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EDITORIAL

Driven by curiosity and speculation as well as quest for new facts and principles, Pure Sciences stop at the development of general laws of nature and are less concerned with the practicality of their results or finds. Applied sciences take over from there, seeking the practical use of scientific knowledge and, therefore, forming the bridge between sciences and development. With the growth of the chemical and electrical power industries in the 19th century, scientific knowledge became of direct use in solving problems and the development of products.

The *Journal of Applied Sciences and Development* was born to publish materials on the areas bordering on the output of applied natura sciences as they relate to development of the society. It is a biannual published April and October beginning from 2010. However, due to high rate of rejection of low-standard papers, the two issues for a year could be published in one Volume, such as Volume 2 Number 1-2 of October 2011 and others. As usual, the current Issue, Volume 8 Number 2 of October 2017, is loaded with a variety of sound articles covering contemporary issues in applied natural sciences and development.

In the first paper, titled *Rationale and challenge of anti-open-grazing law in Nigeria in the 21st century*, Ezinwa, V.C. and Ikechukwu, A.E. of General Studies Division, Enugu State University of Science and Technology, Agbani, Enugu State, Nigeria examine the rationale and challenges of the anti-open-grazing law in forestalling and curbing herdsmen-farmer clashes in the 21st century Nigeria. Although, most citizens of Nigeria accept the anti-open-grazing law as the best solution to the incessant clashes between killer herdsmen and crop farmers, the Fulani herdsmen resist it as unworkable.

In the second paper, titled *Task analysis and trouble shooting*, Eneh, O.C. (Ph.D.) of the Institute for Development Studies, University of Nigeria, Enugu Campus and Prof. J.C. Agunwamba of the Department of Civil Engineering, University of Nigeria, Nsukka submit that orderliness, decorum, discipline and harmony are needed in work environment for optimal productivity. But, most establishments in Nigeria are lacking in these needs. The worker often does a thing in his way, at his time and rate. He has generally replaced punctuality with lateness, commitment with truancy, diligence with self-serving interest, and integrity with impunity and it-doesn't-matter attitude. He does not really care to be efficient. Yet,

efficiency is a hallmark of high growth establishments, while inefficiency grinds an establishment to a reproachable halt. To address the situation, fresh workers need training to make them fit to perform; subsisting workers need refresher training to restore competence in them because of the tendency of humans to relapse into unproductive habits. Task analysis inform the content and design of worker training and refreshers to keep them fit to perform. Troubleshooting serves for restoration and continuity of production and prevention of further failure. Frequent task analysis and trouble shooting are recommended for the staff of every establishment in Nigeria.

In the third paper titled,

In the fourth paper, titled

In the fifth paper, titled

In the sixth paper, titled

We thank all our esteemed contributors and enjoin them not to flag in their zeal for research and publishing, especially now that rejection rate appears to be growing. We must all not relent in our determination to use research and publishing to confront abounding development challenges in developing countries for the development of the total man. We welcome contributions from across the globe in all cognate disciplines (see *Author's Guide and Editorial Policy*, pp. 98-99), as we reiterate our commitment to delay-free and efficient processing of all submissions and their subsequent professional and competitive online publishing.

Best regards.

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RATIONALE AND CHALLENGE OF ANTI-OPEN-GRAZING LAW IN THE 21ST CENTURY NIGERIA

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Abstract
The mass burial of 73 crop farmers in Benue State in 2018 is a black spot in history. The farmers had been gruesomely murdered January 1, 2018 by Fulani herdsmen protesting the anti-open-grazing law promulgated by the State governemnt. This paper examines the rationale and challenges of the anti-open-grazing law in forestalling and curbing herdsmen-farmer clashes in Nigeria in the 21st century. The paper notes that the law specifically permits grazing of livestock only within ranches and prohibits the roaming of cattle from one place to another within a state except by rail, trucks and other vehicles. The anti-open-grazing law was seen by many as the best solution to the incessant clashes between killer herdsmen and crop farmers in the recent history of Nigeria. But, the Fulani herdsmen resist it as unworkable.

Keywords*: Anti-open-grazing law, Threat to crop farming, Bloody herdsmen-farmer clashes*

Introduction

In Nigeria, issues of anti-open-grazing re-surfaced in other dimensions in 2015 when Muhammadu Buhari became President of Nigeria and

Fulani herdsmen became unruly. Suddenly, the herdsmen became armed with AK47 and grazed on crop farmland of host farmers, destroying family crops and livelihoods and raping and killing the crop farmers and defying arrest and prosecution by the federal security agencies. In response to the crisis generated by these new developments, the Ekiti State Governor, Ayodele Fayose, on August 29, 2016, signed an anti-open-grazing bill into law to curb herdsmen excesses. He threatened to charge any cattle rearer found carrying arms while grazing with terrorism. The anti-grazing law has six main features.

1. Grazing must be from 7am to 6pm daily.
2. Anyone caught grazing on portions of land or any farmland not allotted by the government shall be apprehended and made to face the law.
3. Any herdsmen caught with firearms and any weapons during grazing shall be charged for terrorism.
4. Any cattle confiscated shall be taken to the government cattle ranch at Erifun and Iworoko Ekiti community in the State.
5. Any farm crop destroyed by any apprehended herdsman shall be estimated by agricultural officers and the expenses shall be borne by the culprit.
6. Any herdsman who violates any of these rules shall be imprisoned for six months without an option of fine.

Also, on Monday, May 22, 2017, the Benue State governor, Samuel Orton, signed into law the Open Grazing Prohibition Law 2017 to come into effect from November 1, 2017 as the best solution to curb the recurrent clashes between herdsmen and farmers in the state. The anti-open-grazing law specifically allows grazing of livestock only within ranches and prohibits the roaming of animals from one destination to another within the state except by rail, trucks and other vehicles. The law protects livestock and ranches by stipulating severe punishment for any person convicted of cattle rustling or any other

animals kept in ranches. Punishments for offenders range from imprisonment to payment of fines on conviction by a law court (Onamiga, 2018).

Governor Ortom set in motion the machinery to provide land for pilot ranches to assist livestock owners who may find the establishment of private ranches financially involving. The Governor inaugurated livestock guards and advisory committee charged with enforcement of the act across the State. Consequently, relative peace returned to the communities while farming and other socio-economic activities resumed (Onanuga, 2018).

But, Miyetti Allah Kautal Hore, a Fulani socio-cultural association, faulted the law, describing it as obnoxious and a recipe for anarchy. On January 1, 2018, irate herdsmen invaded villages in Guma and Logo Local Government Areas of Benue State, killing host crop farmers in their farms and homes. Seventy-three (73) fallen farmers were buried in a mass grave. The killings sparked outrage. Tor Tiv and paramount ruler of Tiv land, Prof. James Ayatse, said the attack was the 47th in five years by the Fulani herdsmen. He likened the killings to genocide (Onanuga, 2018).

Rationale of the Anti-Open-Grazing Law

This anti-open-grazing law was introduced in Ekiti and Benue States of Nigeria for te following reasons:

1. The practice of open grazing of cattle by Fulani herdsmen destroy crops and the businesses and livelihood crop farmers.
2. It needed to be regulated by clearly stated dos and don'ts to prevent the killer herdsmen from killing farmers, raping their wives and female children and destroying farmlands
3. The anti-grazing law would legitimize cattle rearing done in such a way as not to destroy someone else's business.
4. The killer Fulani herdsmen are suspected terrorists, decent of Boko Haram group terrerizing the northeast for half a decade running. Except their open-grazing activities were checked,

invasion of southern states by Fulani herdsmen was imminent. Hunters were charged with defending the people against unforeseen invasion.

5. There was an alarm against the surreptitious move by some persons identified as Bororo to kill and maim people. The anti-ope-grazing law was needed to protect the people and curb the killings of farmers by killer herdsmen (Balogun, 2018).
6. The killer Fulani herdsmen were mindless and devilish, requiring the introduction of anti-grazing law to protect lives and properties of indigenous farming communities (Balogun, 2018).
7. The government needed to discourage indigenous farmers from desertin crops and cash crops farming activities due to threats of herdsmen killings, expansionism and domination through the inauguration of Grazing Enforcement Marshall to confiscate cattle found grazing after 6 p.m.
8. For the past 10 years the people of Ekiti and Benue had continued to suffer attacks from the killer herdsmen. For example, from Ekiti came the report that herdsmen destroyed about 45 hectares of 500 hectare farm belonging to former Chief of Naval Staff; Vice Admiral Samuel Afolayan. The Ex-naval boss was quoted as saying that the cattle rearers burnt about 20 hectares of cassava farm and five hectares of palm farm. Afolayan averred that the destruction of his farm was a setback to his quest to contribute to food security in the state and the country.
9. The herdsmen also carried out frequent attacks on the farm of former Finance Minister and Secretary to the Government of the Federation, Olu Falae, in Ekiti state, who in addition, was once kidnapped by the herdsmen, but later regained his freedom. These attacks were sufficient precipitating factors for enactment of anti grazing laws (Obioha, 2018).
10. The once peaceful Fulani herdsmen suddenly became armed criminals, carrying not just sticks and knives to ward-off cattle rustling, but armed with AK47 guns to destroy crop farms, rape, maim and kill the crop farm owners. Worse still, Buhari's sturdid

silence and body language emboldened the Fulani herdsmen on their killer rampage of some states in the country. This fear, suspicion, and mistrust gave birth to anti-grazing law in Ekiti and Benue states.

11. The marauding herdsmen's menace attracted global attention that in 2014, they were ranked the 4th deadliest terrorist group in the world after Boko Haram, ISIS and Al-Shabab by the Global Terrorist Index. A pro-democracy group, the Human Rights Writers Association of Nigeria (HURIWA) called on President Buhari to categorise the killer Fulani herdsmen as terrorists, but he looks the other way. The introduction of anti-open-grazing law to protect people from terrorists in the disguise of herdsmen became necessary (Obioha, 2018).
12. The federal government had been handling the herdsmen menace with kid gloves. It never arrested nor punished the masterminds of Enugu massacre, Benue massacre and their foot soldiers. It was bad to turn Nigeria into the killing field because of cattle. Sadly, Nigeria is not reckoned among major producers of cattle in the world, yet cattle remain the source of Nigeria's headache and danger as herdsmen trespass on farmland of other people. If they dare complain, they would either be killed or intimidated with impunity. Under the Buhari regime the Fulani had been killing farmers daily because of cow.
13. All over the world, cattle are reared in ranches where their quality can be maximized and never allowed to roam and destroy people's farms and crops. Continuous killings in Nigeria because of cow farming do not portray Nigerians as a civilized and entrepreneurial people. Fulani herdsmen should establish ranches in northern part of Nigeria, from where they hail and stop the ongoing massacre that the cattle pastoralists portend (Obioha, 2018).
14. Cattle rearing is carried out to constitute a danger to farm crops and human lives as is presently the case in the Middle Belt and other parts of Nigeria.

Challenges facing the anti-grazing law in the 21st century Nigeria

Since the coming of the ant-grazing laws in Ekiti State in 2016 and Benue State in 2017, Miyetti Allah Kautal Hore, a Fulani socio-cultural and economic group, faulted the laws and described themt as obnoxious, offensive and hurtful to their economic interest of roaming about freely and rearing their cattle on peoples' crop farmland. The National President of Miytti Allah Kautal Hore Association, Alhaji Bellow Abdullahi Bodejo, said the land grazing law of 1960 is what they know and is subsisting. He harped on the impossible mission to decimate the Fulani and expressed worries that their human right to free movement was being violated as a result of the restriction placed on their means of livelihood. Bodejo noted that pastoralist have same legal rights like every Nigerian (Onanuga, 2018).

There are operational challenges, causes and difficult conflict between the Fulani herdsmen and crop farmers struggle for survival in the Benue Green valley axis. This axis has witnessed continuous orgy of violence and killings by suspected herdsmen not only in Benue State but the whole of the Middle Belt region. Nigeria has in recent time witnessed increased violence between farmers and herdsmen leading to the death of innocent souls. In Benue and Ekiti States, as well as other Southern states, open-grazing is seen an uncivilized and outdated cattle-rearing practice and a source of anarchy, utter lawlessness, chaise and complete disorder with the increasing population in Nigeria and development everywhere. How can herdsmen roam about with their cattle without trespassing on crop farmlands? These are some of the challenges facing herdsmen in recent times. To curtail the clashes of herdsmen and crop farmers, states have had to enact anti-open-grazing bill to protect citizens' lives and property and to arrest the threats to peaceful and mutual co-existence in many farming indigenous communities. But Miyetti Allah Kautal Hore members see the anti-grazing bill as discriminatory, ill-intended and a misplaced priority. To them, grazing, like any other occupation, is cultural. The challenge of open grazing in the recent history of Nigeria makes

indigenous crop farming communities to be battling with killings and wanton destruction of property by killer herdsmen.

Other challenges facing herdsmen and crop farmers as regards the anti-grazing law are ethnic politics, religious and multi-cultural differences. The killer herdsmen and the crop farmers are divided along ethnic and religious fault lines, most often between Christians and Muslims hatred and bigotry which often cause bloodshed and anarchy. The Benue State Governor, Samuel Ortom, on Saturday, January 20, 2018, opined that only the arrest of the leadership of Miyetti Allah Kautal Hore (MAKH) can give the Benue people a sense of belonging and restore their hope in the Nigerian State. Ortom also lamented that despite open threats by the leadership of the group to mobilize all its members to resist the anti-grazing law, which resulted in the attack on some communities of Benue State and killing of over 73 people, the leaders of MAKH are still walking freely in the country.

Ortom urged the federal government to take proactive action on intelligence reports that were gathered on threats alerts from the state so that the fears of the indigenous crop farming communities regarding possible attacks could be allayed. Aside from the 73 people killed by the killer herdsmen in Benue state on January 1, 2018 alone, the state was saddled with the responsibility of catering for over 80,000 internally displaced persons (IDPs), who were dislodged from their homes as a result of the herdsmen attacks. In further protest against the anti-grazing law, MAKH claim that the Benue valley belongs to them (Ejembi, 2018). Despite widespread condemnation and rejection of the proposed cattle colony across the country for Fulani herdsmen by the federal government, the pro-North Arewa Consultative Forum (ACF) has expressed its backing for the proposal. But, other socio cultural groups, like Ohaneze Ndigbo, Yoruba Elders as well as some ethnic groups all over the country, lately kicked against the idea.

Even if the Ministry of Agricultrue got a law to back the cattle colony project for the Fulani, it would be a bad law and would certainly be obeyed in the breach. To make a law to create cattle colonies for Fulani herdsmen is discriminatory. Nigeria's constitution

does not permit discriminatory laws, which will easily be defeated on the judicial interpretation as unconstitutional and sectional to favour and benefit a particular set of Nigerians against others (Emewu, 2018). The herdsmen killings of crop farmers in Benue State in response to Ortom's creation of the anti-grazing law was a big dent on Buhari administration and an indication that the federal architecture had collapsed. The cattle colony project is viewed as a ploy to Islamise Nigeria. Cattle colonies creation in the federation would increase conflict in Nigeria because those aggrieved by the loss of loved ones in Benue, Enugu and Ekiti killings would see this as a reward for the killer herdsmen.

The Nigerian police, the Nigerian Intelligence Agency (NIA), the Department for State Security (DSS) and the State Security Service (SSS) have sadly failed to live up to their responsibilities on the issue and this may result to food shortages and hunger because crop farmers, for fear of the killer herdsmen, have run to urban centres and internally displaced persons' camps for safety. Other challenges that hinder the smooth operation of the anti grazing law in Benue and Ekiti States are inflammatory statements from the leadership of Miyetti Allah Kautal Hore. They do not exercise restraint in their comments on the current herdsmen-farmer crisis across the country. The leadership of Miyetti Allah Kautal Hore is not cautious and circumspect on their public utterances, especially in this trying period of the country's unity. The association sees nothing wrong in the use of firearms, including AK 47, for herdsmen to protect cattle.

Way out of herdsmen/crop farmers clashes

Federal Government should establish special court to settle cases of cattle rustlers rather than allow herdsmen to take violence and reprisal on innocent crop-farmers. The government should also regulate the quest of herdsmen for pasture and water for their cattle which have often brought them in collision with indigenous crop farming communities. Government must also identify the root cause of the problem and summon the courage to confront them and not to look the

other way, while killer herdsmen massacre the crop farmers. Government of the various states where these herdsmen hail from should brace up to the challenge and develop ranches where herdsmen could breed and raise their cattle rather than for the herdsmen to be trespassing on peoples crop farmland.

The security situation in Benue and other Middle Belt States is worrisome. The mindless bloodletting in these crop farming communities by killer herdsmen does not augur well for the peace and unity of the country. The federal government must overhaul the nation's security architecture. The current arrangement of centralization of provision of security services and the inadequate numerical strength of the Nigeria Police Force cannot guarantee adequate security for all Nigerians. While Abuja and the 36 States capitals are relatively secure, the same cannot be confidently said of the local government areas in the country. This probably explain why many local government officials and big time farmers who hardly stay in their domains, but mostly reside in their State capitals.

The federal government should consider introducing state police, to make policing more effective. Community policing is also required to tame the increasing menace of killer herdsmen. The insecurity in Ekiti, Benue and the states in the Middle Belt, which some influential politicians in the North are trying to politicize, must be seriously checked before it degenerates to anarchy. For many years, Benue politics has been associated with violence of unimaginable proportion. The political gladiators in the region ought to work for peace in the larger interest of the farming communities. Security agencies should bring the killer herdsmen to book. They should not relent until the killer herdsmen and cattle rustlers are apprehended and brought to justice, to enable the families of the victims of this dastardly murder and maiming to recover and continue to sustain Nigeria with abundance foodstuff from te green Benue valley.

The continued clash between killer herdsmen and crop farmers in the Middle Belt and the nation in general calls for a national dialogue of the creation of grazing fields for the herdsmen, especially

from the region they hail from. This will rescue the nation from anarchy.

Conclusion

Nigeria needs a marshal plan to rebuild the whole of grazing fields in the North where the cattle rearers come from. The government and cattle owners need to collaborate in building modern ranches in the region. In addressing the herdsmen-farmers crisis in Nigeria, the media campaign should not be biased against ethnic or religious groups. The media ought to say the truth and provide panacea and space for herdsmen-farmers conflict resolution and management in order to address the contentious issues. The federal government should call for judicial commission of inquiry into all these killings so as to unravel the truth and the offenders. Nigerians media should shun every form of discrimination and vices that can trigger senseless violence and bloodshed in the country. The Nigerian law enforcement agencies should be prepared to lay down their lives to fight crime in the country and the citizenry should co-operate with security agencies and furnish them with relevant information and intelligence that will help in ending the senseless bloodshed caused by killer herdsmen-farmers clashes.

The government at all levels, religious leaders, traditional rulers, activists and the media should serve as national vanguards in resolving the killer Fulani herdsmen and crop farmers crisis. Likewise, politicians should be wary of their campaign messages and slogans by ensuring that they are geared towards peaceful coexistence of the electorate. The agony created by killer herdsmen and crop farmers tragedy should not be used as a campaign tool to instigate crisis among the ethnic and religious groups who are already divided along fault lines. Instead, mediations, dialogue and peaceful participation and constructive engagement of the citizenry should be encouraged. During this trying moment of tension created by killer Fulani herdsmen and crop farmers clashes across the six geopolitical zones in Nigeria, the armed forces and the security agencies are advised to remain apolitical,

neutral and focused on the ethics of discipline which is the hallmark of their profession.

Recommendations

This study has come forth with the following recommendations to curb herdsmen-farmers crisis in the 21st century Nigeria:

1. The federal government should assure farmers of adequate protection of their lives and property and mobilize security forces to prevent nefarious activities of the killer herdsmen and cattle rustlers who provoke the Fulanis to attack farmers. Governors, the Police and other law enforcement agents should always read the riot act to the herdsmen and crop farmers regularly, urging them to stop their dastardly acts or face the wrath of the law. Be they Nigerians or foreigners, killer herdsmen must stop killing farmers and destroying farmlands in the bid to herd their cattle.
2. The federal government and the Governors must be ready to defend Nigerian farmers wherever they may be. The ugly experience of killings in Benue, Taraba, Adamawa, Enugu and Ekiti States by Fulani herdsmen must not be allowed to happen or spread to other states of the federation. The Fulani herdsmen attack in the Middle Belt region of Nigeria had created the consciousness and spirit of defence mechanism to all ethnic groups against the killer herdsmen.
3. Government should also introduce new grazing system and deployment of modern technology like an electronic chip to track animals. This will go a long way to curb crisis of herdsmen and farmers in Nigeria.
4. Nigeria has a total of 417 grazing reserves out of which only about 113 have been gazetted. This means that the government should commission a large scale research to carry out in-depth study to understand the reasons for the escalation of violence between herdsmen and cop farmers, pattern of population distribution, and

development areas. These factors may determine areas to develop ranches and cattle colonies in Northern Nigeria.

5. The media should show restraint in their reportage of the clashes of herdsmen and crop farmers crisis in order to prevent further escalation to other areas. The media dousing the tension of the crisis would help promote mediation and dialogue between herdsmen and crop farmers in Nigeria.
6. In resolving the herdsmen and crop farmers crisis in Nigeria, international best practice of animal husbandry should be considered by the state and federal governments.
7. Government should also recommend ranching as one of the possible models in areas with lower population densities in the North East (Sambisa Game Reserve in Borno State) and North West (Gadan Jaja Grazing Reserve in Zamfara State). This will help curb herdsmen and crop farmers crisis in Nigeria.
8. The federal government should honestly prevent the situation that year-in year-out crop farmers are killed in the Middle Belt and other parts of Nigeria with no action taken by the government to address the conflict, save proposed cattle colonies. The killer Fulani herdsmen, be they Nigerians or foreigners, should not device an agenda to be killing people in the indigenous farming communities and destroy their economy and promote their domination of the people politically and economically. Between 1800 and 2018, Benue people have been under attack by this organized evil, and only courage and determined resistance have preserved the people. Between 2010 and 2018 alone, over 1,000 people have been slaughtered in Benue state without the federal government taking definitive steps to end the massacre, attacks and killing of citizens of Nigeria en mass by an armed organization attacking the Nigerian state. The unity of Nigeria is being threatened not only by organized terror, but also by those in authority, who have the capacity to act, but deliberately do nothing (Anule 2018).

9. Enough has been said, but not done about these mindless killings in the Middle Belt and other parts of Nigeria. Yet, while the murdering, raping and destruction of homes and crop farmlands continues, the herdsmen's activities have no links to "communal crisis" compelling police operations. They are programmed for certain ends, which could inadvertently threaten the security and corporate existence of the nation. For one, the government must come clean about the issue of herdsmen and crop farmers crisis, which has become an albatross on the necks of President Buhari and the All Progressive Congress (APC) administration he heads. Why is it difficult to mandate the military to take charge, and label the armed herdsmen terrorists, the way the unarmed Indigenous People of Biafra (IPOB) was named, proscribed and pigeonholed? Why would the President, despite spirited denials, allow the festering of the direct allegation of using the herdsmen as foot soldiers for the so called plan to Islamise Nigeria? Doesn't this discernment bother him, as it worries even his most ardent supporters of other faith and tribe? With patriotic fervour, Buhari should juxtapose his stance on the herdsmen issue with his famous inaugural proclamation to keep his oath and serve as President to all Nigerians in te manner of "I belong to nobody and to everybody". The time to act is now, and with the bare knuckles, not kid gloves, that demands immediate deployment of military troops to the troubled spots, so that the "pythons can dance" and the "crocodiles can smile" to the perpetrators of the heinous crimes against Nigerians. That is the only way to disprove the President's perceived "body language" towards the killer herdsmen's notoriety, and to pacify a harrowed, traumatized and beleaguered citizenry (Ezomon, 2018).

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TASK ANALYSIS AND TROUBLE SHOOTING

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Abstract

Orderliness, decorum, discipline and harmony are needed in work environment for optimal productivity. But, most establishments in Nigeria are lacking in these needs. The worker often does a thing in his way, at his time and rate. He has generally replaced punctuality with lateness, commitment with truancy, diligence with self-serving interest, and integrity with impunity and it-doesn't-matter attitude. He does not really care to be efficient. Yet, efficiency is a hallmark of high growth establishments, while inefficiency grinds an establishment to a reproachable halt. To address the situation, fresh workers need training to make them fit to perform; subsisting workers need refresher training to restore competence in them because of the tendency of humans to relapse into unproductive habits. Task analysis inform the content and design of worker training and refreshers to keep them fit to perform. Troubleshooting serves for restoration and continuity of production and prevention of further failure. Frequent task analysis

and trouble shooting are recommended for the staff of every establishment in Nigeria.

Introduction

For optimal productivity, work environment needs orderliness, decorum, discipline and harmony. But, in most establishments, including the University system in Nigeria, there is the lack of orderliness. Staff often do things in their ways and at their own time and rate. Workers have generally replaced punctuality with lateness, commitment with truancy, diligence with dereliction of duty, discipline with indecorum, morality with immorality, corporate interest with self-serving interest, and integrity with impunity and it-doesn't-matter attitude (Neboh, 2006). Doing things right has been thrown to the wind as old-fashioned. Many workers tend to play smart, short-change the organisation and take the pay for which they did not labour.

The effects are legion, unpallatable, and rob the establishment and society of meaningful progress in development. They include:

- poor work output and productivity
- pieces of work yawn for attention, while high and low cadre workers put precious and high-costing man-hour and machine-hour to criminal waste
- by withholding services, staff frustrate the people they ought to serve
- some workers extort money from the public for rendering the service for which they were employed and are paid salaries
- robbing employer of salaries
- public services have acquired a second name - ineptitude - because workers handle their duties without seriousness and commitment
- the public expresses dissatisfaction and lack of confidence in MDAs, including SOEs
- workers have become known for vicious and deviant behaviours, including greed, envy, jealousy, in-fighting, gossip, petiness, among

others, which are evil hurricane fast truncating progress in the society
- development retrogress (manifesting in economic recession)
- staff are fearlessly insubordinate to authority (*onwero ife geme*, *odeshi*) because the boss is party to the mess or rot in the system
- the products of the establishments are of poor quality beause of indiscreet attitude to work, corner-cutting and compromising stance of staff.

Study Aim

Employers of labour are decrying worker inefficiency, which often leads to lay-off and attendant income poverty and drop in the level of the wellbeing of the people. Addressing the situation requires task analysis and trouble shooting. Workers are hired for effective service. They must be productive. Continued retention of a worker in an organisation demands efficiency of the staff. This presentation targets workers in an organisation. It is concerned with job analysis and trouble shooting, aimed at improving worker efficiency.

Study justification

Workers should be hired based on skill of operation – not certificate, relationship, connection, etc. They are retained on basis of effectiveness or faithfulness – not sentiments. Right workers know what to do, when, how, where and with what tools to do it, and perform as they ought to. Bad workers are unproductive and double-destructive by wasting resources and stampeding the way of good workers trying to perform. Since man is imperfect, task analysis and trouble shooting are used to right the wrong in work process and to enthrone efficiency in workplace. Workers must, therefore, be exposed to task analysis and trouble shooting in training, refreshers and literature update.

Task analysis

Meaning

Task analysis is the process of observing workers in action in order to learn and understand in detail how they perform their tasks and achieve their intended goals. According to Kirwan & Ainsworth (1992), it is the analysis of how a task is accomplished, including a detailed description of both manual and mental activities, task and element durations, task frequency, task allocation, task complexity, environmental conditions, necessary clothing and equipment, and any other unique factors involved in or required for one or more people to perform a given task.

Job task analysis (JTA) is the most widely accepted and nationally used process for determining valid job content and employment requirements. It is used to construct accurate and valid job descriptions, and to define valid and defensible position duties and responsibilities. It is a systematic identication of the fundamental elements of a job, and examination of knowledge and skills required for performing the job. This information is used in human resource management for developing institutional objectives, training programmes, and evaluation tools.

According to Jonassen, Tessmer & Hannum (1999: 3), *hierarchical task analysis* provides an understanding of the tasks users need to perform to achieve certain goals. *User task analysis* is the means by which scientists, engineers and technical writers determine the characteristics of users which will influence the development of software systems or other technological products. *Task analysis for instructional design* is a process of analyzing and articulating the kind of learning that you expect the learners to know how to perform.

Uses of task analysis

Hackos & Redish (1998) submit that *i*nformation from a task analysis can be used for many purposes, such as:

- personnel selection and training
- tool or equipment design
- procedure design (e.g., design of checklist or decision support system), and
- automation.

Kinds of task analysis
There are five kinds of task analyses:

- job or performance analysis
- learning analysis
- cognitive task analysis
- content or subject matter analysis, and
- activity analysis.

Distinct functions of task analysis process
The task analysis process consists of five distinct functions:

- Classifying tasks according to learning outcomes;
- Inventorying tasks – identifying tasks or generating a list of tasks;
- Selecting tasks – prioritizing tasks and choosing those that are more feasible and appropriate if there is an abundance of tasks to handle;
- Decomposing tasks – identifying and describing the components of the tasks, goals, or objectives; and
- Sequencing tasks and sub-tasks – defining the sequence in which instruction should occur that will best facilitate learning.

Relationship between productivity and task analysis

Productivity
Productivity is the ratio of output to input:

$$\text{Productivity} = \frac{\text{output}}{\text{input}}$$

From the equation, the higher the output over the input, the higher the productivity, and vice versa. Inputs are human and material resources, while output is work done or outcome. To perform, workers must know what to do, when, how, where and with what tools to do it, and be committed to doing it as and when due. This is where task analysis comes in.

Benefits of task analysis

Task analysis ensures/enhances productivity. Productivity begins to fail from improper or a lack of task analysis.

When tasks are properly analysed:

- job schedule is clearly defined
- personnel recruitment or selection is made easy
- the training need of old and new staff is identified
- tool or equipment need and design becomes clear
- procedure of work is outlined
- design and specification will ensure use of all resources and avoid waste of materials
- design and specification will avoid waste (e.g. in building project or student training)
- adherence to process or operation will give faultless products (e.g. graduand)
- specification guides economical procurement of materials for a given performance
- proper handling will prevent damage of materials
- proper handling will avoid waste of time (e.g. academic overstay) and materials
- proper performance will keep embarassments abay (e.g. reproach from failures)
- proper performance will avoid the need for costly image laundering (e.g. recall of goods)

- supervision is made easy as deviation from benchmarks becomes obvious
- generating a list of tasks (inventorying tasks) is made easy
- prioritizing tasks and choosing those that are more feasible and appropriate is made easy
- decomposing tasks, i.e. identifying and describing the components of the tasks, goals, or objectives is easier
- sequencing tasks and sub-tasks avoids bottlenecks
- sequencing tasks will maximize the use of man-hour and machine-hour

Task content of a job

The task content of a job is made up of:

1. basic work content
2. excess work content, and
3. ineffective time.

Basic work content is measured in terms of the irreducible minimum time theoretically required to do the work. Excess work content is a product of wrong usage of machine, process in bad condition or not being operated correctly, wrong tool usage, bad layout causing wasted movements, and poor working method or condition. Excess work content is measured in terms of the time (t) required for work content plus defects (t_x) in the design or specification of the work.

Ineffective time is divided into two: *ineffective time due to management*, and *ineffective time due to operator*. Ineffective time due to the shortcoming of the management consists of:

(i) excessive workload which increases fatigue
(ii) bad planning of work
(iii) lack of raw materials (e.g. fuel, network, fan/airconditioner, etc.)
(iv) plant breakdown

(v) tools in bad conditions (increase ineffective time due to scrap and/or rework)
(vi) bad working conditions (increase ineffective time through forcing workers to rest)
(vii) accidents increase ineffective time (through stoppages and absence)
(viii) lack of supervision increases wastes (e.g. Friday is almost completely sacrificed to burial)

Ineffective time within the control of workers can be grouped into:

(a) absence, lateness and idleness
(b) careless workmanship that leads to scrap and rework
(c) carelessness that leads to accidents.

Management can reduce excess work content due to ineffective method through:

a) process planning that ensures selection of correct materials
b) process planning and research that enure correct operation
c) process method study that ensures correct selection of tools
d) method study that reduces excess work content due to bad layout
e) method study and operator training that reduce excess work content due to bad working method.

Management can apply techniques to reduce ineffective time within the control of the worker through:

1) sound personnel policy and incentives that reduce ineffective time due to lateness, absence and idleness
2) personnel policy and operator training that reduce ineffective time due to carelessness
3) safety training that reduces ineffective time due to accidents

Solutions to ineffectiveness

The solutions to ineffectiveness lies in targeting appropriate work content by eliminating excess work content and ineffective time. We can reduce excess work content through:

1. job task and value analysis
2. specialization (of a worker) and standardization (of work) to speed up work and ensure quality
3. customer-care techniques (feedback mechanisms, etc.)

Trouble shooting

An organization or system can be described in terms of its expected, desired or intended behaviour or output or objective or purpose or mission. Inputs to the system are expected to generate specific results or outputs. For example, selecting "Print" option in a computer should result in a hardcopy emerging from the printer; an otherwise outcome is a symptom that necessitates diagnosis of the failure of the computer. Similarly, inadequate work output is a symptom that necessitates diagnosing why the resources (human and material inputs) are not performing. Since there is no perfect system, there is often the need for troubleshooting process of isolating the specific cause or causes of the symptom. Corrective action can then be taken to prevent further failures of a similar kind.

Trouble shooting is the process of analyzing and solving serious problems for an organization. It is the identification or diagnosis of trouble or symptoms of malfunction in the management flow of an organization caused by a failure of some kind and remedying the causes of these symptoms.

Relationship between productivity and trouble shooting

Trouble shooting addresses the imperfect human system by isolating the specific cause of failure in a task with a view to taking a corrective action in order to restore productivity and to prevent further failures of

a similar kind. Without troubleshooting, a system grinds to a permanent halt when it encounters a failure.

Conclusion

Efficiency is a hallmark of high growth establishments; inefficiency grinds an establishment to a reproachable halt. Fresh workers need training to make them fit to perform; subsisting workers need refresher training to restore competence in them because of the tendency of humans to relapse into unproductive habits. Task analysis and trouble shooting inform the content and design of worker training and refreshers to keep them on their toes to perform. Troubleshooting serves for restoration and continuity of production and prevention of further failure.

Recommendation

Frequent task analysis and trouble shooting are recommended for the staff of every establishment.

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KNOWLEDGE MANAGEMENT A VERITABLE TOOL FOR EFFECTIVE HEALTH CARE IN NIGERIA

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Abstract

Amidst an ever changing health care knowledge, patients die most times for inadequate health care knowledge on the side of the medical personnel. To address Nigeria's poor ranking in effective health care delivery, knowledge management - a tool that makes tacit knowledge (experience) available for use at the right time and when it is needed – has become imperative. This study proposed a knowledge management system which allows health personnel share their vital experiences which can be accessed by other health personnel at the point of care.

Keywords: *Knowledge management, Healthcare, Organisation*

Introduction

Many experts mistakenly assume that knowledge management is about capturing all the best practices and knowledge that people possess and storing it in a computer system in the hope that one day it will be useful. This is a good example of what knowledge management is not about! Consider this: how often has information or knowledge been pushed at you when you do not need it, i.e. paper, emails, training, and other irrelevant meeting? Then later, when you do need it, you vaguely remember seeing something relevant but can't find it. Some surveys suggest that professional workers spend ten per cent of their time looking for information they know is somewhere. If what you want is in people's heads, and they're not always around, how can you access it when you need it? What if you don't know whose head it's in, or if they'd be willing to share it with you? In a nutshell, good knowledge management is all about getting the right knowledge, in the right place, at the right time.

The right knowledge are what you need in order to be able to do your job to the best of your ability, whether that means diagnosing a patient, making a decision, booking a referral, answering a patient's question, administering a treatment, training a new colleague, interpreting a piece of research, using a computer system, managing a project, dealing with suppliers etc. Information and knowledge can usually be found in a whole variety of places – research papers, reports and manuals, databases etc. Often it will be in people's heads – yours and other people's. The right place, however, is the point of action or decision – the meeting, the patient helpline, hospital bedside, behind the reception desk and so on. The right time is when you (the person or the team doing the work) need it. (DeBrún, 2005)

Knowledge management is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously un-

captured expertise and experience in individual workers (Obotor et.al, 2013).

Broadly, knowledge management involves four key steps of creating/ generating knowledge, representing / storing knowledge, accessing/using/re-using knowledge, and disseminating or transferring knowledge (Gibson et. al 2010; Dalkir, 2005)

Knowledge in organisations is often classified into two types: explicit and tacit (DeBrún 2005; Chen 2013; Dalkir 2005; Uriarte 2008).

Explicit knowledge is information that is easy to capture, structure, and share with individuals. For example, explicit knowledge can be the documentations like hospital policies and procedures and clinic diagnostic methodologies. Alternatively, tacit knowledge is comprised of experience and skills that an individual can acquire overtime and apply to problems. The exposure to events over time can evolve a person's thought process. Tacit knowledge is difficulty to capture, structure, and transfer to other individuals. Tacit knowledge is the understanding of how and why with regard to a particular subject area. Due to the degree of complexity, objectivity, and subjectivity, tacit knowledge is difficult to capture and transfer without dedicating significant resources to codify the knowledge into an explicit form that can be utilized by others.

Organizational knowledge is not static; rather it changes and evolves during the lifetime of an organization. What is more, it is possible to transform one form of knowledge into another; i.e., transform tacit knowledge into explicit and vice versa. This process of transforming one form of knowledge into another is known as the knowledge spiral (Gibson et.al 2010) naturally, this does not imply one form of knowledge is necessarily transformed 100% into another form of knowledge. In (Gibson et.al 2010), (1) Socailsation or tacit to tacit knowledge transformation usually occurs through apprenticeship type relations where the teacher or master passes on the skill to the apprentice. (2) Combination or explicit to explicit knowledge

transformation usually occurs via formal learning of facts. (3) Externalization or tacit to explicit knowledge transformation usually occurs when there is an articulation of nuances; for example, if an expert surgeon is questioned as to why he performs a particular surgical procedure in a certain manner, by his articulation of the steps the tacit knowledge becomes explicit. (4) Internalisation or explicit to tacit knowledge transformation usually occurs when explicit knowledge is internalized and can then be used to broaden, reframe and extend one's tacit knowledge. Integral to these transformations of knowledge through the knowledge spiral is that new knowledge is being continuously created (ibid) and this can potentially bring many benefits to organizations. What becomes important than for any organization in today's knowledge economy is to maximize the full potential of all its knowledge assets and successfully make all germane knowledge explicit so it can be used effectively and efficiently by all people within the organization as required

In healthcare, having the right information at the right time can become a very difficult challenge due to the sheer amount of ever-expanding knowledge. The volume of medical knowledge doubles itself every 17 years. (Stroetmann & Aisenbrey, 2012).

Healthcare enterprises can be regarded as 'data rich' as they generate massive amounts of data, such as electronic medical records, clinical trial data, hospitals records, administrative reports, benchmarking findings and so on. But, in the same breath we can say that healthcare enterprises are 'knowledge poor' because the healthcare data is rarely transformed into a strategic decision-support resource (Abidi, 2001).

Healthcare delivery processes are knowledge-intensive nature; there has been a call for implementation of knowledge management in the context of hospital management. Once knowledge creation and sharing are embedded in the management practice and the daily operational routines, the resultant proprietary knowledge can establish a solid foundation for a truly sustainable competitive advantage

The success of healthcare depends critically on the collection, analysis, and exchange of clinical, billing, and utilization information or knowledge within and across organizational boundaries

The Institute of Medicine called for reform of the health care delivery system by drawing attention to the alarming rate of medical errors in hospitals, where mistakes are made because of inadequate processing of critical knowledge at the point of care (Guptill 2005). Nigeria as a developing nation is considered one of the highest child mortality rate as a result of lack of adequate information at the point of care. Oral investigation of citizenry confirmed that most death of a loved one is as a result of lack of information required from the medical personnel on how to tackle a particular ailment

The purpose of this is paper to reduce the rate of medical error among health personnel as a result of lack of medical knowledge at the point of care. The unavailability of required health care knowledge adversely increase mortality rate thus knowledge management system is developed as a tool to improve health care delivery where health personnel can share tacit medical knowledge.

In DeBrún (2005) there are six(6) approach to identifying and sharing best practices. The overall approach is aimed at documenting the essential features of a best practice, giving pointers to relevant experts in that practice, deducing general guidelines, diffusing basic knowledge, and using subject matter experts to apply and adapt the practices in a new context. However our proposed knowledge management system is a combination of case management system, group decision support system in (Gibson et al, 2010) and the six (6) approaches to identifying and sharing best practices

Case management system evolved recently as a result of a growing trend of integrating health service delivery both vertically (coordinating clinical care across providers i.e., between surgeons and physical therapy) and horizontally (linking institution providing the same types of treatments) Another feature of these systems is that they enable case mix applications and thus provide the capability and

flexibility of integrating financial and clinical data. The benefits of this cannot be understated. Group decision support system Involve the use of interactive, computer based systems that facilitate the search for solutions to semi-structure and unstructured problems shared by groups. Once again these systems will benefit the quality of the patient treatment by supporting decision making processes regarding patient treatments

The six (6) approaches are:

1. Identify users' requirements: Starts by considering where you can really add value. Look at what areas of the organisation need attention because of poor performance or difficult challenges

2. Discover good practices: look at who is producing excellent results and is therefore likely to be using good practices.

3. Document good practices: Best practice descriptions are usually kept in a database in a standard format

4. Validate best practices: is to have a panel of reviewers compromising internal and external subject experts and peers, who evaluate a potential best practice against their knowledge of existing practice.

5. Disseminate and apply: This is where the real value is added. Not only does it help the recipient dig beneath the explicit knowledge and gain more in depth insights, but it can also provide a two-benefit in that dialogue between the conveyor of best practice knowledge and the recipient can enrich the knowledge of both.

6. Develop a supporting infrastructure: involves the people to facilitate and drive the process through its initial stages, until it

becomes embedded in the organisation's ways of working. The technical infrastructure for document sharing and databases. The content management infrastructure to ensure that best practices are documented and classified electronically in a way that makes them easy to find.

Proposed knowledge management system architecture

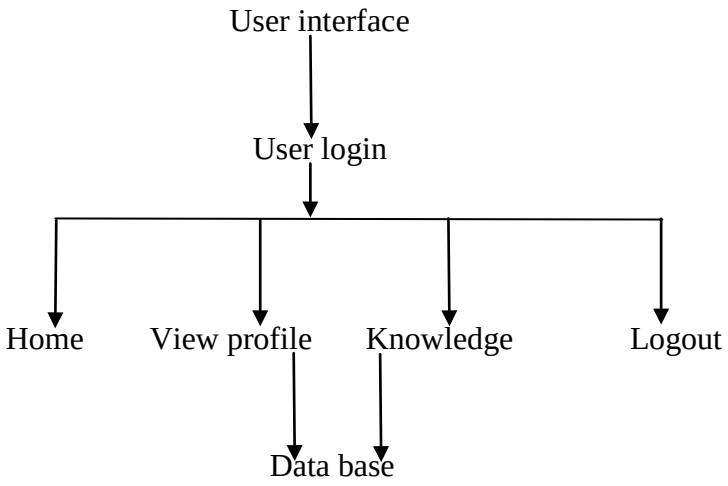

Figure 1: Knowledge management architecture

The knowledge management architecture in figure 1 shows the various stages of processing of the knowledge management system development for health care delivery accessible to registered health personnel.

User interface and login

The Figure 2 is a user interface login that allows doctors access the knowledge management system and share their experiences in an appropriate manner

Figure 2: User interface and login

User Home Page

Figure 3 allows the health personnel view posts (experiences) of other personnel and also to view comments of other personnel.

Figure 3: user home page

Comment interface

This allows other health personnel contribute their experience into the knowledge management system to further support or critic the knowledge already posted as shown in figure 4.

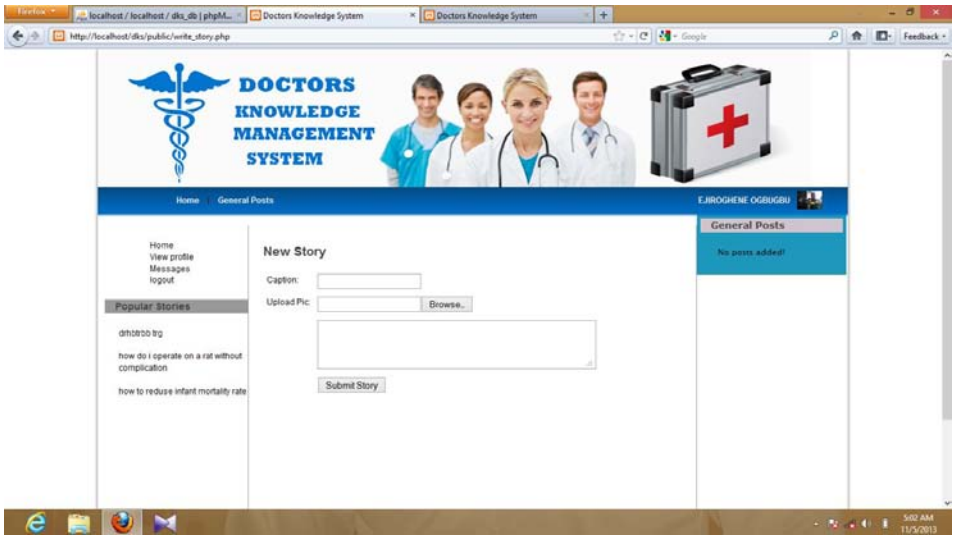

Figure 4: comment interface

Database of knowledge management system

Figure 5 is a view of the Admin end that allows monitoring of activities from the back end.

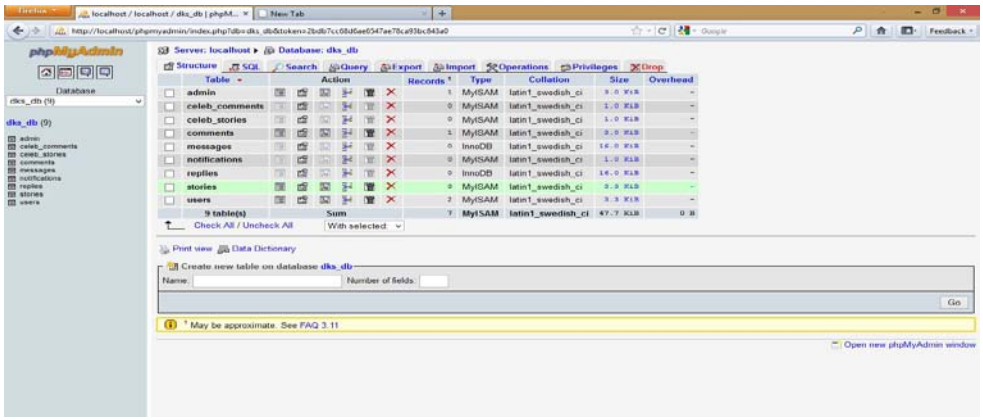

Figure 5: database view of the knowledge management system

The health personnel begin by creating an account establishing him or her as a legitimate user. After creating the account, an experience (healthcare knowledge) can be shared together with a picture of the patient. The experience includes the ailment and how it was tackled so that users (health personnel) can read and learn from other health personnel.

Conclusion

Knowledge management is a vital tool that allows tacit knowledge that resides in experts and experience personnel shared so as to improve efficiency in the work force of any organisation. Health care can benefit from knowledge management because of the ever change state of health knowledge and our discovery is that most patient suffer and die because of the lack of adequate knowledge at the point of care. However our knowledge management system allows personnel share

their experiences. This form a data base of expertise knowledge which can be consulted when needed thereby when the knowledge management system is used at the point of care the required knowledge can be accessed, reducing the risk of death that comes as a result of lack of required knowledge at the point of care.

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PROCEDURE AND INDISPENSABLE INGREDIENTS IN THE PRODUCTION OF "OKPA" A READY TO EAT FOOD PRODUCT: A SURVEY

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ABSTRACT

The processing technique and the indispensable ingredients used in the processing of "Okpa" food product (OFP), a gelled Nigerian food product made from Bambara groundnut seeds' flour was surveyed. Answer from a 37 point questionnaire returned from 189 respondents and analyzed revealed the following: The recipe was: one painter measure 2.5kg-3kg BGN Flour, one liter of palm oil, about six liters of potable water, 5-10g of salt. The use of ground pepper was optional. Four steps were involved in the production of "okpa" food product from bambara groundnut (BGN) seeds. Step 1, was the production of flour by milling the cleaned bambara groundnut seeds into flour. The second step was the thorough mixing of the flour with three indispensable ingredients namely: water, palm oil, pepper and salt to produce the slurry/paste. In step three, this slurry was packaged into retail unit packs after thorough mixing, and was dropped into a pot containing boiling water and, on a steady heat source, for cooking to take place. Cooking (the fourth stage) was allowed for about 3hrs for the slurry/paste to fully gel or get cooked. At the end of the cooking period, cooling of the retail units was allowed. However, the commercial producers enclosed the hot retail packs in available improvised insulators for the "Okpa" food product, so as to retain its

heat for the sales' period.

***Keywords**: BGN flour, indispensable ingredients, packaging, cooking, "Okpa" Food Product*

INTRODUCTION

Bambara groundnut (BGN) is one of the underutilized tropical dry beans (Bhat and Karim, 2009; Bamishaiye *et al*, 2011). It is an indigenous tropical crop grown widely across the African continent and is the third important grain legume after groundnut and cowpea (Dambaba *et al,* 2016). It has the potential to improve nutrition, boast food security, promote rural development and support sustainable landcare (Ojimelukwe, 2009). Like most common beans and pulses, it is a diverse resource of high nutritional value with about 19% protein, 63% Carbohydrate, 6.5% Oil, then fiber, vitamins and minerals (Atiku *et al,* 2004). It is used for subsistence agriculture, and it is generally grown by women, and referred to as "poor man's meat". One of the major constraints to bambara groundnut seeds' consumption is its' hard to cook (HTC) defects (Enwere, 1998). This is due to the long cooking time through which scarce fuel (especially fire wood) reserve is consumed in vulnerable communities. This probably led to the act of reducing the BGN seeds to flour before usage of same for "Okpa" food product (OFP), a gelled Nigerian food product. The major way of consuming BGN seed is through the production of "Okpa" food product. "Okpa" is popular in South Eastern States in Nigeria especially in Enugu State. It is a ready to eat food product used for snacks and dinner and has become of commercial importance. "Okpa" food product is known in most states of Nigeria Including Lagos State. Onuorah, (2011) reported of its production in many homes of people in the middle belt and Eastern parts of Nigeria, and that the product is marketed in motor parks and along major roads between the East and the Northern routes."Okpa food product" production is often regarded as an enterprise for the females. However, standard "Okpa" is not available in the market because traditionally prepared foods e.g, "akara", "moin moin", "Okpa" etc, are influenced by cultural values

which in turn affects the quality of the end product. The other common form for the consumption of BGN, is by boiling the freshly harvested and washed pods for consumption and the emerging roasting of the seeds and, the consumption of the same, with or without palm kernel nuts (Nzelu, 2014a). Despite its nutritional and economic importance, no industrial use of the crop is made anywhere in Nigeria. Due to scarce information in literature on the utilization patterns of this edible BGN crop or its food product, this survey was carried out. Information from this work will benefit users and entrepreneurs on the crop or products. "Okpa" food product plays an important role in the diet of all classes of human beings from nursery school children to the working class people and even to high energy requiring labourers in most Igbo land communities.

Materials and Methods

A "37 points" questionnaire was administered and about 189 fully answered questionnaires were collected from "Okpa food product" producers. The "Okpa food product" producers (who also were the respondents) were selected from twelve areas in both Enugu and Anambra State. The areas were Ogbete main market, Kenyatta market, (both in Enugu); Amechi town, Amokwe town, Naachi town, Four Corner Junction market and Oji Triangle market, Oji all in Enugu State. Then Nkwo Oraifite, Eke Oko market, Eke Ekwulobia market, Afo Ufuma market, Nkwo Umunze market, Federal Polytechnic Oko Community market all in Anambra State. Producers' consent was obtained by explaining the purpose of the study, assuring them that the information obtained was for research purpose only. The questionnaire was divided into two sections. Section A: part of the questionnaire covered questions like the sex, age groups and the age of the "Okpa" production enterprise exercise. Section B covered such questions as the known Bambara Groundnut Nut (BGN) varieties, the varieties of choice and why, the main ingredients, recipe and spices, any use of leafy edible vegetables and which, sequence of ingredients' addition during the mixing before packaging for cooking, types of packaging

materials of use, procedure and duration of cooking, means of determining the adequacy of cooking, how long the cooked product would last before spoilage and comparative estimation of the gastrointestinal (GI) resident time of "Okpa" food product, with cowpea's moi-moi, "akara" and beans' pottage, how regularly consumers consumed "Okpa" food product , and how else BGN seeds could be consumed?

RESULTS AND DISCUSSION

The Results obtained from the survey were summarized on Table 4.1.

Table 4.1: Production procedure and qualities of okpa

Parameters assayed	**Results Obtained**			
Periods of Okpa Food Production	1-10yrs **Frequency 81:** 42.86%	11-20yrs **Frequency 48:** 25.40%	21-30yrs **Frequency 36:** 19.05%	1-40yrs **Frequency 24:** 12.70%
Types of BGN Seeds known	Qualities (1) White or cream coloured – 95.23% usage: (i) Enhanced water absorption during mixing BGN Seeds/flour (ii) Brighter orange coloured Okpa Food Product (iii) Better taste and quality (iv) Economical with palm oil (v) Absence of spots in both flour and food product (vi) The white/cream variety was more readily available in the Market (vii) onset of degeneration or spoilage was easily noticed due to its			

	clear colour		
	(2) Red BGN		
	(3) Brown BGN		
	(4) Black BGN		(i) Has a bitter taste and is believed to be medicinal (ii) Consumes too much oil i.e. uneconomical with palm oil
Recipe per 2.5-3kg flour	Traditional Recipe		Modern Recipe
	Palm oil ……..1L Water ……..5-6L Salt……..5-10g Pepper (fresh or dry) by choice Adherents = 85.71% Frequency = 162		Palm oil ……..1L Water ……..5-6L Salt……..5-10g Other additions includes: Crayfish, Onions, Food colour, Leafy vegetables, Maggi cubes and Spices Adherents =14.29%, Frequency = 27
BGN Seeds of Choice	White/Cream	95.23% -Frequency 180: adopted the white/cream BGN seeds	
	Other seeds	4.77% -Frequency 9: managed non-white BGN seeds in the absence of the white BGN seeds	
Measured ingredients' addition sequence to the mixing bowl.	(i) BGN Flour → palm oil/palm oil sauce→ mixing→ water→ mixir other ingredients→ thorough mixing→ wrapping→ cooking (ii) BGN Flour → water/palm oil sauce→ mixing→ measured ingredients→ thorough mixing→ wrapping→ cooking iii) Ingredients→ water/palm oil sauce → BGN Flour → thorough mixing→ wrapping→ cooking iv) Others 90.48% (frequency:17.1) adopted option 1 2.66% (frequency:5) adopted option 2 2.66% (frequency:5) adopted option 3 4.20% (frequency:8) adopted option 4		
Types of leafy vegetables	Nil	Fluted pumpkin leaves (Ugu Leaves)	*T. occidentalis* A. *chlorostachys* (Spinach leaves) *V. amygdalina* (Bitterleaf leaves)

		O. *viridis* (Scent leaves) *S. macrocarpum* (Ańara leaves)
Type of animal products added	Nil	Crayfish flour Boiled egg
Packaging material	Wilted or dry Banana leaves and cellophane paper or cellophane paper alone	Wilted or dry banana leaves and cellophane paper or cellophane paper alone
Period of cooking/Boiling (Standard)	1-3hours	1-3hrs
Perceived "okpa" flavour	Peculiar Beany flavour	Mixed flavour void of beany flavour
*Discovery	Colour additive	Colour additive

** Basic dye branded carbolic brown*

The results from this survey showed that "Okpa" food product producers were females including young school leavers, young housewives and elderly women. The age groups of the respondents were 15.873% (for 21-30yrs age group), 33.33% (31-40yrs age group), 30.16% (41-50yrs age group), 17.46% (51-60yrs age group) and 3.17% (for ≥ 60yrs age group). In the issue of the duration of the enterprise, the periods they had processed the "Okpa" food product ranged between 1 to over 42yrs.

All through the (2012-2013) survey period, only one male called "Okpa man" was observed in Obiagu area Enugu urban. "Okpa" food product production is therefore a means of job creation for both the youths and the elderly. It is an entrepreneurial outlet which is ripe for clusters' formation towards industrialization.

1. How long have you processed Okpa food product?

From the respondents, the processors had been in the "okpa" business for a period of between 1 and 42 years. 42.86% fell in to the class (1-10yrs); 25.40% belonged to the (11-20yrs), 19.05% fell into the (21-30yrs) as Okpa food product (OFP) processors while 12.70% had processed the product for between 931 and 40 years). Two women (in their 60's) had processed the product for between 40 years and 42 years respectively. It may be safe to conclude that "Okpa" food product production had been in existence for up to 50yrs and as such it is old enough to be industrialized with improvement in the techniques or processes. The "Okpa" food product has come to stay. No incident of food poisoning alarms from the "Okpa"is known.

All the processors learnt the technology of OFP processing transferred from their mothers or relations. All the processors testified to multiple benefits from the business to include self-employment, self-maintenance, and ability to feed the family as well as to sponsor children at school for their education. Two women expressed their joys as to their ability to have built family houses through the profit made from "okpa food product" production.

2. How Many Okpa seed types (varieties) do you know?

Four Bambara groundnut seeds varieties were known to the processors according to their seed-colour accessions. These were white (or cream), red, brown and black Okpa-seed varieties. This was in agreement with some researchers' reports. Many researchers have attested to the availability of four to six (4-6) varieties based on seed colours. Ojimelukwe (2009) reported of BGN seeds with seed testa colours of maroon red, black, russet brown and cream, all of which had white helium. Aykroyd and Doughty (1982) reported of six varieties. Massawe *et al* (2005) have reported that a large number of BGN landraces have been preserved by the small-scale farmers. However genetic diversity of the BGN seeds should be exploited to improve

yield through increased production. Five land races of BGN with distinct colour differences namely, cream black eye, cream white eye, brown, maroon and black were studied by Nti (2009)

3. Which type (variety) of BGN seeds do you use and why?

Cultivar selection was one of the factors that influenced utilization. 95.23% of the respondents/processors adopted the white/cream coloured BGN seeds' flour as their raw material for the production of OFP as against the use of other coloured BGN seeds' flour. Their reasons for that choice included the following: (i) The white/cream variety of BGN used for OFP was economical in the use of palm oil or palm fruit sauce. (ii) the resultant colour of the slurry/OFP turned bright orange/yellow colour; (iii) the BGN flour had the ability to absorb reasonable amount of water during mixing (thus enhancing yield and profit), (iv) the OFP had better taste and quality as well as higher preference by customers. (v) The left over OFP possessed non-degenerating taste. The white/cream BGN Flour required less ingredients, preserved better, consumed less palm oil. (vi). The white/cream BGN seeds were more readily available than other BGN varieties. Again some of the processors could detect the onset of spoilage due to clear colour of the BGN (both for seed, flour and food product). The white/cream BGN seeds' flour did not contain black spots consequently; the flours would never have spots. The 4.77% respondents could manage various other BGN varieties in the absence of the white/cream BGN seeds. According to Hillocks *et al* (2012), the cream or the white seeded BGN are more sought after in Ghana

4. What Recipe and spices do you use?

The utilization of "Okpa" the gelled Nigeria food product has been as old as anyone could remember (particularly in the present day Enugu state, especially in Nkanu and Udi Local Government Areas). Its production had been based on the traditional recipe and the use of the indispensable ingredients namely: the flour, palm oil, water, pepper and salt were generally mixed into orange coloured slurry or paste due

to the palm oil. The slurry was then wrapped with wilted banana or plantain leaves, and the numerous wraps dropped into a pot containing hot water and then, the wraps would be cooked overnight. The researcher discovered the following: (a) The recipe could be summarized as: 1 painter a common volume measure which amounts to (2.50-3.0kg) BGN flour to 1 lucozade bottle (1 liter) of palm oil, five to six liters of water and 5-10g of salt. Fresh or ground pepper was added according to choice (through interviews). (b) That all who used cellophane paper, with or without wilted banana or plantain leaves sneaked in some food colour into the slurry/paste, for the purpose of yielding deep orange colour in the cooked OFP product.

With the advent of exotic flavour enhancers and other food additives, as well as consumer's demands, some processors would deviate from that old traditional recipe to what they termed "modern recipe". In the modern recipe, items like ground crayfish, non BGN flour, onions, maggi cubes etc were added.

About 85.71% of the respondent/processors maintained the traditional recipe (BGN Flour, water, palm oil, pepper (optional) and salt), while 14.29% of the respondents are advancing to the modern recipes. The adherents to the traditional recipe also complained that the use of crayfish marred the "okpa" beany taste while onions resulted to accelerate souring of OFP. Compliance to the traditional recipe yielded the peculiar beany flavor or aroma (taste) peculiar to OFP, while the non-common aroma of OFP was regarded as adulteration, resulting (as they claimed), to a moi-moi type of taste. "Moi-moi" food product is made from cowpea while "Okpa" is made from Bambara groundnut seeds' flour. The survey notably revealed that "Okpa" food product processors added a colour additive which yielded a deep orange color to their products. The present day "Okpa" colors are based on that food color sneaked in and not on palm oil alone.

5. Which leafy vegetables do you use

It is a known fact now, that some “Okpa” processors added leafy and non-leafy vegetables as well as colour additive to the “Okpa” food product. The preceding paragraph revealed that 14.29% of the respondents in this survey were practicing the “modern recipe” advances. Within the past decade, “Okpa” processors have added some leafy vegetables to their products. While some did this on customer's demand (as they claimed), others did so to attract more sales. Among the leaves added were fluted pumpkin leaves (*ugu*), spinach (green), bitter leaf (*onugbu*), *Ocimum viridis* (scent leaves) *Solannum sp* leaf (*ańara*), fermented *Pentaclethra macrophylla* (*ukpaka* slices) and boiled whole egg(s) or combinations of these additives. While the above additives would enhance the total plant protein, ash and fibre some could enhance the anti-nutrients and protein quality of the product. Again additional sand may be introduced to the "Okpa" food product. 33.33% of the respondents used “Ugu" leaves, 26.94% of the respondent's added spinach (green). The addition of leaves was practiced by all the age groups for use in *special “Okpa*” (as they referred to it). Some of the respondents suggested the use of either bitter leaf, or boiled egg or “ukpaka slices”. The adherents to the original traditional pattern (39.68%) avoided the addition of edible leafy vegetable. They adhered to the use of the BGN flour, palm oil, water, pepper (optional) and salt. It may be safe to conclude that the present day “Okpa” processors are deviating from the traditional recipe of just the use of BGN flour, water, palm oil and salt, to the use of various other additives. Since the consumers have neither complained nor strongly rejected the products, they are concurring to these changes. Besides, there are no regulations on these products yet. This is the more reason why the producers should form “clusters”, agree on what they should use for industrializing this “Okpa” food products. Products could be stabilized and exportable. However, Adumanya *et al* (2012) have reported on the use of the edible leaves of *Telfeiria occidentales* and *Occmum viridis* in the production of “Okpa” food product. From the researcher's additional investigation, it could be

concluded that over 90% of the "Okpa" processors now use varying quantities of colour additive, with palm oil or palm fruit sauce. It was only in Orumba (north and south) Local Government Areas that the traditional method of just the use of BGN flour, water, pepper, oil, or palm fruit sauce, and salt was being maintained. This was probably for the sake of maximizing profit since extra money would be spent on some added additives with little or no enhancement in volume. One can interpret these changes as "consumers" or processor choice/desire for some changes in the quality of OFP. In the questionnaire, the respondents (processors) were encouraged to suggest which of the areas (the mixing process, the cooking, preservation, general quality or others) of the OFP processing and production that required improvement and only 11.11% (21 respondents) suggested that the mixing stage needed attention. Many housewives and other beginners produced Okpa Food Product that had textural segments and curdled slumps in the food product. This could be part of the reasons that informed the respond form the 21 respondents. Nothing was said about the other stages or steps. The processors reported that curdles in the paste could be removed with sieves while in the slurry form and by implication this critical stage would partially determine the success of the final product.

6. **State the sequence of ingredients' addition during the mixing and before wrapping.**

The sequence options were as follows: (1) to the measured BGN flour was added palm oil, and mixed. Then the measured hot water/cold water was added and mixed. Lastly the other ingredients were added and mixed thoroughly before wrapping and cooking; (2) to Okpa flour, was added measured hot/cold palm fruit sauce and mixed. Lastly, the other measured ingredients were added and thoroughly mixed; (3) all ingredients were ground separately, and mixed with hot water and palm oil, then the Okpa flour was added. Then everything was mixed homogenously through thorough stirring; (4) others. Efforts must be made to avoid lumps in the slurry. Some producers would use potable

and circular shaped sieve to remove the lumps, break the lumps and add the smoothened portion back to the mixture.
About 90.48% of the processors practiced option 1. About 2.66% respondents practiced each of options 2 and 3, while 4.20% of the respondents practiced option 4. Some of those that chose option four agreed that they would add palm oil and hot water, or palm sauce to the Okpa flour, and mix until a homogenous mixture was obtained, then they would add the other ingredients and stir thoroughly. The use of palm oil was mostly practiced in Enugu State while the use of palm fruit sauce as oil sauce, was practiced more by the Orumba (North and South) LGAs OFP processors, and by the Oji River area OFP processors; however Oji River area processors were guilty of sneaking in the food colour.

7. What packaging material type do you use?
Generally the Okpa food product processors used either wilted plantain or banana plant leaves of which Murevanhema and Jideani (2013) attested to. However, processors have advanced to the use of these leaves in combination with polythene material or, the wilted plantain/banana plant leaves alone. The slurry/mixture was first enclosed in the polythene and finally wrapped with the plantain/banana plant leaves. On the other hand most OFP processors in Orumba north and south LGAs in Anambra State and, Oji river LGA in Enugu State used only the wilted plantain/banana plant leaves, for the packaging of the OFP slurry where they generally used palm fruit sauce as oil source. This variation in the issue of oil source (whether palm oil or palm fruit sauce), and the packaging material should be standardized.

As for the length of time of cooking, all the respondents agreed that the cooking time was overnight. Either the cooking lasted from 8pm till about 10:00pm, and then continued from about 4:00am till about 6:00am when the product would be carried to motor parks and other sales' centers. Alternatively, the producers cooked from about 3:00am till about 6:00am when the processors would rush out with their

products to supply traveler with very hot OFP for breakfast. Laboratory experiments and the results of the pasting properties analysis of the Bambara groundnut seed's flour confirm that Okpa" food product gels sufficiently with 45mins to 60minutes steaming, Adumanya *et al* 2012 and Nzelu 2014. Thus their effective cooking time is about 3 hours. In answering the question on the storage period, processors agreed that every left-over for each day's sales must be re-heated by the evening of same day. However if not re-heated within the next 24hours, the product might become slimy.

In comparing the gastrointestinal (GI) resident time of Okpa, with cowpea's moi-moi, akara and beans pottage, 92.0% of the respondents agreed that Okpa was heavier in the body than the cowpea's food product The other 8.0% of the respondents did not adopt any sequence when comparing "Okpa" with the other cowpea's food products as per their GI resident time. The report of Onimwawo *et al* (2007), agreed with the response of the 92% of the respondents. Onimwawo *et al* (2007), reported the average glycemic index of "Okpa" food product as 38.33 while that of moi-moi from cowpea seeds had a GI of 77.94. Also Awaisheh *et al* (2005) reported that legumes have shown to have low glycemic index, hypocholesterolemic effect, breast cancer prevention and health benefits with respect to cardiovascular diseases and bone health. Hawkers could be seen selling boiled BGN seeds (within their pods).

In answering the question on what ways or dishes the respondents additionally consumed the BGN meals, many could not keep good record of how regularly they consumed OFP weekly. The striking thing was that many of the respondents did not know any other way through which the BGN seeds could be consumed. The respondents knew little or nothing about boiled BGN (in pods), or BGN flour prepared into semolina-like product, or BGN seeds cooked like beans (Cowpea) pottage, neither did they know about BGN seed or BGN flour used in any other form (roasted or otherwise). However, some respondents from Udi LGA, Enugu State, knew a little about roasted BGN seed eaten with palm kernel (as compliment); some respondents from Isi-

Uzo LGA, Enugu State, agreed that BGN seeds was used for "Akara" production or used for the production of a pasted food product such as semolina. In the study of Atoyebi *et al* (2017), 15 panelists and respondents, representing employees of the National Centre for Genetic Resources and Biotechnology, Moore-Plantation, Ibadan, Nigeria scored the looks and the taste of Bambara groundnut cooked pottage with an average of 58.3% and 58.2% respectively while similar parameters in Okpa food product were scored 64.27% and 71.24% respectively, during that sensory evaluation exercise in their company/institution. By implication, BGN pottage is not a commonly known food product. Accordingly to Uvere *et al* (1999), the bases of acceptability of Okpa Food Product include taste, firmness of the product and colour due to palm oil. Nzelu (2014)[b], Siddiq and Uebersax (2014), Uvere *et al* (1999) and Hillocks *et al* (2011) reported of roasted BGN with or without palm kernel compliments as a veritable processing method used to manipulate both nutritional and sensory quality of Bambara nut seeds. Enhanced use of BGN seeds could be brought about through sensitization processes of some sorts. Hillocks *et al* (2012) suggested that compared to groundnut and some other legumes, there should be "promotion" to encourage commercial exploitation of Bambara groundnut (BGN).

CONCLUSION

The results of the survey revealed that "Okpa" Food Product (OFP) process had been in existence for upwards of four decades in the eastern region of Nigeria. OFP had been a product of four major ingredients namely; Bambara groundnut seeds' flour, water, palm oil (or palm fruit sauce), and salt. For commercial purposes, the BGN flour is generally produced from the white/cream BGN seeds, because of its advantages over other BGN seeds varieties. The use of pepper is optional. The original wrapping paper was wilted plantain/banana leaves. However, the producers have advanced to the use of cellophane paper alone, a combination of plantain/banana leaf and cellophane paper while the use of only plantain/banana leaf alone is also being

practiced. Other advances include the addition of food colour to enhance customer perception, (which may be considered fraudulent until otherwise proved to be safe), and the addition of sliced edible leaves such as fluted pumpkin, spinach/green, bitter leaves, "scent" leaves and ańara (*Solannium sp*) to the "Okpa" Food Product for the enhanced variations and nutrition. Fermented *Pentaclethra macrophylla* slices and boiled whole eggs are also being added for enhanced nutritional purposes and for enhanced economic gains. The production of the product was carried out mainly by females. The product was packaged with wilted plantain/banana, with or without first enclosing in a cellophane paper. The product got slimy after 24hours storage at ambient conditions. It is therefore necessary to standardize the production process and to design appropriate packaging for the product, while the coloured additive should be reviewed for health purposes and certification by the relevant bodies

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