

**FEDERAL UNIVERSITY OF TECHNOLOGY  
MINNA**

**GIVE THEM TO EAT!  
UNVEILING THE SECRETS  
OF STAVING PERSISTENT  
HUNGER PROTESTS**

**BY:**

**Professor Anuonye, Julian Chukwuemeka**  
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**INAUGURAL LECTURE  
SERIES 113<sup>TH</sup>**

**27TH MARCH, 2025**



**FEDERAL UNIVERSITY OF TECHNOLOGY,  
MINNA**

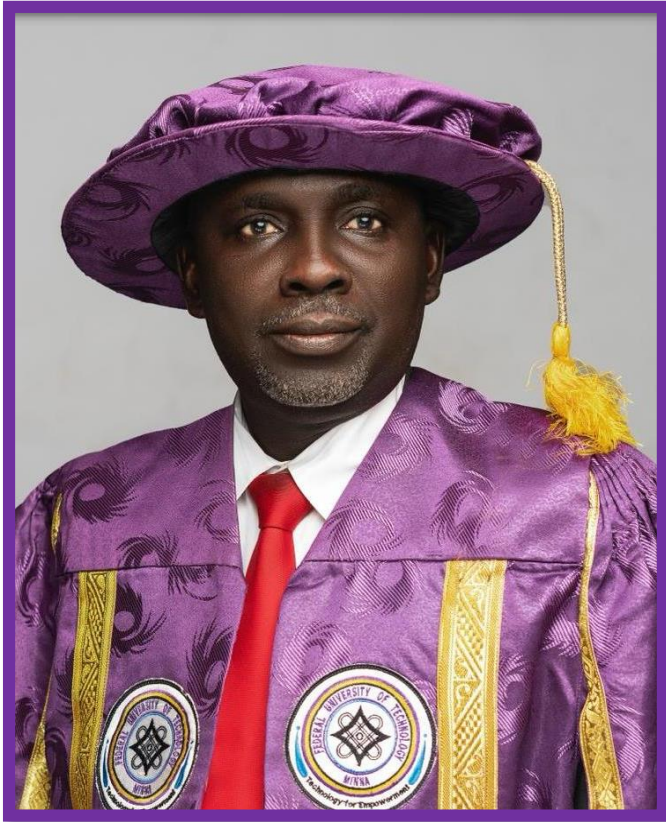
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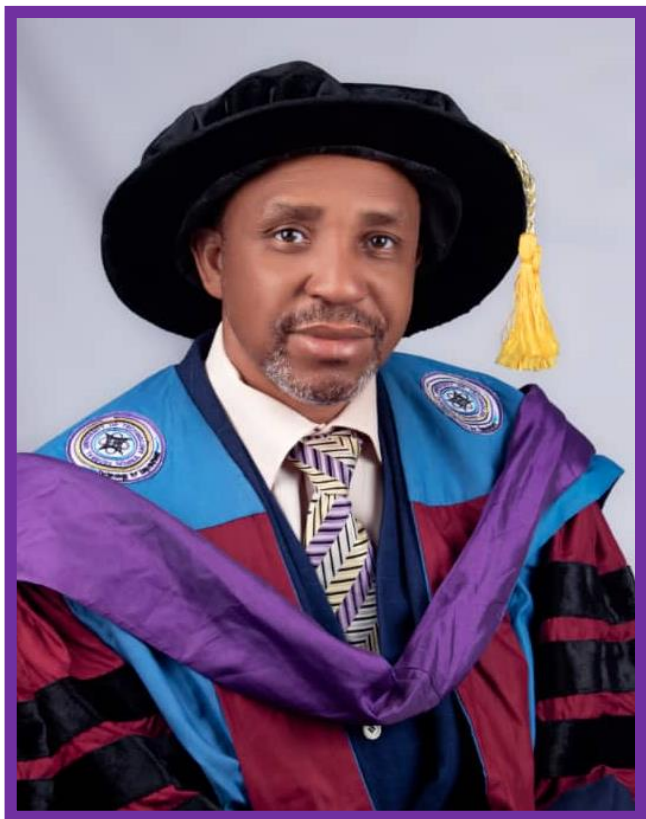
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**INAUGURAL LECTURE  
SERIES 113<sup>TH</sup>**

**THURSDAY, 27<sup>th</sup> MARCH, 2025**



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*B.Sc. (UDUS), M.Tech. (FUTMIN), PhD (ATBU)*  
**Vice-Chancellor**



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## **PREAMBLES:**

According to the Federal University of Technology advert on its colloquium page an inaugural lecture is an occasion of significance in an academic staff member's career at the university. It provides our professors with the opportunity to share their achievements in research, innovation, engagement and teaching activities before an audience of members of the University community and the general public.

Our Inaugural Lectures provide our professors with the opportunity to share their achievements and showcase the difference their research, innovation, engagement and teaching is making to society. The inaugural lecture series is therefore a platform for our professorial staff to contribute to the academic life of the University through the medium of a public lecture. But Ngoddy (2021) has postulated that Nigeria normally copies incompletely whenever it copies other nations hence the benefits that accrue to inaugural lecturers like three months paid research leave obtainable anywhere in the world is not mentioned not to talk of payment.

However, Abu (2024) explained that inaugural lectures such as this one in our clime is used for newly promoted and appointed professors to share their account on the journey leading up to attaining the rank and ought to take place typically within the first five years. Mr Chairman and Vice Chancellor, Sir, ponder over the fact that some people who applied for full professorship stayed over four years before hearing whether or not their assessments have come not to talk of whether it was positive or not.

I was indeed ready for inaugural lecture five years ago. But the dynamics at play within those years where my professorial promotion waited for four years for no just reason other than the assessments has not come in no small measures discouraged me such that I was determined to leave the University without delivery this lecture. However, and as providence will have it, this current change of mind is due mainly to your coming on board as the Vice Chancellor and the urbane manners where with you have attended to the affairs of this great citadel of learning.

I therefore humbly, crave your indulgences to so proceed with this lecture, hoping that the three months leave will come.

## 1.0 INTRODUCTION

Everywhere you turn today in Nigeria you just see hunger, written all over-; individuals, families, communities, local councils, senatorial zones states, regions and nationally. How did we suddenly arrived at such horrendous situation as we now have. This was not only sudden but completely unplanned and unexpected. Something beyond all predictions; economic, social spiritual or otherwise; but suddenly everywhere, hunger and deprivation has taken over such large populations that even war conditions had not produced such level of abysmal lack and squalor. It is the price every nation pays when madmen take over the asylum (apologies Peter Obi). Now the cry and anger against hunger and squalor has exceeded what would have never been expected as minors were locked up for treason for protesting the unnecessary and avoidable hunger that is now ravaging the nation.

History is replete with stories of hunger strikes and the inherent dangers what to eat and drink can turn out for individuals, a people and nations. Right from the garden of Eden to present day Nigeria all who have toiled with food and its compliments have lived to tell the bitter stories. **Had God said that you should not eat any of the fruits of the Garden was all that Adam and Eve needed to toil with before they were eternally removed from glory to gloom and till today all the generations of Adam are still bearing witness to that unfortunate avoidable encounter (Gen 3:1-4).** It was for a mesh of porridge that Esau sold his birth rite and when he needed it most, repentance could not avail him and he was recorded as a godless man. For hunger, delicate women in Samaria conspired and eat their children (2kings6:27-33) in order to survive the feminine in the land. Only eternity will unravel the number of families that hunger disrupted their courses of life during the Nigerian- Biafran war.

Nigeria have recorded quite a number of public protests arising from disconcerting levels of national discontent with economic conditions, poverty inequality and open wickedness aggravated by ethnic, religious and political corruption. Key incidences recorded in this wise will include but not limited to the following;

1. 1960s-1970s. Student hunger protests for better living conditions in the post independent Nigeria.
2. The national hardship and strike against dictatorship sparked off by the June 12 election annulment in 1993
3. The occupy Nigerian protest against fuel subsidy removal and bad governance in 2012
4. The university of Ibadan student hunger strike against prolonged ASUU strike
5. The 2020 #EndSARS protest against Police brutality and bad Governance.

There have never before been anything close to the recent 2024 hunger strike pitching mostly youths and minors against the Government of the day due to wide spread hunger and squalor. Considering the socioeconomic indexes of the nation, the hunger strike and indeed those that may still happen are inevitable just like accidents waiting to happen. A reflection of the economic situation of the nation leaves no cheering news at all;

1. 21.1% inflation rate as at Nov, 2024
2. Unemployment rate at 33.3% at the fourth quarter
3. 40% poverty rate indicating that more than 40% of Nigerian are living below the poverty line.

Currently these figures have doubled hence the causative agents of National hunger strife and male-discontent have spirally increased and agitation and expression of anger against hunger and such provocations are palpable. In the midst of these discontent the Government of the day seem to be acting like the Rome of Old which played while Rome was on fire. Nothing has been so humiliating as watching minors fainting in courtrooms charged with felony and conspiracy to overthrow Government by force. Nigeria indeed have never had it so bad. From The Police through the Judiciary to the legislators and Executive branch non has shown any meaningful and competent response to the near national tragedy that the Nation has just escaped by the whiskers.

In contemplating answers to this National embarrassment, a story in the bible keeps propping up. In Mark 6:32-42 *And they went away in a boat to a solitary place by themselves. Now many [people] saw them going and recognized them, and they ran there on foot from all the surrounding towns, and they got there ahead [of those in the boat]. As Jesus landed, He saw a great crowd waiting, and He was moved with compassion for them, because they were like sheep without a shepherd; and He began to teach them many things. And when the day was already far gone, His disciples came to Him and said, this is a desolate and isolated place, and the hour is now late. Send the crowds away to go into the country and villages round about and buy themselves something to eat. But He replied to them, give them something to eat yourselves. And they said to Him, shall we go and buy 200 denarii [about forty dollars] worth of bread and give it to them to eat? And He said to them, how many loaves do you have? Go and see. And when they [had looked and] knew, they said, five [loaves] and two fish. Then He commanded the people all to recline on the green grass by companies. So, they threw themselves down in ranks of hundreds and fifties [with the regularity of an arrangement of beds of herbs, looking like so many garden plots]. And taking the five loaves and two fish, He looked up to heaven and, praising God, gave thanks and broke the loaves and kept on giving them to the disciples to set before the people; and He [also] divided the two fish among [them] all. And they all ate and were satisfied.* (AMP)





*Figure 1: Protesting minors and their release after being charged with felony and over throw of govt for hunger protest. (Source: <https://21centurychronicle.com/fourchildren-slump-in-court-during-hunger-protesters-trail/>).*



*Figure 2: Minors arraigned for hunger protest (Source: <https://punchng.com/outrage-as-police-arraign-32-hungry-children-for-treason-four-collapse/>).*

*GIVE THEM TO EAT YOURSELVES:* That the days of several young men and women in Nigeria are far gone is an understatement. Several who graduated over twenty and something- years due to their ethnicity, their social background due to lack of the Nigerian connections due to the lack of the financial back-up are currently eking out life either as Keke drivers or Okada drivers or pure water daily paid factory workers or anything causal work can't but cause any man or woman of conscience to shed tears when juxtaposed with the hard facts that despite all our socioeconomic challenges Nigeria remains an under employed economy.

Their days were far gone since, because of the current pervasive corruption in the body polity of the nation. Gone are the days when university education was indeed a meal ticket. But these days it is the beginning of the nightmares. Unlike Jesus, our politicians would desire the defeated and harassed people to go home in hunger and remain quiet.

Protesting this unjust and avoidable hunger debacle brings with it a charge of felony. Too bad. Yet I hear the Lord clearly re-echoing this singular command-- **give them to eat yourself**. Even if the Government charge such protesters whose days are already far gone, not because of

anything they did but that those who should prepare and afterwards give them to eat abdicated their duties and now turn around to charge them with mutiny and felony, it remains yet a wild goose chase and a spot which the government of the day will wish it never occurred. Nothing can be more immoral than the present situation where in the Nigerian state, those who should know don't know and those who don't know are the ones occupying the wise men's seat. Few of the clearer reasons many young people's day are gone in Nigeria include but not limited to;

1. High inflation rates increasing hardship and poverty such that an estimated 87million Nigerians out of the 200million are below the poverty line
2. Youths are in danger from been 36% less productive from 2020 due to lack of clear access to education
3. Nigeria has the 7<sup>th</sup> lowest capital index in the world with very weak job creation and entrepreneurial prospects that stifle absorption of 3.5million Nigerians entering the job market yearly. The current poverty rate in Nigeria today is up to 38.9% translating to over 89Million of the 200Million people in Nigeria.
4. Nigeria is as at today the 2<sup>nd</sup> largest poor population after India.
5. In most areas in Nigeria, the state capacity is low, services delivery is limited or non-existent while insecurity and violence are widespread (World Bank last updated October 2024).

***This is the sad story of our dear Nation. The political elite are comfortable and keeps shouting send them away let them go and find something to eat even though their days are gone. Yet the cry of heaven remains Give them something to eat yourself.*** North, South, East or West, a legion of poor youths are for no fault of their own, exposed to biting food Insecurity. Every step or misstep taken so far by the Government of the day has widened the gap of the already chaotic food insecurity threatening the fabrics of our national cohesion. Did we suddenly find ourselves in this quagmire? No. It is a self-made and self-imposed tragedy that happens when defiant and arrogant, impulsive, recalcitrant, and unimaginative, clueless uneducated, uncultured, uncaring, self-indulging, unrealistic, biased, bigoted, short sighted

myopic, clannish, irritable and false patriots take charge of critical aspects of governance. The Nigerian situation already situated among the worst in the comity of nations was an accident waiting to happen. That it was allowed to happen even after weeks of notice best describes the kind of political leadership currently midwifing the health of the nation.

This current situation only confirmed what Anuonye *et al.*, (2011) posited about 13 years ago. They reported that ***“that Africa and especially sub-Saharan Africa is in danger of food shortages is no longer news. What is news however is the inability of this region to rise to the great danger facing it in terms of provision of adequate food. This is so perplexing as this region possess the greatest natural endowments for prosperity and subregional, regional and international influence. With weak political leadership, threatening climate change realities, decreasing crop yields and increasing banditry and kidnapping the woes continue to exert unholy pressures over the fortunes of sub-Saharan African Nations.***

Globally, however, food security remains an unfulfilled dream for more than 800 million people (Anuonye, 2006) who are unable to lead healthy and active lives because they lack access to safe and nutritious food. More than 840 million people lack access to enough food to meet their daily basic needs, while more than one third of the world’s children are stunted due to diets inadequate in quantity and quality (WHO, 2001).

Anon (2003), reports that the World Health Organization (WHO) called protein energy malnutrition, (PEM), the silent emergency. According to this report, it declared that PEM is an accomplice in at least half of 10.4 million child deaths each year. WHO (2001) reports that malnutrition cast long shadows, affecting close to 800 million people with 20% of all such people in the LDC. Reports of these wide growing nutritional problems have been steadily mentioned even in Nigeria (Smith and Oluwoye, 1988). Those mostly affected are children, lactating mothers, pregnant women and the elderly. Majority of this class is found in the rural areas, urban slums where common heritage of poverty, ignorance, poor sanitation and other conditions contribute to the problems of malnutrition, interfere with its solution, and thus perpetuate a vicious

cycle (Anuonye, 2006; Iwe,2000). Most malnourished people live in Asia and Africa; and the staple of most people in Asia and Africa are starchy pastes. These pastes are made from cereals (sorghum, rice, maize, wheat, millet, acha) roots and tubers (cassava, yam, sweet potato and plantain). These crops do not only provide marginal nutrition (especially for children) but also require high inputs of time, labour and fuel to prepare.

According to Anuonye *etal* (2011), one of the greatest challenges of changing climate patterns is the decreased productivity of the familiar food crops that could mitigate hunger and infant malnutrition. There is the overhanging fear that infants and nursing mothers may be more affected nutritionally when there is less food available. The situation is made worse in Sub Saharan Africa where animal sources of protein continue to be out of the reach of the average family. **Low wages combined with increased joblessness and difficulty in assessing credit have nearly wiped out the middle class creating a new social order of the rich and the poor. This situation is aggravated by the extended family systems which entails that the average working-class person will cater for his or her extended family.** This leads to a vicious circle of poverty. Children are therefore born into this unfortunate web hence weaning children presents peculiar challenges.

But Nigeria over blessed with both unique agroecological ecosystems and enviable peculiar hydrology, presents a very pitiable visage viewed from any angle.

According to Adigbo *etal* (2013), Nigeria has eight fadama areas (inland valley or flood plains). These include the Sokoto Basin, Chad Basin, Middle Niger Basin, Benue Basin, Southwestern Zone, South-Central, Southeastern and Basement Complex. The estimated 3 million ha of the fertile soils of the fadama in Nigeria, with residual moisture in the dry-season, offers attractive opportunities for the arable farmers to grow off season high value crops but the scarcity of major agricultural crops during the dry season suggests that this resource is not been fully exploited. In their conclusions they averred that it is very glaring that naturally abound inland Agroecosystems, valley in Nigeria is a high resource potential for food crop production. It is robust and resilient

resource that could support triple cropping systems on sustainable basis without the fear of deterioration. Each component of the triple crop in the inland out yielded its counterpart on the highland. Thus, for Nigeria and indeed Africa to be efficient, judicious management of wetlands may likely be the pathway to satisfactorily meeting the food supply of teeming population of a continent plagued by poor soils, drought and unfriendly environmental.

Nigeria has extensive areas of mangrove forest which are also an important source of timber and non-timber forest products (NTFP) for the Nigerian population. The Niger delta have over 3100km of coastline and an estimated over 1million hectares of mangrove forest making the largest mangrove system in Africa. In 1995 the annual value of timber products from the Niger Delta, was estimated to be \$22.8 million. Where are the other forest resources in Nigeria?

Nigeria's proven oil reserves are estimated by the United States Energy Information Administration (EIA) at between 16 and 22 billion barrels ( $2.5 \times 10^9$  and  $3.5 \times 10^9$  m<sup>3</sup>), but other sources claim that there could be as much as 35.3 billion barrels ( $5.61 \times 10^9$  m<sup>3</sup>). ***This resource will last Nigeria for another 273 years if not exported. From what is available now, the summary is that Nigeria rakes in over 50billion US dollars (more than 29 trillion naira) annually from crude oil alone. What of the non-mineral reserves. The Minister of Solid Minerals Development, Dele Alake, disclosed that Nigeria currently possesses a deposit of mineral products worth \$750 billion. This translates to unbelievable equivalents in naira.***

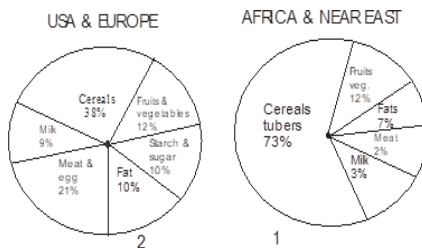
But anyone who asks where is the monies will be looked at as foolish and unpatriotic while the wicked and unpatriotic one whose wickedness and vice has prolonged our transition from squalor to robust civil nation developing in all ramifications now prowl over the land as the messiahs with empty rhetoric's covered in the same agelong deceptions. No nation endowed as Nigeria currently is, can be excused for the low level of life and low-economic well-being currently been experienced in it. No one who understands the level of deprivation that Nigerians have endured and continue to endure can raise one word in defense of the current system.

It is painful that as at today, even the height of Nigeria’s intelligentsia is struggling with the nagging poverty in the Nation in the midst of plenty.

**2.0 THE BATTLE AGAINST HUNGER AND DEPRIVATION:  
THE PRODUCT DEVELOPMENT AND FOOD CHEMISTRY  
ANGLE**

As already observed our Lord Jesus Christ was very explicit in his command to the disciples to go and find out what was on ground and available for multiplication. As a loyal disciple of the master, following this pattern as the secret of staving hunger protests, I employ you Mr Chairman and distinguished audience to follow me as I show you what we in our small corner has discovered available for the Nigerian nation waiting for multiplication for all and sundry.

As a background it is acknowledged that the situation of the African continent and the far east compared to North America and Europe presents significant imbalance in nutritional comparisons. While the industrial world had conquered hunger and squalor, sub-Saharan African is yet to have enough food for its teeming populations. The reasons are not far-fetched and has been continuously explained and elaborated upon that we will not waste precious time going over the much over flogged issue. However, looking at figure 3, it is clear that there are compelling reasons for us as a nation to pay particular attention to development of new foods.



Figs:

**Figure 3: The Disparity of the nutritional realities between developing and Developed Nation (Iwe 1989)**

*It should be noted and clearly taking in, that apart from the salvation in Christ and the word of God, the Food scientist holds the key to national survival and cohesion as he has the mandate to find answers to the many complex issues of diversified and nutritious food to maintain a continuously growing population.* In a nation as our own, where there are no planners but plunderers the efforts at mitigating avoidable hunger and its deprivations becomes herculean. The need for new food product development cannot be over emphasised as the fear of hunger rage has become wisdom for both the powerful and the man on the street. Compelling issues for new product development are shown in the figures below.



Figure 4 : Some of the Nigerian Flood plains with its enormous Potentials. Source: Anuonye 2020 (GMP REPORT).

1. **It is worth noting that** Nigeria seemingly possesses a wider variety of agricultural commodities than many industrialized countries. But unfortunately, there are limited varieties of equivalent processed food items. This trend is due to the fact that there is limited variation of available manufactured local foods stemming

from the apparent low creativity and little adventure of the bulk of the food practitioners. The consequence is that many people in the food business often run out of ideas as to what new dishes could be served to minimize repetitions and reduce drudgery and elongated preparation times.

2. There is also a very deep entrenched ethnic and cultural attitude to food and feeding stuff in Nigeria compounded by religion. What may be consumed in some climes with relish and abandon can become the reason for very implosive and explosive conflagration in other climes thus the food scientist is presented with very serious cultural and religious matters to contend with in the quest for new product development.
3. This is also a general inadequate nutrition in Nigeria hence consumer satisfaction of their nutritional needs is expected to increase with intensified industrial development and urbanization. It is therefore expected that processing, preservation and distribution of foods leading to market availability of a wide variety of new products at competitive prices would become more acute.
4. The quest for export to earn scarce foreign exchange can also not be over looked at the prospects of enhanced new food product development.

### **3.0 MY INVOLVEMENT**

In this lecture I will be showcasing according to the divine counsel what we have as a basic base line for serious Government intervention in the battle against avoidable hunger and its overflowing consequence.

#### **3.1 Fortification of Indigenous Meals with Soybean for Effective Food Security in Changing Climates. Introduction**

Across the African continent, protein energy malnutrition affects 40% of children under three years. This situation may not be unconnected with the weaning culture. A semisolid cereal starch reconstituted to a gruel is the major weaning food. It is stored for a few days by leaving in fresh water that must be changed every other day. The high moisture content (78-80%) of the extracted starch paste predisposes it to quick microbial



and other physico-chemical degradation resulting in low shelf-life. There is a great imperative in the complementation of available weaning foods in developing nations. While Development of drought resistant soybean varieties is imperative in view of the challenges of changing climate, however the greatest challenge to soybean utilization remained the significant changes in the colour taste and texture of foods complemented with soybean flour. For tuber flours like cassava yam etc and pulp fruits such as plantain and banana flours loss of firmness and mouldability of reconstituted dumplings remained a major challenge in the utilization of soybeans and its products. According to Anuonye (2011) development of weaning foods of cereal /soybean blends is greatly impeded by the instability of soybean products at ambient temperatures, thus posing serious storage problems. This is made worse by unstable electric power supply, ruling out refrigeration and other cold preservation considerations at the house hold and small-scale industrial levels. Use of roasted soybean flour along with dry milled cereal flours would have been an alternative but the coarseness of the end product and inherent raw soybean after taste (beany flavor) limits the acceptability of the end products.

**TABLE 1: Amino Acid Profiles of Several Crops Fortified with Soybeans**

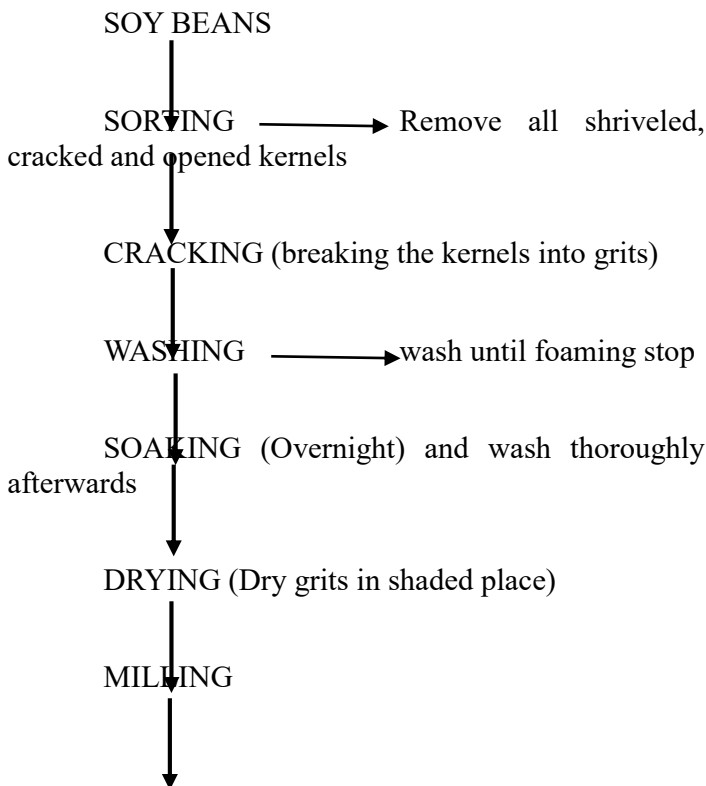
Amino Acids	Acha/soybean blends					FAO Recommended levels	
	Acha/soybean flour(a)	Yam flour/ soybean flour (b)	Soybean flour (c)	Unripe plantain flour (d)	Soybean flour/unripe plantain flour (e)	Children (f)	Adults (g)
Lysine	4.17	3.51	6.24	2.31	4.00	5.50	2.40
Histidine	2.08	2.55	2.38	0.88	1.10	1.40	2.00
Arginine	2.98	4.25	7.49	2.30	3.91	Nil	Nil
Aspartic Acid	4.30	5.27	9.33	3.00	4.61		
Threonine	4.00	3.41	3.77	1.00	3.00	4.00	1.40
Serine	3.05	3.51	3.02	2.05	2.59		

Glutamic Acid	6.20	9.67	14.26	4.10	3.40		
Proline	3.08	1.02	3.19	3.08	2.97		
Glycine	3.45	4.16	4.55	3.06	3.51		
Alanine	2.86	3.71	3.94	2.08	2.49		
Cystine	1.82	1.71	1.59	0.40	0.79		
Valine	5.05	5.31	5.08	3.49	4.00	5.00	2.00
Methionine	2.51	2.20	1.23	0.39	0.70		
Isoleucine	4.24	3.81	4.64	0.78	1.02	4.00	2.00
Leucine	8.04	8.01	7.91	1.02	6.20	7.00	2.80
Tyrosine	3.05	3.19	3.54	2.42	3.06		
Phenyl Alanine	0.76		5.41	0.76	3.13		

a= Anuonye *et al.*, 2006 b= Anuonye *et al.*, (2016) c= Anuonye *et al.* (2006) d= Anuonye *et al.*, 2012 e= Anuonye *et al.*, 2012 f= FAO 1980 g= FAO 1980.

Soybeans by its chemical composition have recieved global attention. I participate actively in the generation and diseamination of new processing and utilization technologies. Of importance is the devlopment of multipurpose soyflour with white colour appeal. Since sundrying and air ovendrying leads to soybean flour browning and cold processing leads to offensive grassy and beany flavours due to the recations of the lypoxygenase enzymes with cold water, we developed a processing technology (Figure 5) which yeilds soyflour with white colour appeal. With this flour simple house holhd food fortification was made easy providing diets for infants, nursing mothers the aged and vunerable with adequate calories and needed protein and minerals (Alabi and Anuonye, 2007). It was also in this effort to diversify the utilization of soybeans and its products that we developed the nutritrious soy-kunuzaki beverage. A beverage made from soybeans and cereals in a 1:1 ratio (Anuonye *et al.*, 1995). This research work have progressed to the point of bottling a shelf stable carbonated soy-kunuzaki beverage. All the efforts of our research in soybean processing and utilization are captured in the summaries of the book chapter): Soybean Utilization and Fortification of

Indigenous Foods in Times of Changing Climates. In: Soybean-Physiology and Biochemistry. INTECH OPEN Publishers Vienna Austria Chapter 12: 209-230.



**Soybean** Flour with greater white colour appeal (Alabi and Anuonye, 2007)

**Figure 5: Flow Chart of Soybean flour with greater white colour appeal.**

We also looked seriously into the rice situation in the country. Of interest is the New rice for Africa (NERICA). At its inception it made waves and become a political weapon to cower many developing nations. However, we took a study of the NERICA lines and compared long standing locally

released varieties. Eighteen elite lines of NERICA(NI-18) were assessed for proximate, amino acid amylose content and viscosity profiles. The results indicated that protein varied from 7.47+0.21 to 11.73+0.15% parboiled samples and from 6.87+ 1.01 to 11.65+ 0.51% for the unparboiled or raw samples. Fat also varied from 5.57+ 4.22- 6.00+ 0.54 the parboiled samples and from 5.33 to 6.33+ 0.5% for the unparboiled samples. The amino acid profile showed that both parboiled and unparboiled samples met the Food and Agricultural Organization (FAO) requirements for infants, adolescent and adults for histidine, threonine, valine and isoleucine and leucine. Both samples and the check were however deficient in lysine (4.01-4.60). Parboiling did not significantly ( $p<0.5$ ) improve the proximate and amino acids composition of samples. The unparboiled milled samples had higher amylose content (23.84 – 50.85%) compared to (12.85 – 31.81%) of the parboiled samples. The amylose content of the parboiled samples placed them in the intermediate amylose category. The pasting properties showed that raw samples exhibited conventional non-waxy cereal pasting characteristics while the parboiled samples indicated destructuring in the pasting profile. The results were indicative that the NERICA LINES would have high cooking qualities.

**Table-2.** Proximate composition of NERICA lines (parboiled) compared to checks

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Crude Fibre (%)	Carbohydr-r (%)
L1	8.19±0.03 <sup>c</sup>	8.72±0.28 <sup>d</sup>	5.26±0.41 <sup>c</sup>	0.85±0.30 <sup>b</sup>	1.05±0.67 <sup>c</sup>	76.11±0.29 <sup>a</sup>
L2	8.43±0.15 <sup>c</sup>	10.31±0.29 <sup>b</sup>	6.00±0.24 <sup>b</sup>	1.53±0.58 <sup>a</sup>	2.22±0.78 <sup>b</sup>	72.87±0.55 <sup>b</sup>
L3	9.95±0.13 <sup>a</sup>	7.90 ±0.78 <sup>d</sup>	7.00±0.86 <sup>a</sup>	1.27±0.25 <sup>a</sup>	1.70±0.38 <sup>b</sup>	77.46±0.48 <sup>a</sup>
L4	9.75±0.18 <sup>a</sup>	8.16±0.65 <sup>d</sup>	7.00±0.32 <sup>a</sup>	1.02±0.29 <sup>a</sup>	1.72±0.01 <sup>b</sup>	75.91±0.58 <sup>b</sup>
L5	9.37±0.58 <sup>b</sup>	6.87±1.10 <sup>c</sup>	5.01±0.23 <sup>c</sup>	1.37±0.32 <sup>a</sup>	3.17±1.46 <sup>a</sup>	77.28±1.50 <sup>a</sup>
L6	9.86±0.23 <sup>a</sup>	8.44±0.32 <sup>d</sup>	7.00±0.84 <sup>a</sup>	0.53±0.58 <sup>b</sup>	1.69±0.61 <sup>b</sup>	75.27±0.21 <sup>b</sup>
L7	9.69±0.06 <sup>a</sup>	8.46±0.50 <sup>d</sup>	6.00±0.10 <sup>b</sup>	1.01±0.02 <sup>a</sup>	1.70±0.20 <sup>b</sup>	75.24±0.18 <sup>b</sup>
L8	9.35±0.01 <sup>b</sup>	7.37±0.02 <sup>c</sup>	7.00±0.25 <sup>a</sup>	0.70±0.27 <sup>b</sup>	1.15±0.47 <sup>c</sup>	77.23±0.61 <sup>a</sup>
L9	8.87±0.25 <sup>b</sup>	8.06±0.01 <sup>d</sup>	5.40±0.84 <sup>c</sup>	0.83±0.29 <sup>b</sup>	1.68±0.01 <sup>b</sup>	76.69±0.15 <sup>a</sup>

L10	9.66±0.10 <sup>a</sup>	8.27±0.39 <sup>d</sup>	5.07±4.22 <sup>c</sup>	1.02±0.35 <sup>a</sup>	1.12±0.80 <sup>c</sup>	75.32±0.84 <sup>b</sup>
L11	10.12±0.16 <sup>a</sup>	10.71±0.13 <sup>b</sup>	5.40±0.35 <sup>c</sup>	1.53±0.06 <sup>a</sup>	1.61±0.10 <sup>b</sup>	71.30±0.44 <sup>c</sup>
L12	9.35±0.08 <sup>b</sup>	8.18±0.22 <sup>d</sup>	6.57±0.11 <sup>b</sup>	1.33±0.29 <sup>a</sup>	1.12±0.70 <sup>c</sup>	74.74±0.53 <sup>c</sup>
L13	8.39±0.05 <sup>b</sup>	8.05±0.01 <sup>d</sup>	6.00±0.29 <sup>b</sup>	1.30±0.25 <sup>a</sup>	0.86±0.29 <sup>d</sup>	77.43±0.61 <sup>a</sup>
L14	9.00±0.15 <sup>b</sup>	10.00±0.30 <sup>b</sup>	6.02±0.20 <sup>b</sup>	1.01±0.17 <sup>a</sup>	1.06±0.01 <sup>c</sup>	74.02±0.30 <sup>c</sup>
L15	8.97±0.64 <sup>b</sup>	10.84±0.30 <sup>b</sup>	6.00±0.53 <sup>b</sup>	1.57±0.12 <sup>a</sup>	1.23±0.95 <sup>c</sup>	72.93±0.58 <sup>d</sup>
L16	9.34±0.32 <sup>b</sup>	11.28±0.53 <sup>a</sup>	7.73±0.21 <sup>a</sup>	1.57±0.12 <sup>a</sup>	1.80±1.47 <sup>b</sup>	71.10±0.26 <sup>c</sup>
L17	8.98±0.31 <sup>b</sup>	11.61±0.51 <sup>a</sup>	5.67±0.84 <sup>c</sup>	1.01±0.02 <sup>a</sup>	2.08±0.07 <sup>b</sup>	72.90±0.48 <sup>d</sup>
FARO 46	8.25±1.47 <sup>b</sup>	10.84±0.30 <sup>b</sup>	6.00±0.23 <sup>b</sup>	1.57±0.12 <sup>a</sup>	1.56±0.42 <sup>b</sup>	72.04±1.18 <sup>d</sup>
FARO 48	8.90±1.30 <sup>b</sup>	11.00±0.18 <sup>a</sup>	6.00±0.29 <sup>b</sup>	1.37±0.32 <sup>a</sup>	1.07±0.02 <sup>c</sup>	72.47±0.27 <sup>d</sup>

L1-L18: NERICA Lines. FARO46 and 48 are already released rice varieties in Nigeria

Values are means and standard deviation of three determinations. Source Anuonye *et al.*, (2016)

Values with the same superscript in the same column are not significantly ( $P>0.05$ ) different

**Table-3. Proximate compositions of NERICA lines (unparboiled) compared to released checks**

sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Crude Fibre (%)	Carbohydrate (%)
N1	10.00±0.10 <sup>a</sup>	8.43±0.15 <sup>d</sup>	6.60±0.53 <sup>a</sup>	0.68±0.44 <sup>c</sup>	0.21±0.10 <sup>a,b</sup>	68.63±0.35 <sup>c</sup>
N2	10.00±0.10 <sup>a</sup>	11.33±0.15 <sup>a</sup>	5.50±0.46 <sup>b</sup>	0.19±0.01 <sup>c</sup>	0.18±0.01 <sup>a</sup>	67.77±0.25 <sup>c</sup>
N3	10.00±0.10 <sup>a</sup>	8.17±0.15 <sup>d</sup>	5.00±0.06 <sup>b</sup>	1.13±0.01 <sup>b</sup>	0.26±0.01 <sup>c</sup>	70.90±0.36 <sup>b</sup>
N4	10.00±0.10 <sup>a</sup>	6.53±0.15 <sup>f</sup>	5.00±0.58 <sup>b</sup>	0.16±0.01 <sup>c</sup>	0.26±0.01 <sup>a</sup>	72.97±0.96 <sup>a</sup>
N6	10.01±0.01 <sup>a</sup>	11.03±0.15 <sup>a</sup>	6.93±0.51 <sup>a</sup>	0.21±0.01 <sup>c</sup>	0.26±0.02 <sup>a</sup>	64.77±0.65 <sup>g</sup>
N7	9.40±0.10 <sup>b</sup>	8.17±0.15 <sup>d</sup>	6.33±0.58 <sup>a</sup>	0.53±0.40 <sup>b</sup>	0.20±0.01 <sup>a</sup>	68.43±0.35 <sup>d</sup>

N8	10.00±0.10 <sup>a</sup>	10.07±0.15 <sup>b</sup>	5.53±0.58 <sup>b</sup>	0.13±0.01 <sup>c</sup>	0.51±0.01 <sup>c</sup>	68.90±0.27 <sup>c</sup>
N9	10.00±0.10 <sup>a</sup>	8.13±0.15 <sup>d</sup>	5.68±0.55 <sup>b</sup>	0.20±0.01 <sup>c</sup>	0.23±0.56 <sup>a</sup>	71.23±0.78 <sup>b</sup>
N10	9.00±0.10 <sup>b</sup>	10.03±0.15 <sup>b</sup>	5.93±0.12 <sup>b</sup>	0.16±0.01 <sup>c</sup>	0.70±0.01 <sup>a</sup>	68.70±0.27 <sup>c</sup>
N11	9.00±1.53 <sup>b</sup>	8.17±0.15 <sup>d</sup>	6.50±0.10 <sup>a</sup>	0.79±0.51 <sup>b</sup>	0.40±0.10 <sup>a</sup>	68.07±0.3 <sup>d</sup>
N12	9.00±0.10 <sup>a</sup>	11.63±0.15 <sup>a</sup>	6.50±0.12 <sup>a</sup>	0.25±0.10 <sup>c</sup>	0.61±0.10 <sup>a</sup>	66.27±0.32 <sup>f</sup>
N13	9.17±0.15 <sup>b</sup>	8.00±0.10 <sup>d</sup>	5.00±0.12 <sup>b</sup>	0.26±0.10 <sup>c</sup>	0.21±0.10 <sup>a</sup>	72.87±0.32 <sup>a</sup>
N14	9.00±0.15 <sup>b</sup>	7.47±0.21 <sup>c</sup>	5.53±0.06 <sup>b</sup>	0.21±0.10 <sup>c</sup>	0.55±0.10 <sup>a</sup>	71.93±0.38 <sup>b</sup>
N15	10.30±0.10 <sup>a</sup>	8.43±0.15 <sup>d</sup>	3.50±0.50 <sup>a</sup>	0.18±0.01 <sup>c</sup>	0.54±0.04 <sup>a</sup>	73.63±0.76 <sup>a</sup>
N16	9.33±0.15 <sup>b</sup>	8.37±0.21 <sup>d</sup>	6.33±0.58 <sup>a</sup>	0.17±0.01 <sup>c</sup>	0.61±0.10 <sup>a</sup>	69.30±0.79 <sup>c</sup>
N17	10.10±0.10 <sup>a</sup>	10.00±0.15 <sup>b</sup>	5.87±0.55 <sup>b</sup>	0.22±0.01 <sup>c</sup>	0.55±0.10 <sup>a</sup>	68.83±0.78 <sup>c</sup>
N18	10.00±0.10 <sup>a</sup>	8.47±0.15 <sup>d</sup>	5.33±0.58 <sup>b</sup>	3.55±0.01 <sup>a</sup>	0.25±0.10 <sup>a</sup>	69.03±0.95 <sup>c</sup>
FARO 46	10.20±0.10 <sup>a</sup>	10.00±0.15 <sup>b</sup>	5.34±0.58 <sup>b</sup>	3.93±0.01 <sup>a</sup>	0.59±0.01 <sup>a</sup>	68.30±0.82 <sup>d</sup>
FARO 48	10.00±0.10 <sup>a</sup>	9.03±1.36 <sup>c</sup>	5.87±0.55 <sup>b</sup>	3.62±0.93 <sup>a</sup>	0.55±0.10 <sup>a</sup>	66.63±0.90 <sup>f</sup>

Values are means and standard deviation of three determinations Values with the same superscript in the same column are not significantly (P>0.05) different. Anuonye *et al.*, (2016)

**Table-4. Amino acid Composition of Unparboiled, and Parboiled NERICA lines compared to Check (FARO 46).**

<b>Amino Acid</b>	<b>Unparboiled</b>	<b>Parboiled</b>	<b>FARO 46 (parboiled)</b>
Lysine	4.01±0.01 <sup>a</sup>	4.26±0.36 <sup>a</sup>	4.06±0.05 <sup>a</sup>
Histidine	2.50±0.01 <sup>a</sup>	2.46±0.07 <sup>a</sup>	2.39±0.44 <sup>a</sup>
Arginine	6.39±0.01 <sup>a</sup>	6.56±0.36 <sup>a</sup>	5.11±0.15 <sup>b</sup>
Aspartic Acid	6.65±0.01 <sup>b</sup>	7.84±0.50 <sup>a</sup>	6.80±0.42 <sup>b</sup>
Threonine	3.57±0.01 <sup>a</sup>	3.75±0.35 <sup>a</sup>	2.96±0.07 <sup>a</sup>
Serine	2.80±0.01 <sup>b</sup>	3.04±0.02 <sup>a</sup>	3.90±0.14 <sup>a</sup>

Glutamic acid	8.25±0.01 <sup>c</sup>	8.77±0.96 <sup>b</sup>	11.5±0.74 <sup>a</sup>
Proline	2.71±0.01 <sup>a</sup>	3.19±0.45 <sup>a</sup>	2.52±0.68 <sup>a</sup>
Glycine	4.83±0.01 <sup>b</sup>	5.25±0.34 <sup>a</sup>	3.05±0.64 <sup>b</sup>
Alanine	4.29±0.01 <sup>a</sup>	4.58±0.02 <sup>a</sup>	3.23±0.89 <sup>b</sup>
Cystine	1.03±0.01 <sup>a</sup>	1.16±0.23 <sup>a</sup>	1.20±0.03 <sup>a</sup>
Valine	5.61±0.01 <sup>a</sup>	5.16±0.06 <sup>a</sup>	4.26±0.62 <sup>b</sup>
Methionine	1.85±0.01 <sup>a</sup>	1.67±0.59 <sup>a</sup>	2.47±0.62 <sup>a</sup>
Isoleucine	3.69±0.01 <sup>a</sup>	3.83±0.29 <sup>a</sup>	3.50±0.70 <sup>a</sup>
Leucine	7.88±0.01 <sup>a</sup>	8.38±0.19 <sup>a</sup>	5.11±0.14 <sup>c</sup>
Tyrosine	4.30±0.01 <sup>a</sup>	3.38±0.42 <sup>a</sup>	3.94±0.30 <sup>a</sup>
Phenylalanine	5.12±0.01 <sup>a</sup>	5.46±0.66 <sup>a</sup>	4.20±0.28 <sup>a</sup>

Values are means and standard deviation of three determinations. Values with the same superscript in the same rows are not significantly ( $P>0.05$ ) different. Anuonye *et al.*, (2016)

Equally, we investigated a troubling national issue concerning the status of ofada rice as regards ofada rice been a scented variety of rice and as such deserving of a special status among other rice varieties. In the study of the definition of ofada, we discovered that it is not a scented rice variety but its odorous scent may be due to microbial contamination of the soak water during its oversoaking for 8 days in previous soak water.

**Table 5.** Acceptability profile of the processed samples compared to commercial samples.

Samples	Parameters evaluated				
	Appearance	Aroma	Taste	Floppiness	Overall acceptability
A	8.50 ± 0.75a	7.66 ± 1.26a	7.78 ± 1.34a	7.53 ± 1.68a	7.66 ± 1.68a
B	4.59 ± 2.00b	5.41 ± 2.27ab	5.50 ± 2.20b	4.78 ± 2.44b	5.75 ± 2.44ab
C	6.22 ± 1.84b	5.91 ± 1.65ab	5.63 ± 1.96b	6.69 ± 1.67b	6.16 ± 1.67ab
D	6.53 ± 2.12b	4.84 ± 2.29b	4.66 ± 2.29b	4.78 ± 2.54b	5.56 ± 2.54b
E	4.48 ± 1.65b	5.22 ± 1.96b	5.38 ± 1.96b	5.69 ± 2.36ab	5.75 ± 2.36ab
F	8.50 ± 0.75a	7.66 ± 1.26a	7.78 ± 1.34a	7.53 ± 1.68a	7.66 ± 1.68a

A = FARO 42 soaked for eight days without changing the water (traditional Ofada rice processing). B = Ofada rice soaked for eight days without changing the water (traditional Ofada rice processing). C = Ofada rice soaked for eight days with changing of water every day. D = Ofada rice soaked overnight in hot water (improved processing method). E = Ofada soaked overnight. F = Ofada rice soaked for eight days with daily change of soak water.

Source (Anuonye, *et al.*, 2015)

### 3.2 Application of Modern Current Knowledge of Optimization to Food Product Development

For innovation and challenging results in the bid to develop new foods the use of modern scientific methods cannot be over emphasized. The



optimization techniques come in handy here. Meyer, (1976)) had noted that this usual method of one-variable-at-a-time experiment is not a good experimentation strategy in many situations. Inability to detect cross product interaction, examination of large numbers of experiments and difficulty in generalizing the results were some of its limitations.

Optimization, therefore, is the activities involved in arriving through experimentation at the condition of variable that gives rise to desirable process yield (Meyers, 1976). This involves deciding on the range of experimentation and what combinations of variable levels should be and the cost implications. Most studies directed towards understanding transformations in extruders and reactors have been conducted using two different approaches known as “*black box modelling*” and comprehensive modeling). Both methods are used to model steady-state processes, which in turn are used to predict chemical reactions, functional properties after processing and state indicators during processing. The black box approach is based usually on response surface model (RSM).

RSM basic principle is to relate product properties (mechanical, functional, nutritional and sensory) to process variables (geometry, raw material, operating variables). This is done by means of regression equations that describe inter-relations between input parameters and product properties; this is generally done through the use of a statistically designed multifactor experiment for economy of experimental points (Iwe,2001); Response surface methodology results are presented by surface mapping to describe graphically the relation of one property versus two process parameters (Tayeb *et al.*,1992). The impact of Response surface methodology initially had become apparent in the chemical industry where nearly all process- oriented problems involved an optimization phase. RSM is a powerful optimization tool especially where some complex products or properties of many variables are involved as in the case of the use of extruder as a continuous reactor. In terms of transport phenomena, information about the relative importance and interrelations between process variables abound.

The general form of RSM could be represented as  $\eta = f(\epsilon_1, \epsilon_2, \dots, \epsilon_k)$   
Where  $\eta$  = the dependent variable quality or output variable  $\epsilon_1, \epsilon_2, \dots, \epsilon_k$ =

independent variable (input variable) usually. The form of  $f$  is unknown and perhaps extremely complicated. The success of RSM therefore depends on the approximation of the  $f$  by a low order polynomial in some regions of the independent variables. Mostly a second order polynomial is the general form for a response surface model. This is often used rather than a first order because the first order model does not include any non-linear terms. Further, it was noted that models of greater order than two may be used but it is better to use the lowest order polynomial that yields a suitable approximating function for predicting future response. The second order model can be expressed:

$$Y = \beta_0 + \sum_{i=1}^K \beta_i X_i + \sum_{i=1}^K \beta_{11} X_i^2 + \sum_{i=1}^K \sum_{j=1, j \neq i}^K \beta_{ij} X_i X_j + \epsilon \text{---(equation 1)}$$

Source: Meyer (1976) Leslie and Dale (1992)

Where  $y$  = dependent variable  $X_i$  and variable  $X_j$  = are the independent variables.  $K$  = no of independent variables,  $\beta_0$  = intercept and  $\epsilon$  = Random Error term. By careful selection of variables and using canonical transformation, the surface equation becomes simplified allowing interpretation. The polynomial to use is determined by the level of accuracy needed

The goals of the experimenter include determining what values of the independent variables ( $X_1; X_2; \dots; X_k$ ) are optimums as far as the response ( $y$ ) is concerned. The latter or optimization phase of such problem often involve finding the values of  $X_1; X_2; \dots; X_k$  which maximizes the response (Meyer, 1976).

The analysis of the estimated response function (analysis of the fitted surface) is accomplished by regression estimation procedures augmented by mathematical techniques. If the model equation is an adequate representation of the model in the region of interest, the analysis of the fitted surface will approximate the analysis of the physical system.

Several criteria could be used to evaluate the adequacy of the fitted model. A test of lack-of-fit can be used where a low F- value indicates

that the second-order model is an adequate approximation to the data.  $R^2$  values, canonical (CV) values, and model significance could be used to judge the adequacy of the model.  $R^2$  is the proportion of variation in the response attributed to the model rather than a random error. CV describes the amount of variation in a population relative to the mean. Model significance indicates the level of confidence that the selected model cannot be due to experimental error. Joglekar and May (1987) therefore, postulated that for a good fit of a model,  $R^2$  should be at least 80%, CV should not exceed 10% and model significance should be at least  $P = 0.05$ .

It is important that data obtained by use of this design be subjected to statistical analysis without violating the assumptions of parametric statistics. In general, transformations of data on product characteristics will be unnecessary. In using RSM designs generally, the researcher through knowledge or guess fixes the practical range for each independent variable without going to extremes. All calculations are performed using these coded values that are then reconverted to the original variables at the conclusion of analysis. In coding the variable, Meyer (1976), Mullen and Ennis (1979) reported that the usual convention is to assign the center point (O) the factorial points (-1) and (+ 1) while the axial points are assigned a and b. The number of these points depends on the number of variables in the experiment and design and could be obtained from standard references. The response surface is thirdly represented mathematically by equations called models which are similar to well-known regression equations e.g. a four variable model would be mathematically represented as

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_{11} X_1^2 + \beta_{22} X_2^2 + \beta_{33} X_3^2 + \beta_{44} X_4^2 + \beta_{12} X_1 X_2 + \beta_{13} X_1 X_3 + \beta_{14} X_1 X_4 + \beta_{23} X_2 X_3 + \beta_{24} X_2 X_4 + \beta_{34} X_3 X_4 \text{ -----(equation 2)}$$

The  $\beta$ s are coefficients which indicate the relative importance of their associated X value. For each of the level combinations, one observes or measures a response. This response is labeled Y. Thus  $Y_1 =$  response at level combination 1 and so on. The analysis of the result using the normal

regression procedure gives the estimates of  $\beta$ s. These are called the  $\beta$  values.

The generated surface responses are used to obtain visualizations of the models in the form of contour plots or three-dimensional Figures. These graphical representations help the researcher develop clear mental pictures of the relationships that exist between the processing variables and product quality characteristic (Leslie and Dale, 1992).

Currently Response surface methodologies and optimal mixture analysis are widely combined to produce products with varying techno-functional properties.



**Plate 1: Samples of Acha/Soybean mixtures using response surface optimization procedures (Anuonye, 2006)**

From this fundamental research we discovered

1. That soybeans could be added to cereals beyond the 20% mark set by FAO and WHO without critically compromising the organoleptically properties of the product.
2. That soybeans could be added to some cereal mixtures up to 50%
3. That the off-flavour problems may not be issues with extrusion temperatures.

We have followed this up by complementing several local meals with soybeans following the results of this fundamental research.

Table 6: Summary of Model Equations Developed for Prediction of Extrudate physicochemical properties

Property	Model Equation	R <sup>2</sup>	Remark(s)
1. WS1	$WSI = 808.33 + 17.57 FC*SS*BT - 12.85SS*BT - 13.68 FMC* SS ...$ (1)	.50	Not Used for Prediction
2. WAI	$WAI = 92.68 - 2.54 FMC^2 + 1.18 FC*BT + 0.58 FC^2$ (2)	.53	Used for prediction
3. ER	$ER = 42.46 + 2.92FC^2 - 2.66 FC*BT + 2.30FC*FMC*SS*BT - 1.57FC*FMC - 11.02 FMC*SS*BT$ (3)	+0.78	Used for prediction
4. BD	$BD = 145.49 + 3.00FMC*SS*BT + 1.76FC - 1.76FC*BT - 1.72FC*SS + 9.97SS -$ (4)	+0.70	Used for prediction
5. BI	$BI = -100.11 + 3.13FC*FMC*SS*BT + 16.60FMC*SS + 10.88BT + 11.77SS - 13.61SS*BT + 11.21FMC + 15.41FMC*SS*BT^2 - 2.79 BT^2 - 1.63FC*BT$ (5)	-0.70	Used for prediction
6. PDI	$PDI = 300.76 - 2.18 FC*MC + 1.36 FC^2 + 1.61 FC*MC*SS*BT - 0.96 FC*SS$ .....6	0.54	Not Used for prediction purpose
7. AMY	$AMY = 38.27 - 2.22 FC^2 + 3.83 FC*FMC*SS*BT - 3.07FC*FMC - 2.50$	0.78	Used for prediction

	$FC*SS - 1.58*BT \dots$ (7)		
8. TIA	$TIA = 42.22 - 12.59BT - 13.16 FMC - 1.98 FC*FMC - 3.07BT^2 + 13.29 FMC*BT - 9.74 SS \dots$ (8)	-0.63	Used for prediction
Equations with $R^2 \leq 0.60$ were not used for predictive purposes due to lack of model significance ( $P \leq 0.05$ ) and low $R^2$			

(Anuonye *et al.*, 2009)

Table 7: Summary of Model Equations Developed for Prediction of Extrudate Sensory Properties

Sensory property	Model Equation	$R^2$	Remarks
Colour	$C = -35.04 - 1.70 FC^2$	0.60	Used for Prediction
Aroma	$A = 18.52 - 2.34 FC^2 X - 2.34 FCXFMCXSSXBT$	-0.55	Not used for prediction
Taste	$T = 14.78 - 2.07 - 3.10 FCXFMCXSSXBT + 2.37 FCXSS + 1.19 FCXBT$	0.55	Not Used for Prediction
Texture	$T_x = -72.58 + 1.97 FCXBT + 14.00 FMC$	0.70	Used for Prediction
Overall acceptability	$OV = -39.96 - 1.62 FC^2 + 1.86 FCXBT$	0.6	Used for prediction

(Anuonye *et al.*, 2011)

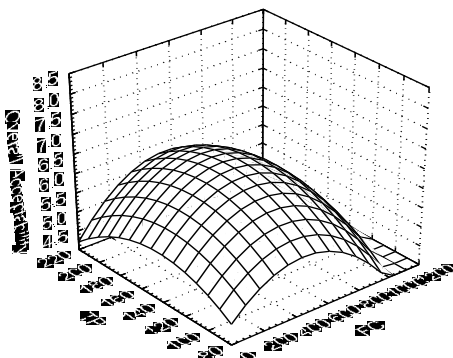


Figure 6: Effect of Feed composition and Barrel Temperature on the overall acceptability of soybean /acha mixtures (Anuonye et al., 2011).

### 3.3 Development of Shel Stable Local Beverages for Commercialization

In the bid to improve the shelf stability of popular local foods and feeding stuff we have scaled up the processing of zobo and soykunuzaki to the point of commercialization of these products through stabilization and carbonation. Using both response surface and mixture techniques and adopting manual carbonation techniques we have as today produced beverages that could remain acceptable sensory-wise and nutritionally competent for over six months on the shelf.



**Plate 2: Carbonating Equipment**

**Source: (Anonymous, 2025)**

The optimal conditions for carbonated *Soykunun-zaki* production were identified based on maximizing overall acceptability while balancing

other sensory attributes. A moderate volume of beverage, the use food stabilizers, and preservative, and an optimal level of carbonation were found to yield the favorable sensory profile as predicted by optimization design. The same was achieved for justicia carnea and lemon grass extracts and braphyllum pinnatum and lemon grass extracts sweetened with dubino.

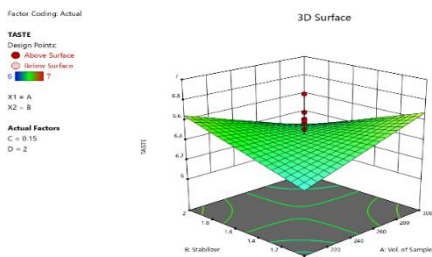


Figure 7: Effects of sample volume and stabilizer concentration on sample taste. (Kolo *et al.*, 2024).

### 3.4 Development of Local Clarificant for Sugar Cane Juice Clarification.

While at the National cereals Research institute we initiated studies on the quality of the brown sugar produced in the institute. In one of such studies, we recommended that the NCRI brown sugar technology is novel but the result of its quality characteristics show that the raw brown sugar still needs to meet several quality criteria to be considered safe for direct consumption though there may be some scientific skeptics as to whether it is completely safe for consumption. The local clarificant or okra bark should be extracted and purified and its quality parameters established. I am happy to announce that we have just done this and have thus developed a shelf stable clarificant from okro bark for sugar cane juice clarification. In this research we employed ultramodern analytical equipment, we screened several local mucilage producing compounds including Okro pod, leaf and stem bark, okoho stem bark etc. for sugar juice clarification. Our major focus and driving aim were that sugar



industries globally are facing some challenges caused by the controversial nutritional and safety attributes of chemical clarifiers (Moreno et al., 2022). Most cane sugar producers in Nigeria employ unauthorized chemical clarifiers including acrylamide (a carcinogenic substance). This has generated health and food safety concerns from the consumers and demanded control from the food authorities or regulatory agencies in Nigeria. On the other hand, the sugar industries in Nigeria spent over three hundred billion naira annually to import these chemical clarifiers which is a huge drain to the economy.



Figure 8: Sugar Cane cutter. Source: (Anonymous,2025)



Figure 9: Dried Okro Bark waste for sugar syrup clarification

Source: Anonymous, (2025)

**Table 7:** Effect of drying methods and extraction medium on the physicochemical properties of okro mucilage

Parameter/extraction medium	Raw Sample	Oven drying	Freeze drying
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pH/WE	6.92±0.00 <sup>a</sup>	6.03±0.01 <sup>b</sup>	6.00±0.00 <sup>b</sup>
pH/ ME	5.89±0.01 <sup>b</sup>	6.00±0.00 <sup>a</sup>	6.00±0.01 <sup>a</sup>
Bulk density (g/cm <sup>3</sup> )/WE	0.60±0.01 <sup>a</sup>	0.60±0.01 <sup>a</sup>	0.62±0.01 <sup>a</sup>
Bulk density (g/cm <sup>3</sup> )/ME	0.61±0.00 <sup>a</sup>	0.61±0.00 <sup>a</sup>	0.60±0.00 <sup>a</sup>
Tapped bulk density (g/cm <sup>3</sup> )/WE	0.67±0.01 <sup>a</sup>	0.63±0.01 <sup>a</sup>	0.64±0.01 <sup>a</sup>
Tapped Bulk density (g/cm <sup>3</sup> )/ME	0.67±0.00 <sup>a</sup>	0.67±0.01 <sup>a</sup>	0.65±0.00 <sup>a</sup>
Viscosity (centipoise)/WE	124.50±1.04 <sup>a</sup>	73.33±0.61 <sup>c</sup>	76.00±0.89 <sup>b</sup>
Viscosity (centipoise)/ME	15.55±0.60 <sup>b</sup>	24.00±0.42 <sup>a</sup>	24.00±0.50 <sup>a</sup>
Swelling index (%) / WE	50.00±0.40 <sup>a</sup>	20.00±0.15 <sup>c</sup>	25.00±0.10 <sup>b</sup>
Swelling index (%) /ME	30.00±1.00 <sup>a</sup>	15.00±0.98 <sup>c</sup>	25.00±1.15 <sup>b</sup>
Swelling capacity (%) / WE	8.40±0.01 <sup>b</sup>	9.26±0.01 <sup>a</sup>	7.00±0.01 <sup>c</sup>
Swelling capacity (%) / ME	6.80±0.01 <sup>c</sup>	7.00±0.05 <sup>b</sup>	7.80±0.07 <sup>a</sup>
Carr index /WE	12.00±0.03 <sup>a</sup>	12.00±0.00 <sup>a</sup>	7.00±0.05 <sup>b</sup>
Carr index /ME	10.00±0.01 <sup>a</sup>	10.00±0.01 <sup>a</sup>	8.33±0.01 <sup>a</sup>
Hausner factor/WE	0.90±0.01 <sup>a</sup>	0.96±0.02 <sup>a</sup>	0.97±0.00 <sup>a</sup>
Hausner factor /ME	0.91±0.01 <sup>a</sup>	0.91±0.00 <sup>a</sup>	0.92±0.01 <sup>a</sup>

Mean ± standard deviation of triplicates. Means with no common letters within a row significantly differ ( $p \leq 0.05$ ). All values are on dry weight basis; WE = Water extract; ME = Methanol extract. Source (Anuonye *et al.*, 2024).

### 3.5 Development of Functional Commercial Beverages from Local Herbs so That our Foods can be our Medicines

Using advanced techniques three popular local vegetables consumed for their health-related beneficial effects were evaluated.

*Jatropha tanjorensis* (Euphorbiaceae) popularly known as “Hospital too far” which is a common weed found in the higher rainfall forest zones of

West Africa and is associated with fields, bush regrowth, road sides and disturbed places in the higher rainfall forest zones of West Africa. The leaf is a widely consumed vegetable in the Southern part of Nigeria and has been used extensively in the treatment of diabetes. Locally, this plant has also been used extensively to address severe anaemic conditions especially by the rural poor who cannot afford the luxury of subscribing to standardized anti-anaemic drugs. Alongside numerous other plants,

*Justicia carnea* commonly known in Nigeria as: “blood root” “ogwu obara” in Igbo. The use of the leaf as a blood supplement and the management of anemia has been widely reported (Ukpabi-Ugo, *et al.* 2019). The plant has also been in treating HIV, cancer, diabetes, whooping cough, epilepsy, bronchitis cold, respiratory tract diseases, gastrointestinal infections, inflammation sickle cell disease, hepatitis, typhoid, malaria, rheumatism, liver disease, arthritis and diarrhea.

*Bryophyllum pinnatum* (Lam.) Oken is less recognized leafy vegetable which can be categorized as a nutraceutical since it contains both nutritional and therapeutic properties in appropriate quantities (Oche *et al.*, 2023). The plant is a perennial succulent shrub from Crassulaceae family regarded as an invasive species (Singh *et al.*, 2019) and it was formerly referred to as *Kalanchoe pinnata*. The plant has a characteristic sour taste, hot strength and sugary post digestive effect. Available literatures showed that *Bryophyllum pinnatum* contains high percentage of carbohydrates, proteins, minerals, lipids, vitamins and crude fibres and other essential phytochemicals including phenols, flavonoids, alkaloids, steroids, glycosides, triterpenes and bufadienolides which are associated with different medicinal properties and this is responsible for its pharmacological use. Despite the great potentials of these plants, they are yet to find any reasonable applications in food systems and currently, its usage is mostly in the field of medicine and pharmacology in drug formulations and delivery. There was therefore the need to develop nutritious foods with characteristic biological active ingredients from the plant and these safe and effective food products will not only compliment daily dietary requirement but also enhance the well-being of the citizens.

The results obtained so far showed that these vegetables were superior to even highly rated commercial supplements, in their outstanding composition in phytochemical and antioxidant composition (table 8)

**Table 8:** Antioxidant activity by 2,2-diphenyl-2-picrylhydrazyl (DPPH) assay extracts of Bryophyllum pinnatum, Justicia carnea Chaya and Okro leaf.

Concentration(mg/mL)				
Samples	100	50.00	25.0	12.5
Bryophyllum pinnatum extract	900.60a	820.13a	690.45a	510.78a
Justicia carnea leaves extract	910.65a	830.19	680.65	680.05
Chaya leaves extract	910.	820.15	690.49	480.78
Okro leaf extract	46a			
	3344b			



**Figure 10:** Obara Zanzam, Miracle Leaf and Hospital too Far. Source: Anonymous, (2025)

Using Mixture predictive analysis, the optimal levels of temperature, volume and concentration of miracle leaf extract, and lemon grass were quantified. Using response surface analysis these extracts were combined

with local sweetener (dobino). The results were indicative that functional commercial beverages high in antioxidant properties were significantly acceptable to panellists.

**Table 9: Experimental Design Layout**

Factor	Name	Units	Minimum	Maximum	Coded		Mean	Std. Dev.
					Low	High		
A	Blanching temperature	<sup>o</sup> C	60.00	90.00	-1	↔+1	↔75.00	10.61
					60.00	90.00		
B	Blanching time	Mins	5.00	20.00	-1	↔+1	↔12.50	5.30
					5.00	20.00		
C	Extract concentration	%	20.00	80.00	-1	↔+1	↔50.00	21.21
					20.00	80.00		

**Table 10: EXPERIMENTAL DESIGN MATRIX**

RUN	FACTOR 1	FACTOR 2	FACTOR 3
	A: BLANCHING TEMPERATURE	B: BLANCHING TIME	C: EXTRACT CONCENTRATION
1	75	12.5	50
2	60	20	50
3	90	20	50
4	75	12.5	50
5	75	12.5	50
6	60	12.5	80
7	60	12.5	20
8	75	5	80
9	60	5	50
10	90	12.5	80
11	90	12.5	20

12	75	20	20
13	75	20	80
14	90	5	50
15	75	5	20
16	75	12.5	50
17	75	12.5	50



**Figures 11 and 12: Resulting beverages with high antioxidant values from local herbs (Anonymous, 2025)**

### 3.6 Development of Inoculated Fortified Flours for Masa Preparation.

*Masa*, commonly known as "*waina*," is a type of fermented snack. It is a cereal-based fermented snack primarily eaten as an accompaniment to breakfast porridges in Nigeria, as well as in Ghana, Côte d'Ivoire, and other West African countries. It is one of the traditional street-vended snacks made mainly from cereal flours like maize (*Zea mays*), millet (*Pennisetum typhoideum*), sorghum (*Sorghum vulgare*), or rice (*Oryza sativa*) and is consumed by people of all ages in the northern regions. It is cooked in pans with individual cup-like depressions, resembling the Indian Idli in shape and the Dosa in taste.

In Nigeria, raw milled rice from the dry milling of paddy rice is typically used to prepare rice *masa* without any further treatment or processing. Additionally, the sensory attributes of *masa* can vary due to the lack of

standardization in the process. *Masa* production in Nigeria have remained traditional effort, which is time-consuming and does not apply Hazard Analysis Critical Control Point (HACCP) principles or any intentional quality control principles.

Again, using both response surface and mixture analysis design a premix mixture of rice flour and Bambara nut flour was developed using live bacteria. This premix produced acceptable *masa* that scored more than the traditional *masa* in all sensory attributes.

**Table 11:** Variables and Their Coded Levels (Coded and Actual) for *masa* preparation

	Combination	Level	
Independent variables	-1	0	1
Volume of water (mL)	170	195	220
Fermentation time (h)	4	6	8
Conc. of starter (g)	3.5	5.0	6.5
Qty of Bambara nut (g/100 g)	5	10	15
germinated Rice Flour (g/100 g)	85	90	95



**Figures 13:** Samples of *Masa* produced using *Massa* Premix. Source Anonymous (2025)

## Safety Of the Products Developed

Accelerated storage test carried out at elevated temperatures were used at the beginning of experimentation to the moment when the beverages were deemed unsuitable for one or more controlled indicators. Beverage samples were taken at time intervals equal to 0; 3; 7; 10; 14; 17; 21; 24 days and using analytical methods, the physicochemical quality and organoleptic quality indicators (colour, smell, taste) were analyzed. Additionally, solid content, active acidity (pH), total (titratable) acidity was analyzed as indicators. Results obtained from these experiments were used to estimate shelf-life using the Arrhenius equation as shown below;

$$K = K_0 \times \exp \frac{-E_a}{R \times T} \text{-----(Equation 3)}$$

Where; k is the reaction rate constant, A is the constant,  $E_a$  is the activation energy (kcal/mol), R is the universal gas constant ( $R=1.987 \text{ cal} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ ), and T is the absolute temperature (K).

**MEDITATION:** *“And He said to them, how many loaves do you have? Go and see. And when they [had looked and] knew, they said, five [loaves] and two fish*

Mr, Chairman and beloved Vice Chancellor, I have laboured to show us what we have. No doubt that with the combination of what is available all over the nation, this nation has no business living in fear of hunger protests, not now or in the near future. But we have already worked into the mine field and needed to come out of it as fast as possible and to oppositely embrace what is nearly, freely bestowed on us by providence. *All of us who are part of this story today bear witness that as a disciple of product development and food Chemistry in this field of Food Science and Technology I have not betrayed the scared mandate to innovate and provide new nutritious food products.*

But according to my mandate, I present here today, **commercializable shelf stable zobo drink, fortified soy-kunuzaki beverage, Shelf stable antioxidant beverages, fortified probiotic massa premix, clarified**



**sugar syrup and brown sugar crystals and sundry fortified weaning foods, dumplings etc and much more.** These products are at different levels of certification and pursuit of patents. That what we have so presented is much more than what the authorities require to compel Nigerians from all works of life to set down and expect satisfaction from the stable of the Nigerian Nation is clearly illustrated and confirmed. What needs be done now?

*Then He commanded the people all to recline on the green grass by companies. So, they threw themselves down in ranks of hundreds and fifties [with the regularity of an arrangement of beds of herbs, looking like so many garden plots]. And taking the five loaves and two fish, He looked up to heaven and, praising God, gave thanks and broke the loaves and kept on giving them to the disciples to set before the people; and He [also] divided the two fish among [them] all. And they all ate and were satisfied.”*

1. I expect that from my Jerusalem the Federal University of Technology Minna, the voice of command will come forth for the people to seat down in their ranks and companies.
2. That these little loaves will be generously be made available within the precincts of the university as the Vice Chancellor and his managements lifts them up for the divine multiplication and even distribution
3. That a period of satisfaction from now, henceforth, will be ushered in as we all labour while there is yet light for our labour.

For these loaves to become reality in the polity, demands the lifting up of what we have diligently laboured to find out. Time and space will fail me to enumerate the several socioeconomic relevance of what we are putting out for lifting before fellow Nigerians. But permit me sir to inform this August gathering that the beverage industry alone today is over 213\$ billion-dollar enterprise where the national contribution is meagerly placed at about \$13billion dollars. That Nigeria has capacity to quadruple its current level is an understatement when viewed from the lens of expansive regional market and the spate of health benefitting beverages

at stake and the current prevailing socioeconomic realities over all the nations.

### **3.7: The Contending Issues**

Persistently, our managers of the agricultural and agro-allied industrial sectors had always pursued the idea that the nation's food security lay only in the production of more foods. According to the minister of Agriculture, one of the most significant challenges facing Nigerian agriculture is outdated farming tools. To remedy this, the government is rolling out a series of agricultural mechanization programs designed to revolutionize the industry. Abdullahi pointed out that many farmers still rely on rudimentary equipment, hindering their productivity. As a solution, the government is introducing innovative mechanization projects. Key initiative is the Greener Imperative Project, set to launch in January 2025. This program, ordered by President Tinubu, aims to modernize the country's farming machinery and processes, significantly improving efficiency and food production. The Greener Imperative Project follows earlier mechanization programs like the Greener Up Initiative and partnerships with Belarus and Brazil, focusing on modernizing agricultural practices and reducing the sector's dependence on traditional methods. Abdulahi expressed confidence that these projects will mark a new era in Nigerian agriculture, enhancing food security and improving the livelihoods of millions of Nigerians.

This is very commendable but actually will not lift us out and cause us as a nation to seat down and become satisfied. Such innovations of improved agricultural productivity lacking the basic follow up of value chain conversion and aggressive rural urban state, regional and national export promotion aspects is as good as a failure before even inception. Ngoddy 2023 had sadly noted that increase in agricultural productivity per se will hardly lead to improvement in food availability without concomitant increase in the capability of industry to convert basic food staples through processing and manufacturing activities to viable shelf stable products. This truth though not hidden from our national food managers remain unheeded and unrecognized for reasons very difficult to decipher. Again, and again government and its agencies leveraging on

pervasive corruption engages on wild goes chase in the agricultural value chain leaving primary and necessary infrastructural necessities hence the nation keeps bleeding inflaming the unproductive youths to persistent anger and violence

The Nigerian government and indeed its functionaries has continued to play with the issues of food insecurity as if it can be overcome by sheer political rhetoric's and wizardry. But the divine attitude was first to search out what was available and then commanding the people to seat down in their own companies and distributing what is broken by efficacious prayer and consecration. That mere political grandstanding cannot avail, is situated in the legions of failed agricultural programme all over the nation. I have been privileged as a research scientist in the National Agricultural Research Systems to witness and participate actively in several of these interventions which eventually led the nation to nowhere. Nigeria is deeply fractured by corruption. There is hardly any such initiative that can thrive today in such climate of malfeasances no matter how well intentioned if the virus of corruption is not addressed. That the present government cannot attempt it is clear to all men of conscience.

Tsado (2022) posits on the contrary that a Nigerian nation without hunger, is possible. However, according to him, for a long time the fate of the rural areas and small-scale farmers has been ignored and their high potentials for development unrecognized. Food is the question of the survival of human kind and the answer to it for now and for long time to come will be provided in the rural areas. This is the quagmire that the nation faces. The gown insists that solution lies not in the so-called mechanization but the town believes that all food insecurity will become a thing of the past with farm mechanization. One speaks from the point of view of the verdict of research and the other from the point of view of what can be harnessed into individual pockets hence the fall out of corruption. Yet it is clear to all and sundry that neither overnight mechanization nor resort to traditional methods no matter how goodly implemented can answer to Nigeria's cry for food security.

## **CONCLUSION(s).**

That we have laboured to keep our mandate under great stress is an understatement. If we could be delivering so much under this harsh environment with so little, then consider what our output, should be if we are to be empowered as should be the case. I sincerely submit Vice Chancellor Sir, that Nigeria ought not to be in this parlous state we find ourselves today not to talk of hunger protest if the minimal necessary things had been in place. However, if these available technologies are exploited, fully commissioned and made to go commercial as is been envisaged, no doubt so many are going to be empowered by them while the greater number will be renewed in health with greater prosperity and harmony within the family circles. There will be greater prosperity of the States and Nation with healthier, more encouraged and energized work force bringing greater output and national benefit.

## **RECOMMENDATIONS**

The nature of the affliction with which the Nigerian state is afflicted is beyond what is currently been comprehended. In the face of the challenging political and social complexities that exists in our body polity, it becomes indeed very herculean and difficult proposing remedies to the multifaceted problem of loss of the social contract between Government and the people. However, coming from the high moral ground of research, I wish to recommend that

- For the sake of our cooperate national survival a National Food Product Development Agency should be put in place to harness all available food product development research that have been resourcefully developed and documented over the years and fast tract the prototype and
- commercialization of all beneficial submissions. The agency should be empowered to facilitate the patenting and improvements of all such encouraging new food products and provide the link with industries for continued new food development research efforts.

- That governments at all levels must get committed at their different levels to provide adequate post-harvest value addition aspects to all forms of agricultural interventions.
- That institutions and agencies like TETFUND should as a matter of national emergency devote significant percentages of research funds for national food product development efforts.
- That governments at all levels must be deliberate in the commercialization of worthy agricultural processes leading to new and improved nutritious foods for the down tunning of the national cry against hunger.
- Overall, Government at all levels must cooperate with researchers for establishment of proto-type small-scale industrial incubational centres for new developed agricultural products.

#### **ACKNOWLEDGEMENTS:**

I am grateful to God Almighty for the privilege of standing here today delivering this inaugural lecture. Like Jesus Christ His Son of whom we were taught in catechism that he sat and taught among the pharisees as one of those “who knew” Today I am standing and teaching and lecturing as one of “them that know”. All the glory goes to God who by Himself alone has brought me this far. One, I am not and have not at any point in time thought of myself as knowledgeable but have seen God taking me through those processes and trainings that the knowledgeable go through. As I stand here today paying this professorial debt, I cannot but remember, that my name is “Chukwuemeka”-translated literarily is God has over done it. God indeed have overdone so many things for me that day will break and night will come and still the stories and testimonies would not have been concluded. With heart filled with joy in unreserved estacy I say to God and to God alone be the glory.

Vice Chancellor Sir, I was ready for this inaugural lecture about six and a half years ago. But what I later discovered so discouraged me that I made up my mind never to climb this podium for this August lecture not in the presence of any of your predecessors. But somehow, your

emergence and the ways you have handled things made me to do a rethink. I therefore want to profoundly thank you. Indeed, there are so many things for which I need to thank you. For the hand of fellowship, for your humane and amiable humble disposition to the use of power and authority, for your naturalness and warm personality and for none overbearingness I say thank you sir. Thank you most especially for reposing confidence in me that you trusted enough to appoint me the pioneer dean of the New School of Food Science and Agricultural Technology. This appointment which aligned with the divine calling on my life and Ministry coming at the eve of my sixtieth birthday and at the point of my twenty-fifth marriage anniversary remains the icing on the cake of the many wonderful things you do and have kept doing. I remain indeed grateful to you and your management team for all the encouragement and engagement so far.

My amiable Deputy Vice-Chancellor's Academics and Administration I deeply appreciate the warm and uncommon friendliness we share. Right from our days as HODs while the DVC admin held forth at the E-Center you've all remained committed to our comradeship. I sincerely thank you and your families for standing with me in this novel day. I also owe a deep sense of appreciation to the lady of the exchequer-our own amiable delicate and soft-spoken Bursar who is the chairperson of the Committee of Universities Bursars of Nigeria. We have worked and related in those days when I was a HOD and you now as always listened with concern and empathy to all our request. Severally we have called upon your benevolence and have received uncommon attention due to your own diligence at duty and your commitment to moving the system forward. Accept my sincere appreciations. All other members of the University Management please accept my unreserved appreciation for all your input in making me what I am today.

Prof M.O. Iwe the current Vice chancellor of Federal university of Agriculture Umudike supervised me at undergraduate. It was his Christian standing and testimony of his marriage that inspired my young heart then to pursue righteousness as a way of life and I have never regretted that relationship which have endured till today. Prof G,

I, O. Badifu then of University of Agriculture Makurdi now Joseph Takar University Makurdi (JOSTUM) but now at Delta State University Abraka taught me the rudiments of graduate research, supervising me both at Masters and Doctoral levels. To this self-effacing Prof, I owe a huge debt of gratitude for teaching me patience and resilience in the face of real human challenges. To this quite intellectual juggernaut I owe whatever I have garnered today academically. I also, had the privilege of studying under Prof Mrs C. U. Inyang, who co-supervised me at the doctoral level and was my HOD then. Through this mother in Isreal, I was delivered from the forces that loomed larger than death and my career was not halted for no sin of mine. Late Prof, M, Akpakpunam also co-supervised my PhD at JOSTUM while Prof C. Araiahu was one of my prominent and eminent teachers at JOSTUM. Prof M, Nwankiti then Dean of PG school at JOSTUM and now retired saved my doctoral studies when it became impossible for me to continue. I owe him huge debt of gratitude for rising up on my behalf. For him I was persuaded to keep hope alive and that persuasion is the reason I stand here today among the egg heads. God will bountifully reward him. I appreciate all my undergraduate and post graduate peers at both Federal University of Technology, Makurdi, University of Jos, Makurdi campus and University of Agriculture, Makurdi. We were the only set of students who attended three different universities and graduated with only one degree. The wonders of our nation Nigeria.

Permit me Vice Chancellor, sir, to pay particular tribute to the memory of my Bossom friends, room-mates, course mates and Christian brothers and much more; Late James Ujah Abah and Calistus Madueke. We were supposed to travel back to school the same day but providence held me back, and they left only to run into a ghastly motor accident and both lost their lives at the spot. I had the unfortunate responsibility of identifying their wasted bodies at the Wuse General Hospital Morgue in the hay days of the Abacha Junta. Abah died few months to his wedding but that death remains for me one of the most painful experiences of my life. Equally demised are also Kase, and Igbian who were both friends and course mates in the same period. For Prof Abu

Onoh (immediate Past President of NIFTS), Prof John, Onoh, University of Alabama USA, Prof Abraham Girgi, (Special Advisor to the Benue State Governor on Diaspora Affairs) University of Ontario Canada, Dr, David Gbenyi, Mubi Polytechnique Adamawa I appreciate our friendship and comradeship. To my brother and roommate, Martins Okoli and Wife (New York USA) and the entire Children of Love community JOSTUM, I remain eternally grateful. Prof and Mrs Mike Momoh JOSTUM hosted me at both my Masters and PhD courses. The labours of your love cannot be forgotten in the annuals of the heaven. The Lord shall replenish you indeed.

I owe huge debt of Gratitude to Late Prof, Ojanuga of blessed memory, who was the then Dean School of Agriculture Federal University of Technology Makurdi. Under his deanship I became the President of the Nigerian Agricultural Students Association of FUT Makurdi. His interest in me made him to introduce me to Late Dr BB Wudiri then Director of the National Cereals Research Institute Badeggi, where I was doing the compulsory National Youth Service. Wudiri braised all odds of ethnic war and appointed me shortly after my youth service as a Research officer II at the National Cereals Research Institute Badeggi. I cannot sufficiently appreciate Late Prof Ojanuga and BB Wudiri. These two men made me to believe that there is still hope for Nigeria. Though death did not allow them to see what I have become today; their memories live on. All my directors and heads of programme at the National Cereals Research Institute Badeggi are appreciated for the various lessons of life God allowed me to learn under them. I appreciate all my colleagues at the National Cereals Research Institute Badeggi, too numerous to mention. Our times in NCRI remains a watershed in all the story that become me today.

Prof Audu, Employed me as a senior lecturer in 2009. I am sincerely appreciative of that singular privilege which is the reason and the grand norm for today's gathering. I was interviewed by Prof Limai who incidentally is now retired. Thank you, Sirs, for finding me appointable. I am grateful to Prof M.G.M. Kolo who believed in me and recommended me to be appointed the pioneer head of Department of



Food Science and Technology. Thank you, Sir, for standing for me when the battle for the soul of that nascent department became too hot. I appreciate my predecessors in the office of the deans; Profs Ken Baba, R.J. Kolo and Job Nmadu. I have shared fellowship with several others in the defunct School of Agriculture and Agricultural Technology too numerous to be mentioned. However, permit me Mr Vice Chancellor to pay special tributes to Prof C.E. Chinma. I first met this young enterprising Prof while I was doing my PhD in the then University of Agriculture Makurdi, while he came from Youth Service apparently for purchase forms for his Master's Degree. It was him that urged me to leave the research institute and join the University. I place on record today that in the hey days of the battle for the soul of Food Science and Technology, Prof Chinma stood with us to become what we are today. I also wish to observe that without such a person as Prof Chinma it would have been difficult for FST to have retained its full accreditation status today. My indebtedness to this young man cannot be quantified. God in his just judgements will not only be fair to Him but will also honour him among his peers. To my friends Dr Chinedu, Anyika, (Universitas Barzillai), Prof Rotimi Olaleye, Prof, A. Gana and Prof Haruna Ibrahim I remain very appreciative. To my wonderful colleagues at the Food development Research Team; DR Morris Aloysius, Dr Mrs Venessa Ezeocha, Dr Mrs ojo and Prof C.E. Chinma I dough my hat.

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The Chairman and Vice Chancellor sir, permit me to express my deepest regards to my General Overseer and his amiable wife Dr and Dr Mrs Cosmas Illechukwu. They have not only nurtured my Christianity but has also afforded me opportunities of Christian leadership and service up to national levels of our ministry. I have received spiritual and social and economic help from far and near. - Pastor and Mrs Emeruwa succoured me during my Youth Service in NCRI Badeggi and thus became my discipliers. Bar and Prof Mrs Sunday Agarry had been part

and parcel of my history. I owe them much gratitude. My regional Overseer, Dr and Mrs Robert Agbahia had meant so much to my family. Together, with the Middle belt Regional Core group of the Charismatic Renewal Ministries they have been the back bone of our all our undertakings. Today the presence of all the state overseers in the region and beyond bear eloquent testimony to their commitment to our family. I am also, indebted to the Peace House Missions in Gboko Benue State Nigeria, where I attended the Ministers Leadership Training from 1997-1999. I specially thank Terwase Tegerma for the relationship that we have shared since meeting him during that training. To the leadership of the Pentecostal Fellowship of Nigeria both at the state and the Local Government Level I express my deep appreciation for warm fellowship. I am equally indebted to the Joint Believers Fellowship in Bida, to my contemporaries Pastors Gab, Ejiobi, and Kolajo. My yoke-fellows at the NCRI staff fellowship and many more of the saints who love our master.

I extend special appreciations to Charismatic Renewal Ministries INC. Niger State Nigeria where God brought me over 30years ago as a young missionary corper. In labouring for the emancipation of men's souls God has been faithful these years that today we are moderately spread in Niger State. To the Core group and State leadership I owe immense appreciations for standing with me and my family in the journeys of our life together in Christ. It is indeed worthy and of good report to mention Dr and Mrs Steve Umoru (Retired Director Niger State Health Services). We met in Makurdi while I was doing my Master's Degree and had remained very close. He was my best man at my wedding even though he was married years before me. Dr and Mrs Christopher Nwosu (Consultant Gynaecologist and Obstetrician) Federal Medical Center Bida and the Bida zonal coordinator and Pastor of Bida I church), Dr and Mrs Okechukwu Dominic (Medical Director, Delight Hospital, Berit Hospital, Kubawa Fertility Hospital and Gawaraka Community Hospital Suleja) and Suleja Zonal Coordinator and Elder Omika. Your friendship and fellowship have been beyond church services. Dr Emmanuel Olushola- Chief Lecturer Niger State Polytechnic and HOD Mechanical Ondo State University Okitipupa

Ondo State Nigeria CRM Niger State Administrator and His Wife Mrs Lucy Olushola Emmanuel-Niger State CRM Charismatic Women League (CWL) Coordinator, deserves special mention. At the height of the eight months ASSU strike your benevolence helped me in no small measure to bury Mr Elder senior brother. I remain grateful for your labour of love. To all the pastors who have laboured alongside with me in the ministry, PST Denise Ahmed (Niger State CRM Director of Missions) Dr Innocent Oguche, Benue State University Makurdi, Dr Mike Nwafor,(Ebonyi State University) Abakiliki, PST George Ugwu (CRM Minna Resident Pastor), PST Andrew Abuh (Suleja CRM Pastor) DR Mike Fadipe (Sabon Wuse Pastor, and State Youth Director) PST Peter, Oguche (Bida II Pastor) PST Richard Ugah (Lambata church Pastor) PST Sam Ugwu (Zungeru Church Pastor) PST Fedelis Ibeagwu (Kontagora Church Pastor) PST Raphael (Adunu Chruch Pastor) PST Peter Sati (Chimbi Church Pastor). All other missionaries and church workers too numerous to mention who have laboured side by side with us, it is my esteemed appreciations. My bossom friend and yoke fellow, Kennedy Ozoemena is greatly appreciated for the brotherhood we enjoyed together post youth service working together at Government College Gwagwalada Abuja. To the then FCT Charismatic Renewal Ministries Core group and all the men and women who laboured side by side with us; Uncle Mike Ahile, Elder. Calistus, Dr and Mrs Agulanna, Mrs Vera Okeke, Mr and Mrs Collins Nwanozie, and others too numerous to mention. My friend and brother Richard Umbayor (Retired Director FIRS) deserve mention.

I am indebted to my in-laws Late Isah and Mama Mary Ale wo Onakpa. To Justice Ochimana Onkapa and his family and the entire Onakpa extended families I extend my sincere gratitude for been there for us. To Mr Unekwu Alewo I owe debts of gratitude. I am indebted to Mr Dan Okolo and his amiable wife Ajuma (nee Ochimana) for their encouragement to us all these years.

I owe debts of appreciation to my Mr and Mrs Obi Kanu. God has used them to provide us shelter and we have lived as one happy family. We cherish your warm fellowship and camaraderie.

I am grateful to my parents Abraham Anuonyemere Akasaraonyemere Onyeodilechi Uwadileke and Eileen Ihepusuajo Nwannediya Anuonye, though late. I grew up to see them so committed to our education that there is none of us in our family that doesn't boast of formal education. My father and mother lived for 105 and 109 years respectively. They lived long enough to enjoy a little of their strenuous investments they made in our family education. Their striving for our education remains unparalleled even though they were not educated. The legacy they left had remained a shiny light in all the length and breadth of Umunokwu Okwuatoh Autonomous community that today one of their sons stands in this place not only as the first Professor from Umunokwu autonomous community but also the first also to present such high-level lecture. Also, on record that My Late Sister Lolo Anne Amadi became the first Staff Nurse and Midwife from the same community. We also became the first family to build a modern corrugated iron roofed house. Today we celebrate one of the major gains of your foresightedness and industry. Anyone who argues against investment in education can try ignorance.

I am indeed indebted to the Anuonye family for their forbearance having stood for me and with me from cradle to this point. My Eldest Sister, Lolo Anna Amadi (Nee Anuonye) now late was more than a daughter as she single-handedly kept the family afloat during the civil war. Her industry and commitment to good morals and integrity kept her at a vantage position in the Biafran health Services from which pedestal help and succour came to us that we did not experience much of the evils that befall our people during those dark days of the Biafran Nigerian War. My senior brothers, Jude Amuchie Anuonye (Onyenwezi) now the oldest and head of the Anuonye Clan, a retired Deputy Director Information in Imo State, Chief Canice Ihekoronze Anuonye, (Retired Bank Manager) with United bank for African PLC, and Remigius Chinyeremeze are remaining and holding the forte of the Anuonye dynasty. We however, painfully miss the company of my late senior brothers-; Pastor Livinus Onwuelezi Anuonye (Retired Bank Manager with United Bank for African PLC, and Okenze Geoffrey

Onyemuchekukwu Anuonye. The candour and liveliness you inspire cannot be wished away. We miss you so much today that your presence would have made an entire huge difference in our overall joy beyond what we seem to be having today.

I am indebted greatly to my wife Mrs, Juliana Ojochide (Nee Onakpa) and our children Miss Onyinyechi Elejo Anuonye (BSc Computer Science), Miss Oluchi, Favour Ufedojo Anuonye, (College of Medicine, Federal University Wukari, Taraba State), Miss Ogochukwu Enyo-ojo Anuonye and Chizurumoke David Unekwojo Anuonye (Federal Government College Kwali Abuja) and Chijiuwa Micheal Onyemauchekukwu Anuonye (Union Bank PLC Gboko Benue State). We have come a long way in the experience of God and his ways together. In all things we have found God faithful. Today as we look back all we can say is that what God spoke in years past saying ‘I will always show you where to go. I'll give you a full life in the emptiest of places — firm muscles, strong bones. You'll be like a well-watered garden, a gurgling spring that never runs dry. You'll use the old rubble of past lives to build a new, rebuild the foundations from out of your past. You'll be known as those who can fix anything, restore old ruins, rebuild and renovate, make the community liveable again’. Our life together has been hard and tortuous. We have experienced discriminations, harassed because of our birth and origins, denied our rights, ignored and deliberately misused. In all of these, our testimony remains that the old ruins are been rebuilt, new foundations are springing up, the community is coming live again and so on. The chairman and Vice Chancellor Sir, I report that according to (2<sup>nd</sup> Cor 4:8-10) “You know for yourselves that we're not much to look at. We've been surrounded and battered by troubles, but we're not demoralized; we're not sure what to do, but we know that God knows what to do; we've been spiritually terrorized, but God hasn't left our side; we've been thrown down, but we haven't broken. What they did to Jesus, they do to us — trial and torture, mockery and murder; what Jesus did among them, he does in us — he lives”. This is our testimony.

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## **BRIEF PROFILE OF PROFESSOR ANUONYE, JULIAN CHUKWUEMEKA.**

Prof Anuonye Julian Chukwuemeka was born on the 31<sup>st</sup> of December, 1964 to the family of late Mr and Mrs Abhraham Anuonye Akassraonye Uwadileke Onyeodilechi of Umumbazu, Umunokwu Okwuatoh, autonomous Community of Aboh Mbaise Local Government area of Imo state Nigeria. He began his educational carrier at the Central School Okwuatoh from 1971-1977 where he obtained the First School leaving Certificate and proceeded to the Okenalogho Secondary Technical School Obowo Imo State from 1977 to 1982 and obtained the West African Examination Council (WAEC) certificate in 1982. In 1984 he enrolled at the Federal University of Technology Makurdi now Joesph Tarka University (JOSTUM) for a Bachelor of Technology Degree in Food Science and Technology graduating in 1989 with honours. He did the mandatory one-year National Youth Service at the National Cereals Research Institute Badeggi, Niger State, in 1989-1990. He briefly taught at the Government Secondary school Gwagwalada Abuja from 1990 to 1992. In September, 1992, he assumed duties at the National Cereals Research Institute as a Research Officer II deployed in the value-chain Department under the Soybean Research Programme. He was back to Makurdi, then University of Agriculture from 1994-1996 for a Master's Degree in Food Science and Technology. In 2000 he proceeded again to the University of Agriculture Makurdi and obtained a Doctoral degree (PhD) in Food Technology. He rose to the rank of Chief Research officer and became the ADP team Leader for Taraba State. He was the Team leader for the Exhibition of NCRI's Food technologies at the 23<sup>rd</sup> annual conference of NIFST in Abuja (1999). He has participated and also, lead several national and International Research Collaboration efforts including the NCRI/ IITA/ IDRC Soybean Utilization Project, the PROPCOM/USAID/NCRI Definition of Ofada Rice by Laboratory Analysis (2007), OFDA/IITA/NCRI Community Health Promotion project (2007-2008), Bill and Melinda Gates/ ICRISAT/IITA/NCRI SOYBEAN Processing and Utilization PROJECT (2007-2009),

He was a Member National Agricultural Research Programme (NARP) Team on Impact Assessment of Soybean Processing and Utilization in Nigeria. He was also, a Team member on Training on processing and Utilization of soybeans in Tunga Maji, Ayegunle –Gbede (Kogi State, Nassarawa State, Damaturu (Yobe State), Biu (Brono State), and Kaduna States etc. He equally was a Team member, Survey team on status of Beniseed Production Processing and Utilization in Nasarawa, Benue, Kwara, Kogi, Taraba, Yobe and Borno States. He was also a team member on the diagnostic survey of the status of production processing and utilization of NCRI 's mandate crops in the Middle Belt of Nigeria in 2008. He was on the Nigerian Team for Development of processing manuals for improved rice processing in West Africa (Port Novo) Benin Republic in 2010. He had been a contributing author with Intech Publishers from 2010-2016 and has served as both author and reviewer for several journals and publication outfits.

He left the Research Institute and transferred his services to the Federal University of Technology Minna in 2009. On Assumption of duties at the Federal University of Technology He was appointed Managing Editor of the School of Agric and Agricultural Technology Journal and later became the coordinator of the Food Science and Nutrition Option before emerging the pioneer Head of Department in 2012. He led the Department for its National Universities Resource Verification exercise and the University received NUC approval to run BTech Food Science and Technology. He further Led the Department for its first NUC accreditation exercise scoring 94,60% and earned full accreditation status during the Deputy directorship of Academic Planning of the current Vice Chancellor. During this period under review, Professor Anuonye entered and won the 3<sup>rd</sup> position for individual product development efforts at the 2012 National Universities Research and Development Competition. Professor Anuonye have since won the National Research Fund grant handsomely twice first as lead investigator and secondly as co-researcher and currently two concept notes and their full proposal is awaiting the TERTFUND Final verdict. Over fifty Million (50,000,000.00) naira has

been brought in to the University. Equally he had won several IBRI grants and currently is executing several of such research grants.

He has been a consultant good manufacturing practices expert involved in the auditing and equipping of small and medium scale industrial food processing outfits with the best industrial options for standard operating systems (SOP), health safety and environment, General principles of good manufacturing practices, the health safety and environmental Policy, Fire safety and fire Drill and Inventory management policy and procurement.

Professor Anuonye is a man of many first in his experience and life endeavours. He was the first Food Scientist to be promoted to Chief Research Officer in NCRI

He became the first Senior Lecturer in the department of Food Science and Technology, the first Associate Professor and the First Professor. Today he is presenting the first Inaugural lecture from Department of Food Science and Technology the first from the School of Food Science and Agricultural Technology and he is currently the first dean of the school of Food Science and Technology. He is equally the first person from his secondary School Alamata to become a professor, a head of department and a dean. He is also the first in his autonomous community to attain to this same height. Professor Anuonye in keeping with his pioneering calling is also the first state overseer of the charismatic Renewal ministries in Niger state.

Prof Anuonye is currently a Doctoral student of Systematic theology at the Faith Alive University in conjunction with the University of Ramoon United States of America. He has authored and co-authored some books on spirituality including the missionary church at 30; the fundamentals of true Christianity, the great Salvation, The Nigerian Church, and living according to pattern. He is currently involved in revival efforts reaching and strengthening local and rural pastors. He is married and lives in Minna with his family.

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