

**UNIVERSITY OF PORT HARCOURT**

**NON-CONVENTIONAL FEEDSTUFFS  
AND NATURAL FEED ADDITIVES-  
PANACEA FOR AFFORDABLE AND  
SAFE ANIMAL PRODUCTION**

An Inaugural Lecture

By

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## **DEDICATION**

I dedicate this lecture first and foremost to God Almighty, who by His infinity mercies has made this August lecture possible in October, 2021. He has been the shield and refuge of my life and that of my family.

## ACKNOWLEDGEMENTS

I thank Almighty God, for giving me life to see the reality of this great day.

I appreciate, with great measure the 9<sup>th</sup> Vice-Chancellor (VC) Unique UNIPOINT, the amiable Professor Owunari Abraham Georgewill. It is by his approval that this inaugural lecture is possible today. V. C. Sir. It shall continue to be well with you in Jesus Mighty name.

I recognize the past Vice-Chancellors, past Deputy Vice Chancellors (DVC), Registrars, and Administrators, whose collective and individual efforts made UNIPOINT a unique University.

My reverence and special gratitude goes to my teacher and mentor, Professor Boma Magnus Oruwari, former DVC of Rivers State University. In him, I had my tutelage that brought me to where I am today.

I appreciate my lecturers and colleagues who added value in the cause of my academic journey. They include: Prof. Don Baridam, Prof. E. S. Lale, Prof. Wekhe S. N., Late Prof. U. Orji, Prof. A. Monsi, Prof. (Mrs.) A. O. Amachree, Prof. E. S. Erundu.

I also thank the numerous students of Faculty of Agriculture who, by teaching and supervising them, I have garnered enormous valuable experience.

To the General Overseer of My Church (Abundant Life Evangel Mission-ALEM), Apostle Eugene Egwuatu Ogu, and

all members of ALEM, whose spiritual support I enjoyed, I say thank you very much.

My family has been a pillar of great support to me. My late mother Madam Martha Nwokocho and my late mother-in-law, Madam Sarah Ironkwe showered me with unprecedented love and care. These enabled me to grapple with the enormous domestic duties while pursuing my academic and professional activities.

May their gentle souls continue to rest in peace with the good Lord.

I remain eternally grateful to God for my seven blessed children and twelve lovely grand children. Thank you for your love and prayers. I greatly appreciate my husband, my first love, a brother, my best friend, Professor, Barrister, High Chief, Deacon Uwaoma Ironkwe. JP. Thank you for your love and support.

## **ORDER OF PROCEEDINGS**

2.45 pm.        Guests are seated

3.00pm.        Academic Procession begins

The Procession shall enter the Ebitimi Banigo Auditorium, University Park, and the Congregation shall stand as the Procession enters the hall in the following order:

Academic Officer

Professors

Deans of Faculties/School

Dean, School of Graduate Studies

Ag. Provost, College of Health Sciences

Lecturer

Ag. University Librarian

Ag. Registrar

Deputy Vice Chancellor Research and Development

Deputy Vice Chancellor Academic

Deputy Vice Chancellor Administration

Vice Chancellor

After the Vice Chancellor has ascended the dais, the Congregation shall remain standing for the University of Port Harcourt Anthem.

The Congregation shall thereafter resume their seats.

**THE VICE CHANCELLOR'S OPENING REMARKS.**

The Ag. Registrar shall rise, cap, invite the Vice Chancellor to make his opening remarks and introduce the Lecturer.

The Lecturer shall remain standing during the Introduction.

## **THE INAUGURAL LECTURE**

The Lecturer shall step on the rostrum, cap and deliver her Inaugural Lecture. After the lecture, she shall step towards the Vice Chancellor, cap and deliver a copy of the Inaugural Lecture to the Vice Chancellor and resume his seat. The Vice Chancellor shall present the document to the Registrar.

## **CLOSING**

The Ag. Registrar shall rise, cap and invite the Vice Chancellor to make his Closing Remarks.

The Vice Chancellor's Closing Remarks.

The Vice Chancellor shall then rise, cap and make his Closing Remarks. The Congregation shall rise for the University of Port Harcourt Anthem and remain standing as the Academic [Honour] Procession retreats in the following order:

Vice Chancellor  
Deputy Vice Chancellor Administration  
Deputy Vice Chancellor Academic  
Deputy Vice Chancellor Research and Development  
Ag. Registrar  
Ag. University Librarian  
Lecturer  
Ag. Provost, College of Health Sciences  
Dean, School of Graduate Studies  
Deans of Faculties/School  
Professors  
Academic Officer

## **PROTOCOL**

- ❖ The Vice Chancellor
- ❖ Past Vice Chancellors
- ❖ Deputy Vice Chancellor, Administration
- ❖ Deputy Vice Chancellor, Academic
- ❖ Deputy Vice Chancellor Research and Development
- ❖ Past Deputy Vice Chancellors
- ❖ Members of the Governing Council
- ❖ Principal Officers of the University
- ❖ Ag. Provost, College of Health Sciences
- ❖ Dean, School of Graduate Studies
- ❖ Deans of Faculties
- ❖ Heads of Departments
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- ❖ Directors of Institutes and Centres
- ❖ Visiting Academics and Colleagues
- ❖ Esteemed Administrative Staff
- ❖ Captains of Industries
- ❖ Cherished Friends and Guests
- ❖ Unique Students of UNIPORT
- ❖ Members of the Press
- ❖ Distinguished Ladies and Gentlemen

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**INAUGURAL LECTURE:  
NON-CONVENTIONAL FEEDSTUFFS AND NATURAL  
FEED ADDITIVES-PANACEA FOR AFFORDABLE  
AND SAFE ANIMAL PRODUCTION**

I want to express my heartfelt gratitude to the Management of our great institution for the wonderful opportunity given me this day to showcase this age long topic that has not changed much from what people knew it to be. This special area that benefits every living soul is referred to as Agriculture. It's origin is from the bible; God was the first agriculturist that existed. He located His son Abraham and encouraged him to till the ground, blessed him with thousands of both ruminants and non-ruminant animals.

When God wanted to bless Abraham with animals, He advised him to leave his father's land and go to where he would have more lands to carry out his agricultural activities (Gen. 13:2-5). This continued up to Lot, his nephew, Isaac, Jacob, Esau and Joseph to mention but a few. When we were growing up, the first and main occupation we saw that our great grand and grandparents did was agriculture. They were feeding themselves healthily and robustly. By then, it was a normal practice for a man to marry as many wives as possible for obvious reasons which included having enough labour for his farm works and children that would eat the plenty food that were produced. Those in the riverine areas were engaged in fishing producing sea foods in abundance. But with time, things changed. The white man came and turned us into leaving this prestigious way of life (agriculture). Thus, rural urban migration in search of white collar jobs became fashionable. This new era witnessed mass exodus of the original farm hands from rural to urban areas to serve as house boys/girls for the whites who paid them peanuts insufficient to

care for their needs and that of their extended families. This adversely affected and discouraged the people remaining in the rural areas who now saw agriculture as a job for the poor and less educated masses. This trend continued until the first oil well was discovered in Oloibiri, Bayelsa State on Sunday 15<sup>th</sup> January 1956 by Shell Darcy. Attention was now directed to oil and everybody wanted to work in the oil and oil related industries.

Since then, things have fallen apart in Nigeria. Agriculture was now completely dumped and forgotten; as some will say died and buried. Even the Federal and State Governments relegated agriculture to the background. Agriculture that was the mainstay of Nigeria's economy before the discovery of crude oil became non-functional. From 1960 to 1969, the sector accounted for an average of 57% of Gross Domestic Products (GDP) and generated 64.5% of export earnings. Unfortunately, over the past five years, the sector has contributed an average of 23.5% to GDP and generated 5.1% of export earnings. With this dismal performance in our economy, do we need an oracle to tell us what to do? The panacea lies on our will in transforming Nigeria's Agricultural value chain. In our budgets, agriculture and education receive the least allocation every year. This has discouraged people from the field of agriculture including children who seek admission to study in the tertiary institutions.

There is ill-equipped demonstration farm to run practicals in the University. As we speak, our demonstration and teaching farm in Choba, has few animals in it. After graduating as Agricultural students, there are no integrated farms owned by government or even individuals where the Agric graduates can work. For the practice of entrepreneurial agriculture, there are no easily accessible soft loans to assist them. Even when the

professionals try to venture into this noble profession, to raise few animals, funds are not readily available. The animal compounded feed is grossly expensive and out of the reach of the small scale entrepreneurs, particularly in Animal agriculture. This pitiable but avoidable state has prompted this August lecture in the month of October. Experts in this noble profession (agriculture) including the guest lecturer who is a seasoned Professor of monogastric animal nutrition and production as well as an outstanding farmer, is here to address this age long problem. There are insufficient feedstuffs to compound feed for our animals, while human beings compete with the animals on basic ingredients such as maize, soybean and groundnut meals etc.

Is it not a paradox that in the midst of plenty, there exists lack? Herein lies the problem to Nigeria's agricultural development: Nigeria is blessed with abundant resources including good vegetation favourable for agriculture and sufficient rainfall. What is needed is the right policy, impetus and will for government and persons in authority to harness the abundant human capital (labour) and channel same to productive agricultural ventures. There are enough young school leavers roaming the streets seeking white collar jobs. These will produce enough food for human consumption and the desired ingredients for animal feed. At a time in this country there existed favourable agricultural policies such as Operation Feed the Nation, by President Obasanjo, School to Land in Rivers State, Agric Development Projects (ADPs) in various states etc, but today the story is different as these establishments are moribund. It is hereby advocated and recommended that the sure way to economic transformation of Nigeria is via Agriculture or Green revolution.

Animal agriculture is one of the fastest growing segments of agriculture. This includes the livestock/poultry sectors which gives human beings the cherished animal protein. The major aim of any business including the animal industry is to produce maximally with minimum inputs. Feed is one of the major inputs in animal production. But in our country, it has appeared to attract the highest cost or expenditure in poultry/livestock productions. It accounts for more than 70% of the total cost of production. (Iyayi and Tewe, 1997). Consequently, the constant increase in the cost of poultry /livestock feed ingredients has led to the high cost of formulated feed, thereby reducing the profit of poultry farmers (Kapil et al., 2015). This high cost also has an attendant effect of creating a wide gap between the supply and demand of animal protein (Shittu et al., 2004), thereby making animal protein very expensive.

The Nigerian Gross Domestic Product (GDP) from agriculture was about 152,32 trillion, (one hundred and fifty two trillion, and thirty two billion Naira), over (400 Billion U. S dollars) in 2019 (FAO, 2020). That means that about 24.50% of the Gross Domestic Product (GDP) was generated by the agricultural sector. The largest contribution was given by crop production, which generated 21.8% and livestock 1.39% of the country's GDP in 2020. Agriculture contributes a significant part of the country's GDP. It is a key activity for Nigerian economy as oil. Nevertheless, agricultural activities provide livelihood for many Nigerians, whereas the wealth generated by the oil reaches a restricted share of people ([Support@statista.com](mailto:Support@statista.com))

It is clear from the above statistics that more has to be done in the agricultural sector of the economy especially in the area of feed and feeding of animals. The traditional way of feeding poultry/livestock has always been through the use of

conventional feedstuffs and antibiotics. This has made animal productions to be very expensive and out of the reach of less income earners, (Amaefule et al., 2006). The animal industry from where we generate our animal proteins in the form of meat, milk, egg, and other animal products and by-products can be categorized into two, namely; monogastrics (poultry, swine, rabbit etc) and ruminants (cattle, sheep and goat) etc. But this paper today is going to address the imperative nature of monogastrics and why there is a clarion call on how they can be produced at cheaper prices to make the products available for the non/low income earners. Feeding monogastrics is more critical than their ruminant counterparts that can thrive and survive on free range, zero grazing on forages and agro by-products with little or no medication, (Aletor, 1986). This type of livestock rearing has always led to poor productivity and clashes between farmers and herdsmen in Nigeria.

Monogastric animals must be kept intensively and maintained on formulated diets using both conventional and unconventional feedstuffs if they must produce optimally (Ironkwe and Bamgbose 2012). In general terms, attention must be paid to balance nutrition for poultry if any meaningful thing can be made out of their production. The feeding of monogastric animal takes about 70% or more of the total cost of production (Aderemi and Wuroola, 2010).

Monogastric animals thrive well when they are maintained on balanced rations. Consequently, they yield the necessary animal proteins and by-products expected of them. The importance of animal product cannot be over-emphasized; it nourishes and fortifies the human body with all that it needs to build up immunity in young people and repair worn out tissues in the elderly.

Animal protein plays an important role in human nutrition in sub-Saharan West Africa and South Asia. Small amount of meat and milk added to typical diet of primary school children increased their performance in school and improved results of cognitive ability tests and activity levels and reduced the incidence of stunted growth (Ironkwe et al., 2013). The production of these animals are expensive and this in turn makes animal protein very costly and out of the reach of non and low income earners (Amaefule, et al., 2006). Nigeria, as a developing country experiences low production of animals as a result of using low genetic animals for production in addition to high cost of animal feeds. This has led to shortage supply of these important animal products and their by-products (Dauda et al., 2009). There still exists a wide gap between demand and supply of animal protein. Animals are still produced at very high costs because conventional feedstuffs namely maize, wheat, groundnut, sorghum etc are expensive as man competes with the animals for them. (Aderemi and Wunola, 2010, Abu et al., 2015). This high competition for conventional feedstuffs is what has brought Nigerians to where we are today (Olofuru-Okoleh et al, 2010, Agubiade et al., 2001). According to Iheukwumere et al., 2004, poor quality feeds are being sold to farmers at very high prices. Another reason is conventional feedstuffs are seasonal and are not produced in large quantities during the dry season (Ukanwoko et al., 2012). And because of lack of mechanized agriculture, prices of these conventional feedstuffs tend to rise when they are off season. A good example is maize which is not yet produced all round the year in some parts of the country (Saward et al., 2012). The government on its own part has not deemed it necessary to establish good agricultural programs that were operational some years ago. These include; Operation feed the nation, Agriculture Development Projects, (ADP), School to land, Songhai farm etc. These programs alleviated the sufferings of

the low income earners. The insecurity in the country has also not helped matters. Individual farmers are chased out of their farms, kidnapped or killed, “I want to ask at this juncture, why will there not be scarcity of crops to compound feed for our animals and even fish? You can agree with me that the attendant exorbitant prices of animal feeds and sequel high cost of producing livestock and poultry has left animal consumption at the reach of the middle and high income earners (Dairo and Ojekale, 2004). Only few people now can afford to buy one egg at the prevailing exorbitant price of about one hundred naira.

It is therefore obvious, that this lecture is timely, as it seeks to source for alternative feedstuffs that will not face stiff competition with man and will not have any direct industrial use (Amaefule and Ironkwe, 2004). Attempts to utilize locally available cheap feed resource will benefit the farmers and other end users in reducing the total cost of producing animals and their products. Animal protein will be available at cheaper costs at both urban and rural areas (Ironkwe and Ukanwoko, 2013).

Other conventional sources of animal-products such as fish meal, meat meal, bone meal etc including synthetic vitamins and minerals used in monogstric feed formulation are becoming too expensive in developing countries (Dauda et al., 2009). The availability of such supplements are no longer adequate because of their spiralling cost, as such, the importation for the same supplements have distant them from farmers. (Chot, 2006).

## **Pictorial Representation of some Conventional Feedstuffs (Energy Sources)**

**Maize; white and yellow maize.** The yellow maize is the most popular, palatable grain for all kinds of livestock and poultry. Maize is a high energy feedstuff with a metabolizable energy value of 3,350 kcal/kg. It has low protein level of 8-12%. It is deficient in some essential amino acids like lysine and tryptophan. Yellow maize has appreciable amount of carotene, both types of maize are low in calcium and crude fibre. White maize can also be used to formulate animal feed.



**Yellow maize (Plate 1)**

### **Sorghum (Guinea Corn)**

There are different varieties, but they do not differ much in their feeding qualities. Sorghum is lower in energy than maize; it has metabolizable energy level of 3,250kcal/kg., and a protein content of 8 – 12%. When sorghum is replacing yellow maize, it should be supplemented with about 3% dried green fodder feed to compensate for carotene. It contains tannins, these have deleterious effect on the nutritive value of sorghum as there is a reduction in amino acid availability. This reduction may be alleviated by adding lysine and methionine. Developed countries have succeeded in planting tannin free sorghum species.



**Sorghum (Plate 2)**

### **Millet**

Millet has metabolizable energy level of 2,984kcal/kg and protein level of 9 – 12%. It has indigestible fibre due to the presence of hulls which are difficult to remove. Millet can be used to substitute maize or sorghum if cost permits.



**Millet (Plate 3)**

### **Wheat**

Wheat is higher in protein than maize. It has about 9–15% protein and metabolizable energy level of 3086kcal/kg., but low in fats. It is a good source of iron, thiamin, lysine, tryptophan and B<sub>6</sub>.



**Wheat (Plate 4)**

**Plant Protein**  
**Groundnut**

Groundnut has metabolizable energy of 2,530kcal/kg. it is a protein dense feed resource, that contains about 45% crude protein. It is an important source of plant protein for livestock/poultry feeding. During processing, the oil is extracted as vegetable oil. It contains fats and fibre. The fat is unsaturated and a good one. Because of the much fat content, it goes into rancidity easily especially in a moist environment. It contains a toxic factor called aflatoxin, that is why it is not good to eat raw groundnut.



**Groundnut (Plate 5)**

**Soybean:** Soybean has protein level of 44%, with a metabolizable energy of 3,300kcal/kg. It contains fats and has the highest nutritive value more than any other plant protein source. It must be de-oiled before use. It contains all the essential amino acids. But it contains a toxic substance called trypsin inhibitor, this affects the digestibility of proteins especially in monogastrics, so it must be processed very well before usage.



**Soybean (Plate 6)**

### **Unconventional Feedstuffs**

From the foregoing presentation, it is obvious, that Nigeria is not yet food sufficient and as such has no food security. The crop production is not yet enough to feed over 200 million people and at the same time provide feedstuffs for our poultry and livestock industries. Nigeria has been dependent almost exclusively on the importation of some major feedstuffs like maize, soybean, wheat etc for the formulation of animal feed. This has made formulated animal feed to be very expensive. The poultry sector appears to be the worst hit by this unfavourable situation since it depends, and utilizes about 90% of these food crops for the formulation of their feeds (Dauda et al., 2009). Many people in the poultry industry have folded up because of high cost of feeds. This attendant high cost of feeds,

has resulted in low levels of animal productivity and hike in the prices of produced animals and their products. There is therefore a wide gap between animal protein supply and its demand (Onu et al., 2006). This has necessitated a need to explore the use of non-conventional feedstuffs that are valuable, cheaper and locally available (Dauda et al., 2009). It is imperative therefore to look inward for alternative feed resources that are cheaper to enable animals and their products be produced at affordable prices. This will help an average Nigerian to have access to animal products (meat, egg and milk) and other by-products (Madubuike and Ogbonnaya, 2003). Hence, the search for alternative feed resources has become inevitable to reduce feed cost.

### **Effect of High cost of Animal Feed on Animal Protein Consumption**

Livestock products account for about 30% of the value of agriculture and 19% of the value of food production in Nigeria (Ominisi et al., 2012). Meeting consumers' demand for meat, milk, egg and other livestock products is dependent to a major extent on the availability of regular supplies of appropriate cost, effective and safe animal feeds. As a result, animal feeds have become increasingly a critical component of the integrated food chain (FAO, 2004). Animal production may continue to be expensive if costly conventional feedstuffs are not replaced with cheaper and available non-conventional feed resources (Okoye, 2002). The means of reducing the rising cost of feed resources in livestock/poultry production should therefore be a major concern of all and sundry (Owosibo et al., 2017).

The welfare of people in a society can be measured by the quality and standard of food they consume. The quality of animal protein in a food, is a good measure of the living

standard of the people. (Igene, 1997). The livestock/poultry sector of the economy characterized by the supply deficit in meat, milk, egg and other vital animal products has led to low consumption of this prestigious food items. According to FAO, 2007, the average recommended animal protein intake is put at 53.8g/head/day. But this is yet to be achieved in Nigeria, where the consumption level is 45.4g/head/day, which is far below the recommended level. Several factors like high cost and paucity of feed ingredients, disease prevalence, lack of improved foundation (parent) stock and unfavourable government agricultural policies that is non-existent or where they exist, they are not implemented, lack of mixed crop/livestock farming to mention but a few, account for the deficit (Amaefule, 2002).

The feed industry in Nigeria is still faced with acute shortage of feedstuff supply and high cost of some other ingredients (Soybean, groundnut, wheat etc), this is responsible for the rise in the prices of animal products. A crate of egg that was sold for six hundred naira in 2019 now sells for one thousand, eight hundred naira. This problem is particularly aggravated with scarcity of cereal feedstuffs which constitute the major sources of energy and protein in livestock/poultry rations. There is therefore a clarion call for animal nutritionists to harness unconventional feed resources or agro-industrial milling wastes that can be used as substitute or replacement partially of wholly for conventional feedstuffs. Conventional feedstuffs face a stiff competition between human beings and animals, making them very expensive and always in short supply. Ironkwe, (2014), reported that the search for noble feedstuff that are cheaper, and locally available continues to be very foremost to researchers in synergy with efforts of animal nutritionists in the tropics to remove the toxic substances.

## **The presence of Anti-Nutritional factors in some Unconventional feedstuffs**

Some of the unconventional feedstuffs contain anti-nutritional factors that need to be removed through processing before the nutrients in the feedstuffs can be accessed by the animals, (Ologhobo and Fetuga, 2006). For example, cassava meals are noted for toxicity as a result of the hydrocyanic acid which it contains. Groundnut cake contains a toxic factor called aflatoxin, Gossypol toxicity is found in cottonseed cake. Soybean seed contains trypsin inhibitor and these affect the digestibility of proteins especially in monogastric animals. Many legumes considered as potential unconventional protein sources for poultry contain anti-nutritional factors that have negative effects on digestion and performance of birds (Ologhobo, 1992, D'mello, 1994, Huisman, 1995, Beric et al., 1997). The content of anti-nutritional factors in legume seeds depend on variety and cultivar as well as climatic and environmental factors (Preston, 1995). Most of the anti-nutritional factors are non-protein amino acids which are generally analogues of the essential amino acids or their derivatives (Odunsi, 2003). The relatively high concentration of these anti-nutritional factors in seeds is a major factor limiting the exploitation of alternative grain legumes as protein source for poultry and other non-ruminant animals (Ranjhan, 2003).

Simple methods of detoxification that will be easy and affordable to both the rural and small-scale poultry producers and commercial feed millers are needed to solve the problem. Heat/alkaline treatments of protein products may yield good results, they reduce up to 50% of the anti-nutritional factors in protein and amino acid digestibility. Tannins in sorghum and other cereals cause up to 23% reduction in protein and amino acid digestibility in poultry and pigs (Sarwar et al., 2012). Normally encountered levels of phytases in cereals and

legumes can reduce protein and amino acid digestibility by up to 10%. Lack of good knowledge on how to process these unconventional feedstuffs to get rid of the toxic substances and lack of necessary equipment to process some of them have reduced their usage in animal feeds. This has resulted to many of the non-conventional feedstuffs available in the region being used in small quantities or not being used at all.

### **Unconventional feedstuffs for poultry**

Nigeria has depended almost exclusively on the importation of some major feedstuffs like maize, wheat etc. The poultry sector depends and utilizes about 90% of compound feeds produced in the country. Many farmers of livestock/poultry industries have given up their businesses because of high cost of feeds. This condition has resulted in low levels of animal productivity and high cost of animals produced. These have affected animal protein intake by making it available only to the rich, medium and high income earners.

Nigeria must look inwards as a matter of urgency for unconventional feed resources to cushion the effect of high cost of any animal protein. Fortunately, the pioneering work of Oyenuga (1987) paved the way for understanding that agro-industrial by-products and crop residues could be economically used to supplement the conventional feedstuffs.

There is need to improve the scientific knowledge and researches, for utilizing the low cost, locally available agro-industrial by-products for poultry in order to reduce the poultry feed cost. Since feed constitutes over 70% of the total cost of any animal production, any attempt to reduce the feed cost will lead to a significant reduction in the total cost of livestock/poultry production. Poultry being a monogastric animal lack fibre degrading enzymes for the breakdown of

complex carbohydrates like cellulose, hemicelluloses and roughages. Since the complex carbohydrates is a major component of fibrous by-products like brewers' spent grain, rice bran, wheat bran, maize offal etc. There is need therefore to find ways of improving the utilization of these fibrous materials, as it will enable their incorporation into poultry diet at high inclusion levels, without any adverse effect on animal health and production (Agunbiade et al., 2001). There exists ample opportunity to utilize locally available by-products for economic production of poultry. Hence it is good to evaluate these by-products for economic feeding of livestock/poultry to produce more meat and egg in the coming years. Low cost poultry rearing will be a boom for marginal farmers. Research findings have shown that incorporation of these unconventional feed ingredients in poultry diets reduced the cost of production enormously, according to the Animal Report (2012 – 2013) ICAR Research Complex. Attempts to utilize locally available cheap by-products may benefit the end users in reducing the feed cost which in turn can reduce the total cost of production of meat, milk, egg etc. and make them available at cheaper prices to rural and urban dwellers in Nigeria.

## **Pictorial Representation of some Unconventional Energy-Rich Concentrates**

### **Brewers' Spent Grain**

This is a valuable by-product of the brewery industries that has the potential to be used as supplementary feedstuff for livestock/poultry. It is a noble feed resource when used as wet or dried ingredient. It contains metabolisable energy of 2,313kcal/kg and protein level of 28%, with some water soluble vitamins. The spent grain is good for both monogastrics and ruminants. It has high fibre content.



### **Brewers' Spent Grain (Plate 7)**

#### **Rice Bran**

This feed resource is realized during rice milling. It is made up of rice polishing, rice brain, rice hulls and broken rice. It is a good energy source for poultry. It has metabolisable energy of 1892kcal/kg and protein level of 13%. It can be used as substitute for maize.



### **Rice Bran (Plate 8)**

### **Sorghum Bran**

It contains vitamins like niacin, riboflavin and Thiamin. Has high levels of Magnesium, copper, calcium, and phosphorous, dietary fibre of 94% and contains 9 – 12 protein.



**Sorghum bran (Plate 9)**

### **Wheat bran**

This feedstuff has protein content of 9-15% and minerals such as calcium and phosphorous. It is a by-product of the milling industry of wheat. It has been a major agro - industrial by-product used in animal feeding. Has metabolisable energy of 1256kcal/kg, it is good for poultry and swine.



**Wheat bran (Plate 10)**

## **Maize Offal**

This is a by-product of various maize processing industries including starch and ethanol production. Has protein content of 10 – 15%, 30 – 32% lipids, contains fibre that aids digestion. It is rich in thiamin, phosphorous, vitamin, C and magnesium. It can be used to supplement or replace maize wholly.



**Maize bran (Plate 11)**

## **ANIMAL PROTEIN BY-PRODUCTS**

### **Fish Meal**

Fish product is obtained by processing whole fish. Contains total fat of 18%, the protein content is 44-65%. Contains vitamins A, and C, Calcium, iron, Vit. D, Vit.

B<sub>6</sub> B<sub>12</sub> and magnesium. Contains, zinc, iodine, copper)manganese selenium, fluorine. And has metabolizable energy content of 2645kcal/kg. ME



**Fish meal (Plate 12)**

### **Bone Meal**

It contains 1,988kcal/kg metabolisable energy content, crude protein 50.4% fat 10%, calcium 10.3% and phosphorous 5.1%. This is ground animal bones and slaughter house waste products. It is used as nutritional supplement for animals. It is primarily used as a source of phosphorous and protein.



**Bone meal (Plate 13)**

### **Palm Kernel Cake (PKC)**

Palm kernel cake meal (PKC) is the residue from oil extraction of palm kernel. Use of palm kernel meal as livestock feed is limited; because of its grittiness, dryness in texture and unpalatability. It contains 14% crude protein, useful as energy and protein sources. It can be supplemented with enzymes so that animals will be able to make better of the meal.



**Palm kernel cake (Plate 14)**

It contains 9-13% dry matter, slightly higher than maize, though much more variable depending on growing conditions. Like maize, has low lysine, and tryptophan. The protein content is 10-15%. Soybean has high nutritional value with high level of unsaturated fats. It is the fifth most produced grain in the world after wheat maize and barley. It is high in fibre. Minerals like potassium, magnesium, calcium, copper and thiamin are also contained in soybean Palm Kernel Cake.



**Soybean meal (Plate 15)**

This feedstuff contains 40 – 49% oil. The cake is obtained after it has been de-oiled. It is a good source of calcium, phosphorous, iron, zinc including vitamin E and small amount of vitamin B Complex. High in calories and the raw form contains up to 26% protein. Protein of groundnut shell is about 7.3%)haulms 8 – 15% (processed).



**Groundnut cake (Plate 16)**

## **ANTIBIOTICS (GROWTH PROMOTERS)**

The poultry industry has become an important economic sector in many countries with large scale poultry rearing. The industry is exposed to stressful conditions, including problems related to diseases and deterioration of environmental conditions which often occur and result in serious economic losses (Ironkwe, et al, 2013). The purpose of promoting growth rate, increasing feed efficiency and prevention of intestinal infections have led to an imbalance in the beneficial intestinal flora and the appearance of resistant bacteria in host animals and their products (Ironkwe, et al., 2013). Antibiotics was banned in Europe by the European Union in 2006. (Khan et al., 2016). The utilization of antibiotics as growth promoters in poultry and livestock feed have been scrutinized, and found that they pose a threat to consumers by generating resistance in the host animal as against the bacteria (Ironkwe, et al., 2015). One of the major consequences of the use of antibiotics in agriculture and animal husbandry is the presence of residues of these substances in food and environment (Ironkwe, et al., 2014).

The ban in the use of antibiotics has led to their limited use in many countries. There is therefore increased attention in finding alternatives to antibiotics like probiotics, organic acidprebiotics, to mention but a few. The only answer to the hazardous effect of antibiotics (growth promoters) on our animals is using natural additives, for better and safe production in livestock and poultry (Bidarkar et al., 2014).

## **ALTERNATIVE FEED ADDITIVES**

Probiotics are defined as live microbial supplements, which have an effect on the host animal by enhancing its intestinal microbial balance (Ironkwe, et al., 2017). They are used for growth promotion and immune system healthiness.

Probiotic is prepared using the culture of single bacterial strain, or a mixture of different strains, with the aim of eliminating the colonization of pathogens in the gastrointestinal tract of poultry (Ironkwe, et al., 2010). The main sources of probiotics in poultry are strains of micro-organisms such as *Lactobacillus*, *Enterococcus* and *Bacillus*. A good probiotics is characterized by its ability to exert a beneficial effect on a host, resistance to low pH and bile salts. They adhere and colonize the intestinal epithelium making the microbes non-pathogenic to the host and enhancing antimicrobial resistance to pathogenic bacteria as well as environmental conditions which could have cause serious problems and economic losses. Probiotics can prevent pathogens colonization of the gut and reduce the incidence of microbes or relieve the signs and symptoms of numerous diseases due to deregulated immune responses (Ironkwe, et al., 2014).

## **PROBIOTICS**

Probiotics have been defined as mono or mixed culture of live micro-organism which when applied to animals, beneficially affect the host by improving the properties of the indigenous micro biota (Khan and Iqbal, 2015). *Lacibacilli bulgrius*, *Enterococcus*, *Streptococcus*etc are most commonly used for the treatment of bacteria in the production of probiotics. Besides, yeast and unicellular fungi are also known for their fermentive ability. Yeast reduces enzymes such as amylase, protease, lipase as well as B-complex vitamins in the medium in which they grow.

Parker (1994), was the first to coin the “Probiotic” and describe it as micro-organisms or substances, which contribute to the intestinal microbial balance. In 1989, Fuller defined

probiotics as a life microbial feed supplement which beneficially affect the host animals by improving the intestinal microbial balance. Probiotics have been used as the opposite of antibiotics, while antibiotics destroys life, probiotics build up or promote life. The benefits of feeding probiotics to poultry are that they stimulate immune system (Sanders, 1984), improve utilization of proteins, improve intestinal tract health, improve feed conversion ratio, strengthen beneficial microbial populations and suppress harmful bacteria growth in the digestive tract, it counteracts adverse effects of antibiotic treatments by sustaining the population of beneficial bacteria and also in nutrient synthesis.

### **EFFECT OF PROBIOTICS ON GROWTH RATE AND BODY WEIGHT**

It has been shown from various studies that supplementing broiler diets with probiotics improves their body weight gain. Probiotics also improve the general health of chicks (Ironkwe, and Aderemi, 2015). When broilers were fed *Streptococcus faecium* at 200g/400kg feed by Uche and Ironkwe (2014), they observed that the total body weight gain in birds fed with and without *Streptococcus faecium* were 1570 and 1545g respectively.

### **PROBIOTICS EFFECT ON FEED INTAKE AND FEED CONVERSION EFFICIENCY**

Ikekwere, and Ironkwe, (2006). Reported that probiotics had been successful in improving feed conversion efficiency in broilers. Dike et al., (2016) reported that the supplementation of *lactobacillus*Casei improved feed conversion ratio from 0.3 to 3.1% as compared to control and treatments supplemented with antibiotics or probiotics. Okeli and Ironkwe (2016) reported that supplementation of probiotics product biospur in the diet of broiler resulted in improved feed conversion efficiency. (2.18 vs 2.90).

## **SURVIVABILITY IN GIT**

Ironkwe and Owens, (2018) found that administration of a *lactobacillus* concentrates at 0.5g/kg starter mixture to broiler chickens decreased the incidence of diarrhea and mortality.

Okoli and Ironkwe, (2017) observed favourable effect on the liveability of broiler after addition of probiotics in their diet. Dike et al; (2016) recorded lower mortality in broilers that were fed diet supplemented with probiotics.

## **EFFECT ON MINERAL METABOLISM**

Ironkwe, et al., (2017) reported that fermentation with strains of *lactobacillus* led to increase in calcium solubility which was related to lowered pH associated with production of lactic and acetic acids which in turn enhanced the calcium bioavailability due to increased calcium solubility.

## **EFFECT ON THE CHOLESTEROL METABOLISM**

Ironkwe, and Moses (2014) reported that birds fed lactobacillus showed significantly ( $p \leq 0.05$ ) reduced serum cholesterol in broilers after 30days of age. Agu and Ironkwe et al., (2014) reported that there was significant lowered ( $p \leq 0.05$ ) blood cholesterol levels in the broiler birds fed diets supplemented with probiotics. Okoli and Ironkwe (2017) reported that protein content of chicken given probiotics is higher, while their crude fibre, crude fat and serum cholesterol is lower than control treatment Ironkwe and Uche et al., (2018) also reported that supplementation of probiotics showed significant ( $p \leq 0.01$ ) reduction of serum cholesterol level. Iheukwumere and Ironkwe et al., (2016) also reported that supplementation of probiotics in broiler birds significantly ( $p \leq 0.05$ ) reduced total serum cholesterol level.

It can be concluded that feeding probiotics to poultry renders the following advantage: it improves the utilization of protein, intestinal tract health, feed conversion ratio, strengthen

beneficial microbial population and suppresses harmful bacterial growth in the digestive system, counteract adverse effect of antibiotics, improves nutrient synthesis, stimulates immune system, decrease diarrhea and mortality. Further, it improves feed intake, body weight, lower cholesterol in blood, serum increase meat quality along side with carcass yield. Therefore, feeding probiotics in broiler chicken is highly beneficial for economic production in the poultry industry.

### **ORGANIC ACID AS ALTERNATIVE FEED ADDITIVE TO POULTRY**

Organic acids have gained significant attention due to their high nutritional values and antimicrobial benefits. Iheukwumere and Ironkwe et al., (2016) reported that supplementation of organic acids in poultry diets was shown to increase beneficial microbial activity in the small intestine. It also suppresses the growth of certain species of bacteria such as *salmonella*, *E. coli*, *Clostridium perfringes* etc. Ironkwe et al., (2014) found that dietary inclusion of organic acids in broiler diets increased growth performance and improved intestinal morphology. It could be used as alternative to antibiotics growth promoters or as a tool of controlling intestinal pathogenic bacteria in broilers.

The term “organic acid” refers to a broad class of compounds used in fundamental metabolic processes of the body (Ironkwe and Uche, 2016). Organic acids such as propionic acid have been used for more than 30 years to reduce bacterial growth and mould in feedstuffs and thus preserve hygienic quality.

Researchers have shown that results obtained on the effect of organic acids agreed with previous studies which demonstrated that supplementation of organic acids in broiler diets increased growth performance, reduced diseases and overcome some management problems. Okoli and Ironkwe (2017), concluded that organic acids could be used in poultry

as a growth promoter and as a means of controlling intrinsic pathogenic bacteria. Kalu et al., (2018) found that addition of organic acids of broilers diets improved feed conversion ratio compared with those of un-supplemented diet. Ironkwe and Owens, (2018) reported that total live weight gain and gain to feed of broiler chicks were significantly improved by 9% and 12%, respectively for diets containing organic acids additives, compared with the control diets. Dike, et al., (2015), found that the basal diets supplemented with 2% citric acid in broiler diet significantly ( $p \leq 0.05$ ) increased feed intake, weight gain, better feed efficiency and retention of crude protein.

### **PREBIOTICS AS ALTERNATIVES FEED ADDITIVES TO POULTRY**

Prebiotics are defined as a non-digestible food ingredients that beneficially affects the host by selectively stimulating the growth and or activity of one or a limited number of bacteria in the colon (Kalu et al., 2018). This means that prebiotics provide a substrate for beneficial gastrointestinal microbes. Large amounts of bacteria present in monogastric small intestine are potentially capable of utilizing these indigestible carbohydrate sources of energy. Ironkwe, et al., 2018 suggested that the use of prebiotics is a promising approach for enhancing the role of endogenous beneficial organisms in the gut. They can be used as potential alternatives to growth promoting antibiotics (Ironkwe, 2015).

Ironkwe and Moses, (2014), reported relative increase in the weight of breast and thigh of broiler by adding prebiotics to poultry diets. Producers can minimize the use of antibiotics and drugs resistant to bacteria. Ironkwe and Kalu (2017) reported that prebiotic supplementation improves health status of the gastro intestinal tract, body weight was significantly ( $p \leq 0.01$ ) higher in fermacto ® broilers as compared with control group. Fermacto ® a microbial feed supplement derived from

Aspergillus Mycelium, it has been used as an alternative tool of helping newly hatched chicks. Ferrmaco ® improved broilers body weight gain by about 5-8%, and improved feed conversion ratio by 2-6% (Ironkwe et al., 2018).

Ironkwe et al., (2017) obtained significantly positive effect of prebiotics on performance and height of intestinal villus in small intestines of broiler.

## **PLANT ADDITIVES**

**Some plant additives have also been researched and found to have some medicinal effects on the poultry and its products. They can be utilized in the treatment of many diseases, ameliorating the immune system of birds.**

### **Pictorial Representation of Plant Additives**



Can be squeezed and the aqueous solution given to broilers as alternative additive.

It improves broiler performance.

It is antibacterial, antifungal and acts as antioxidant.

It gives broilers strengthened immunity.

#### **Gongronema Latifolium (Utazi Leaf)**

(Plate 1)



The aqueous solution also improves the microfloral built up.

It improves feed efficiency

It decreases blood glucose of the chickens. This makes it safe for human consumption.

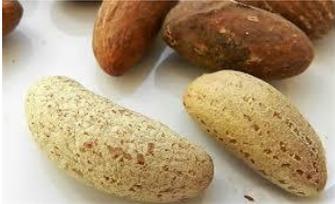
#### **Ocimum gratissimum (Scent leaf)**

(Plate 2)



The aqueous solution of bitter leaf improves and antagonizes the pathogenic microbes thereby improving their growth performance, haematological and serum biochemical indices of broilers.

**Venonia amygdalina (Bitter Leaf)**  
(Plate 3)



The processed liquid of soaked bitter kola nuts is sieved and included in the drinking water of broilers to increase their microbial

**Garcinia kola (Bitter Kola)**  
(Plate 4)

Aqueous solution  
It improves broiler performance.  
It kills pathogenic microbes thereby fighting bacterial infections



**Garlic (plate 5)**

It increases the rate of egg production, quality and weight of eggs  
It can be used in treating coccidiosis  
Garlic lowers bad cholesterol  
It can also be used as an anti oxidant



**Ginger (plate 6)**

Ginger is used to prevent growth of pathogenic microbes  
It supports the immune system of broilers  
It promotes weight gain in broilers  
It improves egg quality and production with lower level of bad cholesterol

## **Conclusion**

In conclusion, this study has established the obvious fact that for monogastric animals to be reared intensively, they require balanced diets. And since the feed ingredients to be used in formulating balanced diets are expensive, there is need to carry out more researches to discover novel feed resources that are cheap, nutritive and locally available. They should be easy to process for the removal of anti-nutritional factors. All these efforts will enable our prestigious animal protein to be produced at cheaper costs enabling the low income earners to enjoy these important products. The farmers will also be in a position to keep functional farms and make profit. The danger of using synthetic antibiotics in treating animals should be reduced to the barest of minimum, since it has been proved that it has residual effect on the animal and their products. This will protect human beings who are the end-users, from being contaminated by the dangerous residues and at the same time protecting the environment of where the animals are being reared. The lecturer advocates that animal farmers use alternative additives that are natural and will leave no residues on the animals that are fed with them and conversely the human beings that consume the animal products.

## **Recommendations**

I strongly advocate and recommend that the nation returns to agriculture which used to be our economic mainstay before oil. I make a clarion call today that the unconventional feed ingredients be used to feed the monogastric animals reared intensively. The reason being that animals will be produced at cheaper prices, thereby making animal protein affordable to low income earners, instead of leaving it as food for only the rich. Soft loans should be made available to those that indicate interest in agriculture, especially animal production professionals to establish farms, thus practicing what they

teach. These farms will employ both students and graduates in agriculture. The Government (Federal and States) should also embark on agricultural programmes like “school to land”, Agricultural Development Projects (ADP) as these will employ both graduates and non-graduates. By so doing, the country will be food sufficient and youth restiveness will be reduced. Mr. Vice-Chancellor Sir, I want to finally plead that you look into the situation of our Faculty farm. It is nothing to write home about. The farm is half-fenced and therefore unprotected. Consequently, it is vulnerable to rustling, and exposes the lives of the workers to danger. Hoodlums come and steal our cows. The structures in our farm are dilapidated; our laboratories are ill-equipped. Animal Science Laboratory has few equipment but no technologists to cow teach the students with them. Our students spend five years of study with no practical experience. If this continues they will not be able to compete with their counterparts in the outside world. On 2<sup>nd</sup> October 2021, it was reported that no fewer than twenty (20) cows were rustled. This is besides previous rustle experiences.

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## CITATION ON



### **Professor Monica Ogochukwu Ironkwe**

B.Sc., M.Sc., Ph.D.

(RSUST) LMSAP, MASAN, MNIAS

Professor Mrs. Monica Ogochukwu Ironkwe was born on the 8<sup>th</sup> October 1964. She hails from Amaoba, Oboro in Ikwuano Local Government Area (LGA), Abia State. She is the fourth child in a family of seven children. She came from a humble background. Her parents were engaged in farming and trading. Right from childhood days, Monica admired people who had formal education and she desired to be like them one day when she grows up. She attended her primary and secondary education at Amaoba Central School and Umuopara Secondary School, in Amaoba and Umuahia respectively.

Identifying her desire for further education, her family members went the extra mile, barring all financial challenges, to ensure that she was sponsored up to secondary school level.

Her burning desire for higher education was motivated when her heartthrob and first love, promised to encourage her to the zenith of academic attainment and excellence. Armed with this assurance, Monica agreed and got married to her precious husband on the 22<sup>nd</sup> of August 1982. Prof. Monica Ironkwe is happily and successfully married to Professor (Barr) Uwaoma Ironkwe. The union is blessed with seven prosperous children and twelve lovely grand children.

Professor Monica Ironkwe is firm and uncompromising in her concept and belief that constructive education should be a veritable instrument to prosperity (spiritually, morally, economically) and in transforming the society to a better place worth living.

Professor Monica Ironkwe bagged a Ph.D. in Animal Science in 2003 from the Rivers State University of Science and Technology (now Rivers State University), having earlier acquired her M.Sc. and B.Sc. degrees in Animal Science from the same University in 1995 and 1987 respectively.

She did her National Service (NYSC) in Shell (Community Development Department) in 1988. She joined Chidalkems Limited (Oil and Gas Services) where she rose to the rank of a Manager. Inspired by her academic calling, she resigned her lucrative executive job to join academics.

The career progression of Prof. Ironkwe within the University system commenced in the year 2000. At that time, she was employed in the College of Animal Science and Health, Michael Okpara University of Agriculture Umudike (MOUAAU) as lecturer II. In 2005, her services were transferred to the University of Port Harcourt. At the University of Port Harcourt, Professor Ironkwe by dint of hard work and grace of

God, rose through Lecturer I (2005), Senior Lecturer (2008) to become an Associate Professor (reader) in 2011. This erudite scholar and disciplinarian mother, was promoted to the rank of Professor (Monogastric Animal Nutrition and Production) with effect from 2014.

She is a regular attendee to Animal Science Conferences both in Nigeria and oversees (California State University, 2012, University of Manitoba, Winipeg, Canada and University of Regina, Sacarkachawa Canada).

She garnered vast administrative expertise including; Head of Department of Animal Science (2017 – 2019), Chairperson, Departmental Graduate Committee on Research and Development (2011 – 2014), Chairperson, Departmental Admission Committee (2009 – 2011), Chairperson, Faculty Lecture Series (2005 – 2016), Chairperson, Departmental Handbook Committee (2011 – 2013), Member, Committee to Review Faculty activities (2014 – 2016), Member, Departmental Appraisal Committee (2009 till date).

Professor Ironkwe is an active member of various relevant professional bodies viz: Nigerian Society of Animal Production (NSAP), Animal Science Association of Nigeria (ASAN), World Poultry Science Association (WPSA) and Nigerian Institute of Animal Science (NIAS).

In 2004, the Nigerian Society for Animal Production (NSAP) honoured this illustrious scholar with the prestigious Roll of Honour Award. Also in 2008 the Agricultural and Rural Management Training Institute Ilorin awarded her a certificate for successfully attending and completing a course on Agricultural Project Monitoring and Evaluation.

Professor Ironkwe has published widely (over 45 journal papers and 10 conference papers) in her field, both in Local and foreign, peer review journals. She is Associate Editor: Journal of Agriculture and Social Research (JASR) as well as Journal of sustainable Agriculture and Environment (JASE). She has written three books in her area of specialization which include: Broiler Chicken Production, Egg Production and Rabbit Production. Also, Professor Ironkwe has attended numerous Conferences and presented papers in her area of specialization both in Nigeria and abroad. Apart from academics, Prof. Ironkwe is a practical farmer. She owns a farm where she practices her profession. She is also a regular guest to the radio station Fm 95.1 programme where she speaks to the public on practical agriculture.

She has supervised many PhD, M.Sc. and undergraduate students. She has acted as external examiner to many Universities and assessed about seven candidates for Professorial rank.

In 2020, her Local Government, Ikwuano LGA appointed Professor Monica Ironkwe as a member of the Ikwuano post COVID-19 Economic Advisory Committee; a duty she discharged most creditably with commendations.

In religious circles, Professor Ironkwe is a dynamo; she is an ardent believer in God and the gospel of Jesus Christ. She remains a very active member and a Prayer Warrior in Abundant Life Evangel Mission (ALEM) where she is a Deaconess.

Professors, Distinguished Ladies and Gentlemen, kindly join me to welcome this erudite scholar, a loving mother, a virtuous woman, a faithful wife, a grandmother, a disciplinarian, an

entrepreneur, a loyal staff, a trailblazer in agriculture, Professor Monica Ogochukwu Ironkwe to mount the podium and present her inaugural lecture.

Thank you.

**Professor Georgewill A. Owunari**  
**Vice-Chancellor**