OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA.

Inaugural Lecture Series 243

A FORAY INTO POULTRY NUTRITION

By

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Professor of Animal Science

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PREAMBLE

Mr. Vice-Chancellor, Sir, The Inaugural Lecture, in the tradition of academia, is meant to mark a beginning of ascending from first foundations and nurturing of the intellect through the acquisition and proposition of knowledge, to the conduct of purposeful academic pursuits meant to train the mind and awaken the true spirit of inquiry in the student, to the conduct of meaningful state-of-the-art research and development, targeting, in this case, the Poultry Development aspects of Nigeria's agriculture and food security. This constitutes as the essence of University education, teaching, research, and services, through which knowledge could be acquired and later adapted, and utilised for National development.

Mr. Vice-Chancellor, Sir, before I deliver the 243rd Inaugural Lecture of the Obafemi Awolowo University entitled: A FORAY INTO POULTRY NUTRITION, I do consider it most appropriate to acknowledge and appreciate my Maker, The Lord God Almighty, The Omnipotent, Omniscient and Omnipresent, Ancient of Days, The Daystar, and My Fortress, Who graciously and mercifully preserved, sustained and defended me hitherto. Thus I commend my "ALL" into His Able Hands, even as I thank Him immensely for my past, my present, even my future.

Mr. Vice-Chancellor, Sir, Principal Officers of the University, Distinguished Members of The University Senate, My Colleagues, Students, My Esteemed Guests, Ladies and Gentlemen, I set out on the journey that spanned some decades way back at the University of Ibadan where I had my undergraduate education.

Birds are mentioned many times in the Holy Bible such as: Genesis 1: 21, 27, and 28. It is a matter of record that the effort by mankind to domesticate the chicken and utilise it as food can be traced to God's command in Genesis 1: 28 (KJV) which reads, "*And God blessed them and God said unto them, Be fruitful and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air and over every living thing that moveth upon the earth*".

At this juncture, one could probably pose the question, "Which came first, the chicken or the egg?" The correct answer, of course, is that it was the chicken, citing as the Authority- The Holy Bible in Genesis 1:20 (KJV) which reads, "*And God said, Let the waters bring forth abundantly the moving creatures that hath life, and fowl that may fly above the earth in the open firmament of heaven*".

What is Poultry?

Poultry is a term used for a group of birds kept for meat and egg production (e.g. chickens) or reared or hunted for a useful purpose e.g. Pheasants. Birds are feathered animals. The group of birds called poultry include the following: Domestic Chickens (fowls), Turkeys, Guinea fowls, Ducks and Geese (also called water fowls), Quails, Pheasants, Ostriches, Pigeons and Doves (Table 1). In Nigeria, the popular breeds are: White Leghorn, Harco Layers, Issabrown Layers, Shikabrown, Bovan Nera Broilers, Anak 2000 Broilers, Marshall Broilers, Hubbard Broilers, Gold Line Cockerels, Harco Cockerels, Bovan Nera Cockerels *et cetera.*

Table 1: Classification of Major Avian Species

Common Name	Order	Family	Scientific Name
Domestic Chicken Or fowl	Galliformes	Phasianidae	*Gallus gallus* or *Gallus domesticus*
Pheasant, Partridge	Galliformes	Phasianidae	*Phasianus colchinus*
Guinea fowl	Galliformes	Numididae	*Numida meleagris*
Turkey	Galliformes	Meleagrididae	*Meleagris gallopava*
Quail	Galliformes	Odontopharinae	*Coturnix coturnix*
Duck	Anseriformes	Anatidae	*Cairina moschata* or *Anas platyrhynchos*
Goose	Anseriformes	Anatidae	*Anser anser* or *Anser cinereus*
Pigeons	Columbiformes	Columbidae	*Columbia livia* var. *domestica*
Doves	Columbiformes	Columbidae	*Columba oenas* or *Streptopella turtur*
Ostrich	Struthioniformes	Struthionidae	*Struthio camelus*

What is Poultry Nutrition?

Poultry Nutrition is the sum of the processes by which a bird takes in feed and utilises all the feed substances required for maintenance, growth, production and reproduction. Nutrients are the substances in the feed which are required for maintenance, growth, production and reproduction. The processes of nutrition include: procurement; ingestion; digestion of the feed; absorption; transport, and the chemical assimilation of the nutrients in the feed by the birds. Birds must maintain homeostasis, (sum of the processes involved in regulating constancy in the internal environment of the bird), while they assimilate the feeds.

Importance of Poultry to Man

The main nutritional advantage of poultry to man is that its amino acid content is more closely related to the needs of human beings than those of most plant proteins. FAO (2004) recommended as the minimum requirement for the growth and development of the body, a protein intake of 65 g /capita /day by an average adult human, 35 g of which should be of animal origin. Nigeria is highly deficient in animal protein intake with the per capita put at 9.3 g/day (Owen and Amakiri, 2010). Poultry meat is a good source of high quality protein, available iron, zinc, and all the B vitamins, while eggs are known as good sources of vitamin D, retinol, riboflavin, iodine, iron and protein. Country reports on rural poultry in Africa (E. B. Sonaiya Ed., 1990) showed that rural poultry production offers the farmers a source of income, and high quality animal protein for their families. They are offered as gifts, and used for sacrifices.

Possibility of Using Eggs to Combat Snakebites

It is noteworthy that research is being conducted in India using biotechnological tools to counter poisonous snakebites with Anti Snake Venom (ASV) from chicken eggs (Subba Rao, 2002). The present horse ASV is costly and is known to have undesirable side effects. About 50 eggs could carry the same amount of ASV as one litre of horse blood. A hybrid hen lays 250 eggs a year, the cost of ASV from chicken eggs would be much less than the horse ASV and very likely to have fewer side effects. Thus if the investigations prove to be consistently successful, ASV would be a welcome development that holds promise for use in Nigeria.

As the consumption of animal protein is low in Nigeria, poultry can serve as a good source of animal protein, with its very high amino acid profile, which is essential in the diet of man, for good health and growth. Poultry is highly prolific, having a short generation interval, rapid growth rate and rapid turn over rate. According to Henuk and Dingle (2003), poultry manure which is a product of pollution from poultry farms, is a veritable source of fertilizer, fuel and ruminant feed.

Poultry Production in Nigeria

The poultry industry is one of the largest and fastest growing agro-based industries in Nigeria because of the increase in the demand for poultry meat and eggs (FAO, 2009). Poultry production is carried out in or near urban centres and in the rural areas of Nigeria. Poultry is the most commonly kept livestock and over 70% of those keeping livestock are reported to keep chickens. Commercial or large scale poultry production is carried out in or near urban centres. About 60%

of the poultry produced in Nigeria is produced in the rural areas and the semi-urban towns of Nigeria. The commercial production of poultry in Nigeria is about 40% (FAO, 2009).

Rural/Family Poultry Production in Nigeria

What is Rural/Family Poultry?

Rural/Family poultry is any poultry species (local or exotic), less than 100 in number, raised extensively or semi-intensively, using family labour with most of the inputs generated in the home.

Hill (1954) reported that the local (indigenous) fowls of Nigeria laid about 40–80 eggs annually which weighed 1-1.5 oz (28–42.5 g) per egg, live weights of 1-3 lbs (0.5-1.4 kg) for females and 1.5-4 lbs (0.7-1.8 kg) for males. He also expressed the general consensus in Nigeria that the eggs and the meat of the local fowls were more palatable than those of imported fowls. Many rural poultry producers raise the domestic chickens, turkeys, guinea fowls, ducks, geese and pigeons of various ages and sexes mixed together (Sonaiya and Olori, 1990; Eshiett and Okere, 1990; Dafwang 1990; Matanmi *et al.* 1992; Sonaiya *et al.*, 1992). Birds are raised under extensive management systems namely the free range system, the cattle kraal system and the backyard system. In the free range or traditional system, the birds are allowed to roam around the homesteads, near the bushes and refuse dumps during the day scavenging for water and food. The birds are exposed to lots of sunshine, physical hazards and harsh weather. The birds get their nutrients from pasture, worms, insects, maggots, stone grits, kitchen wastes and grain residues. Shelter is not provided for the birds at night, and supplementary feeding is not given.

At night, local chickens and guinea fowls at times roosted on roofs or on trees in the farmer's yard (Otchere *et al.*, 1990). Some farmers do not provide water and some do so.

In the background system or subsistence system, birds are partly confined within a fenced yard. Some birds spend the night in the owner's compound, kitchens and some farmers house their fowls and ducks in moveable woven baskets, maize or sorghum stalks or in houses constructed with sundried mud clay. Some supplementary food, grains and kitchen wastes are given to chickens. Sources of water for local chickens include well water, stream, river, brooks, puddles, stagnant water and pipe borne water. Some rural poultry farmers supply water in broken pots, plastic, clay and enamel.

The young die owing to diseases and predators such as hawks, snakes, dogs and cats, while the death of the adults is mainly due to diseases.

According to Atteh (1990), a type of integrated extensive system of raising birds practised by the Fulanis in Kwara State is the Kraal system. They rear mainly guinea fowls and an ecotype of the indigenous chicken which is bigger and reported to grow faster than the non-Fulani chicken due to the higher plane of nutrition. The birds are given grains three times a day and they obtain protein from the maggots embedded in the cattle dung. A minimum of about 200 chickens are raised in this system; shelter is not provided. Chicken production on the kraal is strictly for income purposes. It is a matter of record that the cost of egg and meat production is highest under the free range management system.

Fig. 1: Birds Under Backyard Management System

Commercial Poultry Production in Nigeria

The Commercial Poultry Production Sector in Nigeria has many aspects namely: Layer/Egg Production, Broiler/Meat Production; Feed Milling, Hatchery, Poultry Equipment, Processing, Marketing, Poultry Drugs, and Poultry Breeding (Oluyemi and Roberts, 1979).

The Inputs for most of these Enterprises are imported, and are known to be very expensive. The Management System is intensive whereby the birds are in total confinement, and balanced rations are given to them. The birds are housed all the

time in Battery Cages or on the floor in Deep Litter Pens (Figures 2, 3, and 4).

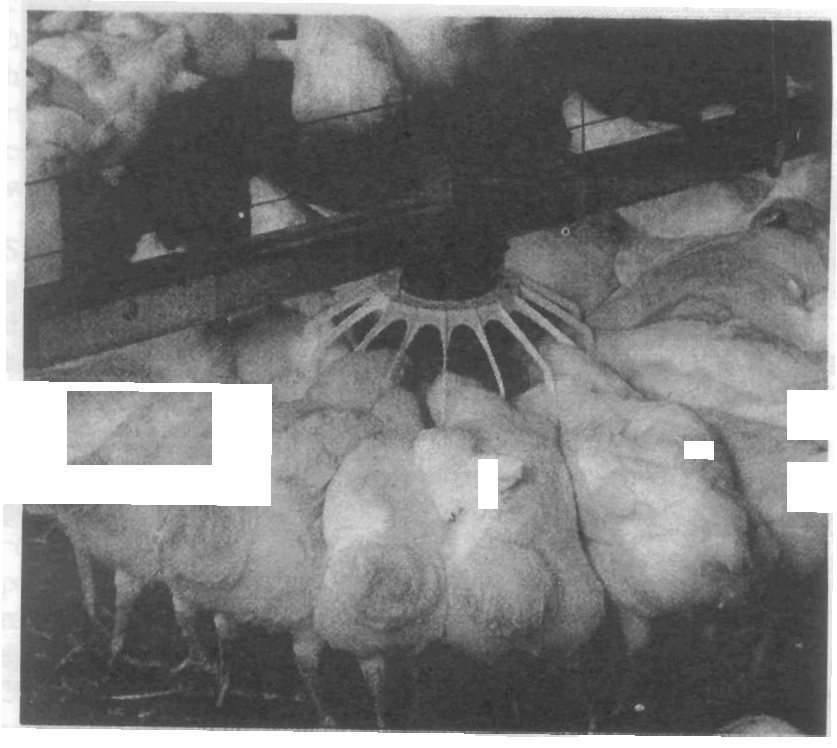

Fig. 2: Feeding System for Broiler Breeders

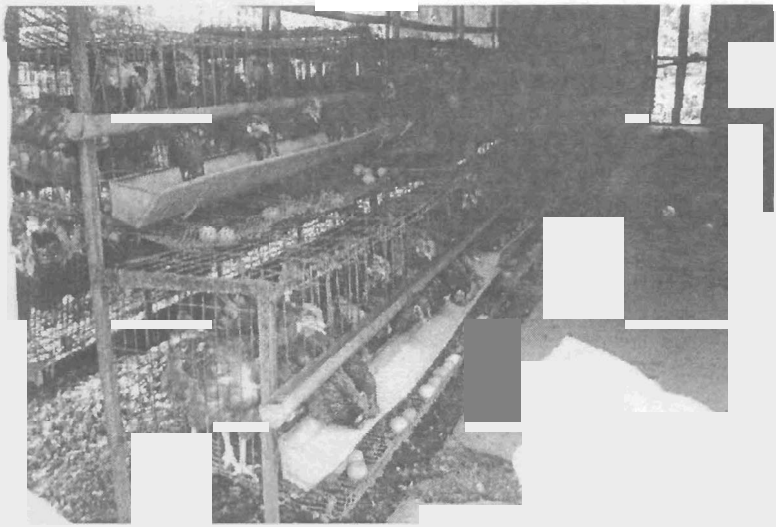

Fig. 3: Layers under [illegible] Cage Production On The Obafemi Awolowo University Teaching and Research Farm

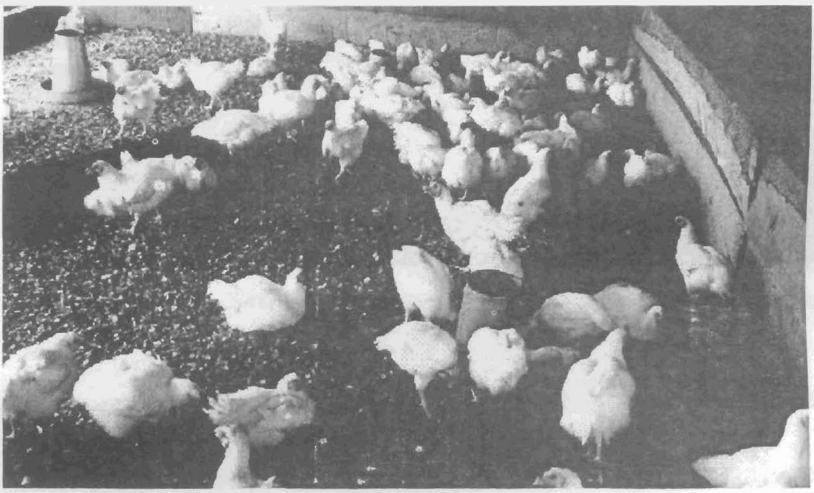

Fig. 4: Broiler Growers Being Raised Under Deep Litter System On The Obafemi Awolowo University Teaching And Research Farm

Birds are also given imported drugs and vaccinations to prevent certain poultry diseases at various scheduled times. The efficiency of meat and egg production is very high (Oluyemi and Roberts, 1979; Pesti *et al.*, 2005). There is also efficient utilisation of labour and the stocking density is very high. The main disadvantages of this system of rearing poultry, however, are that it is very expensive to establish on the short run, and highly balanced rations must be fed. Also, commercial egg and meat production generates lots of poultry waste.

Small scale producers rear a maximum of 1,000 birds, while medium scale producers rear a maximum of 10,000 birds and the large scale poultry producers rear more than ten thousand birds. Most times, large scale poultry producers may operate many Poultry Enterprises together. 65% of Commercial Poultry Production is attributed to South West Nigeria, while 25% lies in the South East and South - South. Commercial poultry meat and Egg Production is mainly for domestic consumption, not for export, and is a source of income for the producers. The laying bird population in Nigeria is about 42 million for a population of 150 million people with per capita egg consumption of about 60 eggs which is very low (Agbato, 2011) compared with the average figure of about 250 eggs for most developed countries of the world, and up to about 340 eggs for countries like Israel, Mexico and China. The population of broiler birds in Nigeria is about 175 million (FAO, 2009).

Nutrient Requirements of Poultry

The National Research Council (NRC) of America has reviewed and evaluated published results of nutritional research data from many experiments, and established that 41

dietary essential nutrients are required by poultry of all ages for maximum growth, egg and meat production and for maintenance of life (Table 4). The nutrients are classified into groups according to their characteristics. The NRC recommendations were based largely on experiments conducted under temperate conditions; it is worthy of note that their conditions are not the same as in Nigeria. Also, there is no nutritional standard that is adequate for all environmental conditions. Thus the NRC (1994) recommendations for various nutrient levels evidently provided a good guide for poultry nutrition research in Nigeria; however, the plain truth is that meaningful local research on same is a job that must be done.

Table 4: Classes of Dietary Essential Nutrients Required by Poultry

1. Water

2. Amino Acids

- Arginine
- Lysine
- Histidine
- Leucine
- Isoleucine
- Valine
- Methionine
- Threonine
- Tryptophan
- Phenylalanine

3. **Fats**

- Linoleic acid

4. **Vitamins**

Fat Soluble Vitamins

A	Retinol
D	Cholecalciferol
E	Tocopherol
K	Napthoquinones

Water Soluble Vitamins

B	Thiamin
B	Riboflavin
B	Niacin
B	Pyridoxine
B	Cobalamin
	Choline
	Folacin
	Pantothenic acid
	Biotin

5. **Minerals**

Macro Minerals

Ca	**Calcium**
P	Non-phytate phosphorus
Mg	Magnesium
Na	Sodium
K	Potassium
Cl	Chlorine

Trace Minerals

Mn	Manganese
Zn	Zinc
Fe	Iron
Cu	Copper
Se	Selenium
I	Iodine

Source: National Research Council, 1994.

Nutritional requirements are determined by many factors including the following: Breed, Sex, Size, Age, and Growth rate of bird, Egg production, Temperature, Stress and disease, Feed ingredient (storage, processing), Salts, Inhibitors and Antagonists.

Research has shown that fast growing birds fed higher protein levels grew faster, had better feed conversion rate, less abdominal fat (resulting in higher carcass yield), more breast meat (increased value of carcass) (Pesti *et al.*, 2005).

Nutrient requirements are determined under very good, stress- and disease-free conditions by Poultry Nutritionists, while Commercial Poultry Producers do rear their birds under stressful social conditions. Poultry producers are interested in profit. They know and use the nutrient level required for maximum performance. They consider the cost and composition of the feed ingredients, and formulate the least expensive feed that produces the maximum growth and maximum feed conversion ratio. This is known as the Least Cost Feed Formulation (LCFF). Another feed formulation is called the Maximum Profit Strategy (MPS), whereby the producer, by knowing the cost of each diet, and the total feed consumption, goes ahead to calculate the feed cost of production of broilers. Moreover, by knowing the weight of the broiler at a particular age and the live weight cost of broiler/kg, the producer calculates the cost of production and the returns, and formulates the ration that would give the maximum profit.

Nutrient Requirements for Poultry in Nigeria

The nutrient requirements of poultry have been established in Nigeria, based on many experimental researches conducted by many poultry nutritionists over the past 4 decades. These studies have determined the amount of various nutrients required. For example, the crude protein, energy, calcium and total phosphorus levels recommended for starter pullets (0-8 weeks) was 20%, 2650 Metabolisable Energy kcal/kg, 1.0% and 0.7% respectively (Obioha *et al.* 1982, Matanmi 1984). For broiler starters of 0-5 weeks of age, 23-24% crude protein and 2800-3000 Metabolisable Energy was recommended, while for broiler finishers of 5-9 weeks of age, 20% crude protein and 3000 Metabolisable Energy kcal/kg was recommended (Babatunde and Fetuga, 1976, Olomu, 1976). Many researchers have conducted investigations / experiments to determine the Nutrient Requirements of Poultry. This has led to the establishment of Nutrient Requirement Tables for Poultry in Nigeria, compiled by Olomu, 1995 and Aduku, 2005.

Nutrient Composition of Feed Ingredients

The nutrient composition of many feed ingredients was first determined by Oyenuga (1959) and later by other Nigerian researchers. The nutrient composition of various feed ingredients tables have been compiled by many researchers including Oyenuga (1959, 1978), Olomu (1995) and Aduku (2005). These analyses do divide the various feed ingredients into: energy, protein, vitamin and mineral sources. Fish meal has about 60-75% crude protein, Soybean and Groundnut cake contain about 49% and 44% crude protein respectively, while maize is a very rich and high source of energy.

Conventional Poultry Feed Ingredients/Unconventional or Alternative Feed Ingredients

Poultry need diets with high bioavailability of nutrients. Feed ingredients with highly digestible nutrients such as maize, fish meal, soybean meal and groundnut cake meal are used. These conventional feed ingredients are also in high demand by man for both domestic and industrial uses, thereby increasing their prices. These feed ingredients are known to have limited quantities of some essential nutrients such as: Lysine and Methionine, and therefore synthetic, imported expensive sources are used to formulate poultry rations. Feed alone accounts for over 70% of total cost of producing birds (Longe, 2006; Aguiha *et al.* 2011). The high cost of feed ingredients (Table 5) for feed formulation results in high production costs of commercial feeds. Maize constitutes about 50-60% of the ration, and the protein feed ingredients inclusion can be up to 30% in poultry rations. The high price of feed ingredients increases the price of poultry products and reduces the profit of farmers. Many poultry nutritionists in Nigeria have, during the past 4 decades, engaged in various research studies meant to source locally available, all-year-round, cheap, unconventional, or alternative feed ingredients that are not consumed by man. Some of these alternative feed sources include: agricultural, animal, industrial and food industry by-products such as rice bran, wheat bran, wheat offal, maize offal, rice offal, brewers dried grains, chicken offal, fish offal, blood meal, abattoir wastes, plantain peels, wild cocoyam, yam peels, cassava wastes, shrimp waste, spaghetti waste, biscuit crumbs, horse eye bean meal. For example, broilers can be fed 30% processed wild cocoyam without any adverse effects (Olajide and Akinsoyinu, 2011); and 20% yam peel meal can be incorporated in the diet of broilers (Inaku *et al.* 2011).

Table 5: Current Prices of Some Energy and Protein Feed Ingredients

Feed Ingredients	Price ₦/kg	Functions
Maize	60 – 75	Energy source
Soybean meal	115 – 118	Protein source
Groundnut cake meal	85 – 95	Protein source
Fish meal	260 – 480*	Protein source
Methionine	1,040 – 1,350*	Amino acid
Lysine	560 – 700*	Amino acid

*Imported Feed Ingredients ($1= ₦158)

Source: Adedeji and Siyanbola, 2011.

My Contribution to Poultry Research

Poultry Research in this University has developed along 6 main areas of Animal Science namely: Nutrition, Health, Genetics and Breeding, Processing and Products and Reproductive Physiology.

My own contribution has been largely in the area of Poultry Nutrition and Housing. Fortunately for me, some eminent Nigerian researchers such as: Hill and Modebe, (1958); Oyenuga, (1959); Ogunmodede and Wogar, (1971); Ademosun, 1973 and Oluyemi and Fowokan, 1973; had earlier carried out experimental studies, and reported along these lines.

Nutrient Requirement/Interrelationship

The bulk of poultry rations in Nigeria is made up of plant feed ingredients which are low in Calcium, Phosphorus, Methionine and Lysine. As far back as 1969/1970, I was initiated into academic research through a final year undergraduate project research at the University of Ibadan under the supervision of my Supervisor, Dr. J.E. Ekpenyong, and tutelage of the Legend, Emeritus Professor V. A. Oyenuga. The studies yielded results, which demonstrated the nutritional superiority of Opaque-2-Maize over the normal Maize with regard to egg production. The production of larger sized eggs was also confirmed experimentally (Ekpenyong *et al.* 1971). I have been involved with other poultry nutrition researchers in the Department for the past four decades in determining the following: nutrient requirements of poultry, the interrelationships among nutrients, rural poultry production, the housing of chickens and their behavioural patterns, and the replacement of some expensive conventional ingredients with

locally available and cheaper unconventional feed ingredients on the performance of poultry.

My Post Graduate Research was centred on the investigation of Calcium (Ca) and Phosphorus (P) interrelationship and requirement by laying pullets in Nigeria. In this study, the effects of 4 different levels of dietary Ca and 2 levels of P on performance of layers in battery cage and deep litter were investigated. From the studies, 3.5% and 0.6% were recommended as the levels of Calcium and Phosphorus required respectively for optimum egg production in layers in the battery cage or deep litter systems of housing poultry in Nigeria (Kalango and Ademosun (1973); Ademosun and Kalango, (1973). We pioneered work in this area as there was little or no information in the literature on the Calcium and Phosphorus requirements for layers in Nigeria at the time these studies were carried out. Up till today, the recommended levels of Calcium and Phosphorus for layers in Nigeria are still 3.5% and 0.6% respectively, as confirmed by the compilations of Olomu, (1976) and Aduku, (2005). It must be said on an occasion such as this one- the research under the supervision of Professor A. A. Ademosun culminated in the award to me, in 1972, of the Second Master of Philosophy Degree in Animal Science of the University of Ife.

In a related study we found of recent, (Fatufe *et al.*, 2011a), that 19% crude protein, as against the earlier recommended levels of 20-23% crude protein, might be sufficient for raising broilers from the starting to the finishing phase (0-8 weeks of age) on a corn-soybean diet. There is a need for regular re-evaluation of poultry requirements for poultry in Nigeria because of the following: genetic change in birds, the improved processing techniques of feed ingredients, and the higher bio-availability of nutrients in feed ingredients.

Much earlier on, I compiled from the literature a quantitative assessment of all the available research data on the nutrient requirements of different ages of chickens, meant to be a Reference Guide for Poultry Farmers and Researchers (Matanmi, 1978). At the time of the publication under reference, there were no compiled data on nutrient requirements of poultry.

I investigated the relationship between the two Essential Amino Acids i.e. Lysine and Arginine, on performance of 2 breeds of chickens. The experiments confirmed the occurrence of dietary antagonism between Arginine and Lysine in the nutrition of chickens irrespective of the source of protein (Matanmi, 1980). This study also showed that the Ancona breed of Chicken tolerated higher levels of Lysine than the other breed.

As far back as 1992, we evaluated two Methodologies: Questionnaire Survey, and Rapid Rural Appraisal (RRA) Techniques (Matanmi *et al.*, 1992), in collecting Baseline information for enhancing the productivity of small scale rural poultry farmers in Nigeria. The two methods were found to complement each other in collecting baseline information. Moreover, we found that in spite of the importance of Rural Poultry, very little research had been carried out on the overall management particularly: nutrition, housing, health and marketing of the birds.

In the year 2001, we pioneered work in the area of the effects of four different sources of water i.e. Stream Water, Well Water, Rain Water, and Pipe-borne Water, made available to Rural Poultry, on the performance of broiler chicken (Matanmi *et al.*, 2001). The study showed that any of the water sources used could be applied to broiler chicken without adverse

effects on their performance, provided that the concentration of ions was not more than the 4000 p.p.m. toxic mark. In another study, we pioneered the investigation of the effects of 3 types of drinkers used by Rural Farmers i.e. bamboo, clay pot and plastic fountain drinkers, on the growth performance of cockerels (Matanmi *et al.*, 2004). None of the drinkers used had any deleterious effects on the performance of the birds.

We also studied the comfort behaviour of birds at different periods of the day, using different types of drinkers (Daniyan *et al.*, 2001). The results showed that inability of birds to engage in comfort behaviours could have serious repercussions on their welfare. We also designed another study to investigate the effects of rain water compared with pipe borne water and 3 levels of ascorbic acid on the performance of layers (Ajuwon *et al.*, 2002). It was concluded from the results that there was no significant effects of water or levels of ascorbic acid supplementation on egg production traits and quality.

During the same year, we determined the effects of feeder space allowance on agnostic behaviour and growth performance of broiler chicks (Olukosi *et al.*, 2002). We observed that, during feeding and non-feeding periods, feeder space allowance had significant effects on agonistic behaviour of broilers. The results also showed that growth performance was optimal with feeder space allowance of 2.4cm/bird for the broilers under study. We also recently studied the effects of chemical treatments (Chlorine or Iodine) of well water on the performance and quantitative water intakes of broiler chicken, and observed that the quantitative water intake (ml/bird/day) of broiler chicken with daily weight gain of 40g/day under the hot humid tropics ranged from 35 during the first week to 550 at eighth week. It was found that the daily chemical treatments of

well water for broiler production might not be necessary at all (Fatufe *et al.*, 2011b).

Evaluation of Feed Ingredients

While I was a Research Assistant in the Department of Poultry Science, University of Wisconsin-Madison from 1972 to 1975, under the supervision of Professor M. L. Sunde, I evaluated Heated Soybean Meal using the slightly modified Cresol Red Technique. It was found that feeding raw or improperly heated Soybean Meal as the sole source of protein and amino acid depressed growth rate of chicks (Matanmi, 1980). It was also found that 3.3mg Cresol Red absorbed per gram meal was the lowest safe level for Young Chickens and Turkey Poults. This simple rapid method can be used for detecting under-heating as well as over-heating of soybean meal as a quality control measure.

The result of my joint investigations with other researchers on the use of some unconventional locally available and cheaper feed ingredients such as: Whole Cassava Plant Meal (WCPM) and Bovine Blood and Rumen Digesta Meal (BBRDM) had been fruitful, for the studies had established that these unconventional feed ingredients could be incorporated into poultry diets, to replace 50% of the maize in cockerel diets, or the soybean meal in broiler diets respectively, without adverse effects on their performance and haematological indices (Matanmi *et al.*, 2004; Akinfala *et al.*, 2004, 2007). The Crude Protein value of 9.1% of the WCPM was comparable with the values of 8.8 - 8.9% reported by Olomu (1995) and Aduku (2005) for maize. The Crude Protein value of BBRDM was higher (46.10%) than that of Soybean Meal (44.0%) (Table 6). These investigations constituted pioneering efforts in this area of poultry research. They have also highlighted the fact that

Cassava Leaves, Cassava Tender Stems, Abattoir (Slaughter House) Wastes such as Blood Meal and Rumen Digesta, which are not consumed by humans, could be used as poultry feed ingredients. This should also have an important impact on the effective management of these waste products in that, they could help to solve environmental and contamination issues in relation to human and bird welfare and health.

Table 6: Proximate Composition of Test Ingredients

Parameters (%)	BBRDM	SBM
Dry Matter	94.00	91.00
Crude Protein	46.10	44.00
Crude Fibre	6.38	6.50
Ether Extract	2.13	3.50
Ash	23.40	6.00
Nitrogen Free Extract (NFE)	16.00	31.00

BBRDM: Bovine Blood and Rumen Digesta Meal, SBM: Soy Bean Meal.

We have researched Acidifiers and Probiotics as Supplements meant to serve as Growth Promoters in Starting and Growing Broilers and Cockerels and also replace Antibiotics which have been banned completely in Europe. Matanmi and Fatufe,

(2008a) reported on their experiments designed to investigate age-related effects on Starting and Growing Cockerels and found that Growing Cockerels grew almost twice as fast as Starting Cockerels. Similarly, Fatufe and Matanmi, (2008a, 2008b) reported on the effects of Commercial Probiotics A containing *Saccharomyces cerevisae* and *Lactobacillus sporogenes* and Probiotics B containing *Saccharomyces cerevisae*, *Saccharomyces boulardii,* and *Lactobacillus acidophilus* on Broiler Chickens, and Bovan Nera (Black) and Gold Line (White) Cockerels respectively, as well as Broiler Chicken. Probiotics Supplementation significantly influenced ($P>0.001$) the ratio of final body weight and body weight gain.

In a 2×3 Factorial Design, 207 3-weeks old Bovan Nera and Gold Line cockerels were treated to three diets. The basal diet was based on Maize, Soybean Meal, Groundnut Cake and Wheat Offal. The Probiotics replaced the Wheat Offal in the diets in proportion of 0, 0.50 and 0.1%. Starting Chickens of both strains did not respond significantly to increasing Probiotics concentration in feed intake, body weight gain and feed/gain ratio.

Reminiscence

Mr. Vice Chancellor, Sir,

Following the completion of my Master of Philosophy (Animal Science) programme in 1972, under the supervision of Professor A. A. Ademosun, I proceeded to the Department of Poultry Science, University of Wisconsin – Madison, U. S. A., as a Research Assistant under Professor M. L. Sunde, Departmental Chairman. At Wisconsin, I majored in Poultry Science and minored in Biochemistry and successfully completed the Course-Work Requirements for my Doctor of Philosophy Degree Programme. But I had to return to Nigeria to complete the research, meaning that I picked a new research topic entirely at Ife. Thus I combined the Teaching Load with my Research, Services, and also the Rearing of a Family. But God saw me through all the rigours!

Since joining the Academic Staff of the Department of Animal Science of the then University of Ife, I had gained a lot of spiritual insight from Zechariah 4: 10a (KJV) which reads, "For who hath despised the day of small things?"

Over the years, I constituted a part of the Team that strengthened Undergraduate and Postgraduate Training, and Research into Poultry Nutrition, Animal Nutrition, and Animal Biochemistry in the Department of Animal Science. As far back as 1976 to 1980, I was the Staff In Charge of the Turkey Unit of the Teaching and Research Farm. It is a matter of record that we raised Turkey for six months in those days, and sold to the University Community in December at a purchase price of Twenty-Five Naira only (₦25) per Large-Size Turkey. Currently, the market price of a Large-Size Turkey at

Christmas is estimated to be up to Ten Thousand Naira (₦10, 000.00).

At this juncture, it is probably appropriate to state that the Academic Departments, in our University, like others, have faced significant changes, sometimes in the negative direction. Programmes have been reviewed and strengthened in line with global trends. Sadly enough, there has not been commensurate increase in actual funding of research, programmes, and the provision of equipment and supplies for teaching and research.

One of the positive developments, however, is our effort in the Department of Animal Science to provide meaningful Entrepreneurial Training through Teaching, Exposure, On-The-Job Training, and Close Supervision of the Internship Students, especially in Poultry Management Practicals which I have handled for many years.

Fig, 5a & b: Internship Students Brooding 11-Day-Old Broiler Chicks

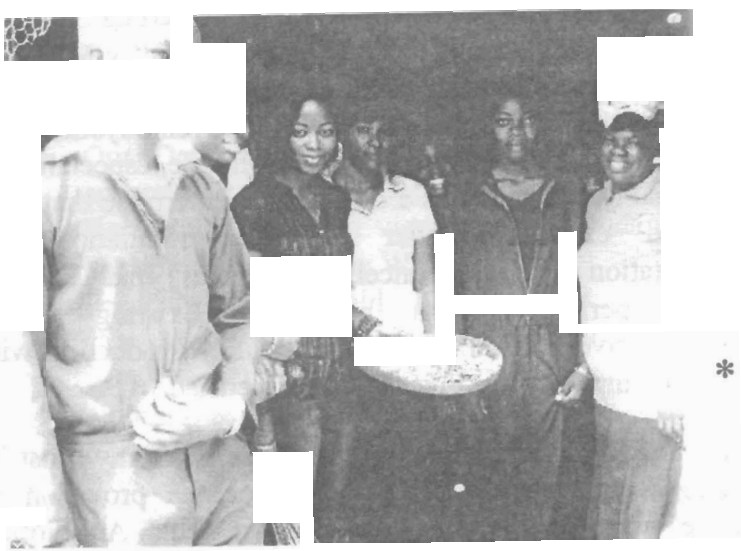

Fig. 6: The Lecturer, (*) Instructing Internship Students On The Brooding Of Chicks At O. A. U. Teaching & Research Farm.

The feedbacks we have received from the past Interns so far, showed that what we imparted into them during their Internship Programme in Poultry Management Practicals enabled the conscientious ones to be self-employed as Poultry Farmers after graduation, or even as an avocation before Graduation. Thus it goes without saying that the Programmes on Poultry should be sustained and even improved upon continually.

Some Food For Thought

Poultry production is considered to be of such strategic importance to the Nigerian Nation. Hence the appropriate Arms of Government at all Levels should, sacrificially, do everything possible to facilitate and actualise Poultry Production in the Family as well as the Commercial Sector in order that Nigeria could be self-sufficient in Poultry Meat and Egg Production and there will be excess that would be exported to other African Countries. It is proven beyond doubt that Poultry Production could be very profitable, especially the Commercial Sector, even as a demanding Enterprise that it is. The need exists, however for the articulation and implementation of well-conceived policies that are re-evaluated periodically as necessary. Existing Policy Statements have not hitherto treated Poultry Production with the needed emphasis and this should be rectified.

The Rural and Commercial Sectors of the Economy must be encouraged as necessary. This calls for the provision of adequate and timely inputs such as Credit, Antibiotics, Probiotics, and Organised Market etc. Thus, the Sector will be enabled to contribute its own quota in supplying adequate

dietary protein from animal sources and thereby contribute towards Food Security.

Mr. Vice-Chancellor, Sir, Some specific points are as follows:

1. The Government should facilitate the production of adequate quantities of maize, soybean and groundnut and encourage the production of unconventional feed ingredients such as cassava.
2. Another essential need is the availability of adequate small dose/vials of Vaccines e.g. 25 doses/pack that Family Poultry Farmers could use efficiently without the need for refrigeration.
3. Also, three is need for well-trained Poultry Extension Agents who would train the Farmers on the job, and ensure the success of Family Poultry Enterprise.
4. Cottage Industry could also be birthed and assisted to convert abattoir wastes into useful products, and poultry waste into manure for: Organic Food, Vegetable Production and Production of Biogas.
5. Our Departments of The Environment should also ensure that Poultry Farms are not operated within Residential Areas in view of the attendant pollution hazards due to Poultry Wastes.
6. Feed Millers should have proper Standards of Operation in order that their Products might meet Proper Specification and Quality Control.
7. Nutrient Requirements should also be Re-evaluated once every decade.

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Along the long journey of my Intellectual Development, I cannot forget the Contributions of the following, who allowed me to tap into their immense wealth of knowledge, experience, and stature, including Late Emeritus Professor V. A. Oyenuga, Late Dr. T. G. Ekpenyong, Professor J. A. Oluyemi, the Late Professor A. A. Ademosun, Late Professor A. A. Adegbola, Professor J. O. Akinokun, Late Professors M. L. Sunde, Suttie, and McGibbon, all of the University of Wisconsin-Madison. All of the above-named eminent scholars and researchers encouraged and assisted me in different capacities, and I am very grateful to them. I appreciate all my Colleagues in the Department of Animal Sciences and all Staff of the Poultry Unit of the Teaching and Research Farm. I do appreciate all my Research Students, Past and Present, for a meaningful working relationship.

My Husband, Professor B. A. Matanmi, shot all but two of the photographs displayed in this write-up. I also appreciate him for his support and encouragement.

I acknowledge all my Siblings for their love and affection; I am grateful to all my In-Laws, and all our Family Friends present. Finally, I most sincerely treasure the love of all my

and Grandchildren. Your tender-loving care continues to mean so much to me.

Mr. Vice-Chancellor, Sir, Ladies and Gentlemen, I thank you all for listening. God Bless You All.

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