b) No
5. If no, how many people or labourers do you have to help you?.....

SECTION B: SHORT DISTANT STUDY QUESTIONS

1. What is the capacity of your poultry farm?

(a): Laying Hens

(b): Broilers

2. How many times do you supply the chickens with food in a day?

Specify:

(a) 2 times – Morning and Evening

(b) 3 times – Morning, Afternoon and Evening

(c) 4 times – Morning, Afternoon, Evening and Night

(d)

3. What equipment(s) do you use in supplying the chickens with food?

(a)

(b)

(c)

(d)

(e)

4. How many times do you supply the chickens with water in a day?

Specify:

(a) 2 times – Morning and Afternoon

(b) 2 times – Morning and Evening

(c) 3 times – Morning, Afternoon and Evening

(d) 4 times – Morning, Afternoon, Evening and Night

(e)

5. What equipment(s) do you use in supplying the chickens with water?

(a)

(b)

(c)

(d)

6. How many eggs are laid in your poultry farm in a day?.....

7. How many times do you gather the eggs in a day? Specify:

(a) 1 time – Morning

(b) 2 times – Morning and Afternoon

(c) 3 times – Morning, Afternoon and Evening

(d) 4 times – Morning, Afternoon, Evening and Night

(e)

8. What do you do with the collected eggs?

(a) For sale only

(b) For family consumption

(c) Both (a) and (b)

(d)

(e)

9. What devices do you use in collecting the laid eggs to the storage house?

(a) Hands only

(b) Filler flats only

(c) Basket(s)

(d) Filer flats contained in baskets

(e)

(f)

10. Do you suffer any egg breakages during collection?
- (a) Yes
 - (b) No
11. If your answer in question 10 is yes, specify number of breakages per day?:.....
12. What do you think are the reasons for the damages?
- (a) Rough handling
 - (b) Type of handling equipment
 - (c) Carrying a large number of eggs at a time
 - (d)
 - (e)
13. What precautions have taken to eliminate or reduce the losses during collection?
- (a) Change the labourers
 - (b) Change the collection equipment(s)
 - (c) Reduce the amount collected per trip
 - (d)
 - (e)
14. What other precautions have you taken to eliminate or reduce the losses during collection?
- (a) Change the labourers
 - (b) Change the collection equipment from to
 - (c) Reduce the number of eggs carried per trip
 - (d)
 - (e)

15. Since you have been keeping poultry, have you changed your method and equipment for egg collection?

- (a) Yes
- (b) No

16. If yes, what changes have you made?

- (a)
- (b)
- (c)
- (d)

SECTION C: LONG DISTANT STUDY QUESTIONS

1. Do you produce the feeds for the chickens yourself?

- (a) Yes
- (b) No

2. If no, where do you get the feeds?

- (a) Buy from the market; Give the location:.....
- (b) Buy from the producers; give address/location:.....
- (c)
- (d)

3. Which devices do you or your suppliers use in carrying the feeds to your poultry farm?

- (a) Head
- (b) Bicycle
- (c) Motorcycle

(d) Van

(e)

(f)

4. Are the chickens and eggs collected in your poultry farm for family consumption only?

(a) Yes

(b) No

5. If no, how do you dispose of the eggs and chickens?

(a) Sell to the retailers in the market

(b) Sell to people/retailers from my poultry farm

(c) Give out as gifts to friends

(d)

(e)

6. By what means of transportation do the retailers or you use in conveying the eggs and chickens to the market or their various places?

(a) Head

(b) Bicycle

(c) Motorcycle

(d) Van

(e)

(f)

7. How do you dispose of the refuse in the poultry houses(s)?

(a) Given to friends from my house or taken to their houses

(b) Taken to the site for use

- (c)
- (d)
- (e)

8. By what means of transportation are the refuse conveyed to the site or to your friends' houses?

- (a) Head
- (b) Bicycle
- (c) Motorcycle
- (d) Van
- (e)
- (f)

Please give your (If you want to):

NAME:.....

ADDRESS:.....
.....

Thank you for your kind co-operation.

APPENDIX II

Samples of Data sheet used for survey 2

HANDLING AND TANSPORTATION DATA SHEET

SURVEY 2 - DATA SHEET 1

Date:..... Time:.....

Location:.....

WATER APPLICATION

Name of worker..... Status:.....

Equipment used:.....

Total number of Drinkers in the poultry house:.....

Drinkers Identification Number	Distance from collection point To supplying Point, D (metres)	Time of bringing Water to supplying Point, t1 (min:Sec)	Time of filling Container/Drinker t2 (min :sec)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Total time for the operation = (t1 + t2) =

Average time for filling one drinker =

HANDLING AND TRANSPORTATION DATA SHEET

SURVEY 2 - DATA SHEET 2

Date:..... Time:.....

Location:.....

FEED APPLICATION

Name of Worker:..... Status:.....

Equipment used:.....

Total number of feeders in the poultry house:.....

Number of Trips	Time of Bringing feed from storage to poultry House (t1) (min : Sec)	Time of Applying feed (t2) (min : Sec)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

Total time for the operation = (t1 + t2) =

Time of operation per feeder:.....

HANDLING AND TRANSPORTATION DATA SHEET

SURVEY 2 - DATA SHEET 3

Date:..... Time:.....

Location:.....

EGG COLLECTION

Name of Worker:..... Status:.....

Equipment used for Collection.....

No of trips	No of Eggs Collected	Time of Collection (min : Sec)	No of Eggs Broken	Weight of Eggs Collected (kg)
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1

2

3

4

5

6

7

EGG LOADING / UNLOADING

No of trips	No of Eggs Loaded/ Unloaded	Loading / unloading time (min : sec)	Weight of Eggs loaded/ Unloaded (kg)	Equipment used
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1

2

3

Distance from collection to storage points (m).....

Time taken to travel from collection point to storage with eggs:.....

Time taken to travel from collection point to storage without eggs:.....

Equipment used:.....

Total time for collection and transportation:

APPENDIX 111

Summary of the Time Study for egg collection in poultry house used in Niger Livestock Company and the poultry house used in Abu-Turab Farm.

TABLE A1: SUMMARY OF THE TIME STUDY FOR EGG COLLECTION IN POULTRY HOUSE OF NIGER LIVESTOCK COMPANY

Treatment	Time of collecting and transporting eggs to storage house (min:sec)	No of eggs collected	Weight of eggs collected (kg)	No of breakages during collection and transportation	Time to collect and transporting 1 egg (secs.)	Distance between poultry and storage house (m)	Walking speed with eggs (m/sec)	Walking speed with empty container (m/sec)
1	28:54	468	26.0	5	3:71	132.00	1.02	1.13
2	27:06	426	23.0	2	3:82	132.00	1.08	1.14
3	28:37	410	21.5	2	4:19	132.00	1.04	1.15
4	27:54	390	20.5	2	4:29	132.00	1.07	1.18
5	25:53	400	21.0	3	3:88	132.00	1.09	1.21
Average	27:12	419	22.4	3	4:00	132.00	1.06	1.16

Note: Equipment used was egg trays (10 of them carried per trip)

TABLE A2: SUMMARY OF THE TIME STUDY FOR EGG COLLECTION IN POULTRY HOUSE OF ABU- TURAB FARMS

Treatment	Time of collecting and transporting eggs to storage house (min:sec)	No of eggs collected	Weight of eggs collected (kg)	No of breakages during collection and transportation	Time to collect and transporting 1 egg (secs.)	Distance between poultry and storage house (m)	Walking speed with eggs (m/sec)	Walking speed with empty container (m/sec)
1	31:13	642	35.3	8	2:92	81.80	0.54	1.41
2	33:10	623	34.3	6	3:19	81.80	0.77	1.70
3	26:41	671	36.9	7	2:39	81.80	0.86	1.60
4	27:16	600	33.0	12	2:73	81.80	0.81	1.57
5	30:41	576	31.7	5	3:20	81.80	0.71	1.57
Average	29:48	622	34.2	8	2:90	81.80	0.74	1.57

Note: Equipments used were rubber plates and wheel barrow.