NUTRITIONAL COMPARISON BETWEEN TWO LOCALLY PROCESSED RICE WITHIN KANO METROPOLIS AND IMPORTED RICE (THAI FOREIGN)

BY

FATIMA ABDULGAFFAR NASIR

1196

A Project Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Bachelor of Science in biochemistry, At the Department of Biochemistry, School of Sciences and Social Management, Skyline University Kano, Nigeria.

2022

NUTRITIONAL COMPARISON BETWEEN TWO LOCALLY PPROCESSED RICE WITHIN KANO METROPOLIS AND IMPORTED RICE (THAI FOREIGN).

BY

FATIMA ABDULGAFFAR NASIR

1196

A Project Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Bachelor of Science in Biochemistry, At the Department of Biochemistry, School of Sciences Social and Management, Skyline University Kano, Nigeria.

DECLARATION

I hereby declare that this work is the product of research efforts undertaken under the supervision of Mr Abdurrazak Muhammad and has not been presented and will not be presented elsewhere for the award of a degree or certificate. All the sources have been duly acknowledged.

_____ _____

Student name sign/date

Student I.D

CERTIFICATION

This is to certify that this study was carried out by Fatima Abdulgaffar (1196) in the Department of Biochemistry, School of Science and Information Technology, Skyline University Nigeria, under my supervision.

_____ _____

Supervisor date/sign

APPROVAL

The panel of examiners recommends the candidate……. for the award of the Degree of Bachelor of Science in Biochemistry subject to effecting all the corrections pointed out during the project defence.

_____	_____
External Examiner	date
_____	_____
Internal Examiner	date
_____	_____
Project Supervisor	date
_____	_____
Head of Department	date

DEDICATION

I am truly thankful for having you in my life. This work is also dedicated to my parents,Sheikh Abdulgaffar Nasiru kabara And Sayyida Aisha Aiyu Harazumi, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

ACKNOWLEDGEMENTS

Praise be to Almighty God,the Omniscient of the omnipotent for sparing my life given me the vigor to accomplish this work. May peace and blessings be upon our Holy prophet Muhammad (S.A.W) and members of his household, His companions and all believers who follow their foot step.

My profound gratitude goes to my supervisor Mr. Abdurrazak Muhammad, for his patience, effort, guidance as well as counselling which made this work reality. I will also not forget to mention the name of our HOD Dr.S usanta Pahari, and other lecturers of the department like Mr. Miracle Uwa Livinus, may Allah bless them all.

I also feel duty bounded to express my indebtedness to my parents, Sheikh Abdulgaffar Shiekh Nasir Kabara and Syyida Aisha Aliyu Harazumi whose love for me cannot be expressed or measured by my words of mouth, they colorfully molded my life into productive and potential shape, and indeed am proud to of you. Iam also obliged to extend a special regard to the hero, the mentor and the role model who passes two positions of being a father and sponsor, he is the best contributor in making me what I am today, indeed my words are not enough to thank you Sheikh Abdulgaffar Malam Kabara, and special regard to my mom Sayyida Aisha Aliyu Hrazumi for her motherly concern may almighty God reward them abundantly.

Its must to mention the names of my relatives like Alqali Mal.Mustapha mal.Kabara ,Commisioner of shariah kano state Imam Jabirul-ansari ma.kabara and major yahya mal.kabara. I would like to mention the names of my sibligns starting with my brother Nasir(Amir) my late

brother,Abulhassan may Almighty God make his gentle soul rest in perfect and grand him Jannatul-Firdaus, Abdulaqadir, Khadija,Safiya, and our last born Abubakar and entire family og late sheikh Nasiru Kabara.

I am also highly gratitude to the entire colleques and well wishers like Fatima Muhammad Bulama, Husna Turad Usman, Khadija Bashir Hayatu, Abdussalam Tjjani Abdullahi, Muhammad Samir, Muhammad Nasidi, Bashir Mt, and All my colleques from biochemistry, geology and microbiology, I wish you all the best lastly, I express my gratitude and appreciation to all whose names are not mention above who helped me in one way or the other toward the succsseful accomplishment of this task.

TABLE OF CONTENTS

Abstract

The proximate analysis and physical parameters of an imported (sample A, Thai foreign) and two locally processed and marketed rice varieties (Samples B-Alwabeel and Sample C-Umza) in Kano metropholis, Nigeria were investigated using standard techniques. Sample A was used as the control. All the rice varieties contained considerable amounts of moisture, ash, protein, Crude fibre and carbohydrate but were low in crude fat. Both the local rice varieties contained higher amounts of carbohydrate than the imported rice. Sample B (Alwabeel) had the highest protein contents ($P < 0.05$) compared with other rice varieties which is also higher than the WHO standard. The ash contents of sample B and C were found to be the same and higher than the imported. For the physical parameters, Sample A had the highest Total milling recovery (Good rice), 89.41% than both the local varieties. Other parameters such as yellow rice was found to be less in Thai foreign (2.74%) than both the locally processed, Umza had lower levels of brokens (3.59%), red streak (9.01%) while Thai foreign has the least level of immature (1.67%) and chalky rice (0.96%) respectively. The locally processed varieties had higher nutrient level than the imported sample.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

By far most consume a ton of rice (*Oryza sativa* L), which addresses 20% of the world's dietary energy supply (Deepak and Prem, 2017; FAO, 2006; Vlachos and Arvanitoyannis, 2008). According to earlier bits of knowledge, a typical Nigerian consumes roughly 21 kilos of rice every year, whether it is foamed or burned (Odenigbo, Danbaba, and Ngadi, 2014). Regardless of how rice is generally used as a staple eating routine because of its high starch content, it moreover consolidates gigantic proportions of proteins, lipids, minerals, and water-dissolvable supplements including thiamine, riboflavin, and niacin (Fresco, 2005; Muhammad, Farooq, Shaukat, and Tahira, 2012).

Also, while rice laying out in these Nigerian regions, various pesticides are showered to fight bug aggravations like stem drills and others that attack these rice combinations, diminishing creation (Personal Communication). Nevertheless, the opportunity of these pesticides being perceived in these rice cultivars, as well as their waiting levels, has not been represented.

Issue Statement Despite extended rice creation in Nigeria, client demand smaller people supply predominantly. As needs be, rice importation rates in Nigeria have extended during the most recent 10 years. Due to the diminishing economies of arising countries, the Nigerian government has actually executed measures, for instance, rice creation undertakings to vivify extended production of neighborhood rice types. Notwithstanding, various individuals acknowledge that secretly dealt with Despite these regulations, a few endeavors keep on bringing in rice, likely because of a craving for unfamiliar rice by some.

Problem Statement

Despite the increase in rice production in Nigeria, the level of consumers demand for it far exceeds the supply. Hence, the increase in the importation rates for rice in Nigeria within the last decade. Recently, the dwindling economies of the developing countries caused the Nigerian government to setup policies such as massive rice production programmes that encourage increased production of local rice varieties. Nonetheless, a lot of people consider the locally processed rice to be inferior to the foreign imported one. Despite these policies, some companies still engage in rice importation due possibly to preference for foreign rice.

Justification

Imported rice is preffered over locally processed rice. This has been associated with different reasons like differences in genuine attributes, healthy quality, and sticking and cooking penchants. According to studies, "long-grain" rice is more well known than short, round grain rice.

Though the enhancement association of various Nigerian rice groupings has been conveyed in past assessments (Oko, Ubi, Efisue, and Dambaba, 2012), further start to finish assessments on their amino acids, minerals, and supplement piece (particularly fat dissolvable supplements) actually apparently can't be driven. This has become pivotal because a fundamental assessment of the nutritious beauty care products of neighborhood combinations with imported ones would similarly help the Nigerian government in their target of making local rice varieties with higher solid advantage.

(https://www.premiumtimesng.com/news/headlines/254114-nigeriaban-rice-importation-year-buhari.html)

Aim and Objectives

The reason for this exploration is to look at the physical and wholesome (Physical and Chemical) properties of two assortments: unfamiliar and native (neighborhood).

Objectives

To investigate the nutrient composition of both some locally produced and imported varieties in Nigeria.

To compare the physical parameters and proximate analysis composition of between the two locally produced (Alwabeel and Umza) rice varieties in Nigeria.

To compare the physical parameters and proximate composition between locally processed and imported rice varieties in Nigeria.

2.0. CHAPTER TWO LITERATURE REVIEW

2.1 INTRODUCTION

Rice is the second greatest cereal yield after wheat and the most generally eaten up staple food grain. Rice covers around 145 million segments of land around the world, addressing one-tenth of arable land, while it addresses 33% or a more noteworthy measure of created land in the majority of Asian nations.region (Faostat, 2006). India, China, Indonesia, Bangladesh, Vietnam, and Thailand are the really five countries with the most raised rice creation All of these countries address more than threequarters of complete overall creation It is filled in something like 114 countries, with a full scale making of Rice is the second greatest oat gather after wheat and the most generally eaten staple food grain. Rice covers around 145 million segments of land generally, addressing one-tenth of arable land, while it addresses 33% or a more prominent measure of created land in the greater part of Asian country area (Faostat, 2006). India, China, Indonesia, Bangladesh, Vietnam, and Thailand are the vitally five countries. Countries with the most vital rice creation All of these countries address different quarters of full scale overall creation It is filled in something like 114 countries, with a hard and fast production of aftereffect of about 610 million metric tons (Faostat, 2006).

It is imagined that this plant has managed additional individuals all through a more significant time-frame period than some other. Another yield Even now, one-half ofoutput of around 610 million metric tons (Faostat, 2006).It is accepted that this plant has dealt with extra people throughout a more expanded time period than some other. another reap Even now, one-half of. planted at crazy levels going from sea level in stream deltas to the Himalayan piles of Nepal at 2,600 m (Ferrero, 2005).

During the forty years following World War II, rice surface extended by around 70%, while complete rice surface extended by practically 70%.

Creation emphatically increased. During this true period, the majority of traditional rice acquiring countries with serious rice security issues (for example, India, Vietnam, and the Philippines) achieved autonomy sufficient rice supply The principal achievements were made generally during the 1960s. with the alleged Green Revolution, which achieved the improvement of new rice lands or the shift from various harvests to rice, as well as the progression of higher-yielding cultivars or further created yields Intensity of altering.

Rice gathered region has expanded by just roughly 0.4 percent consistently starting around 1990.

2.2 CULTIVATION AND ECOLOGICAL DISTRIBUTION

2.2.1. Rice ecosystems

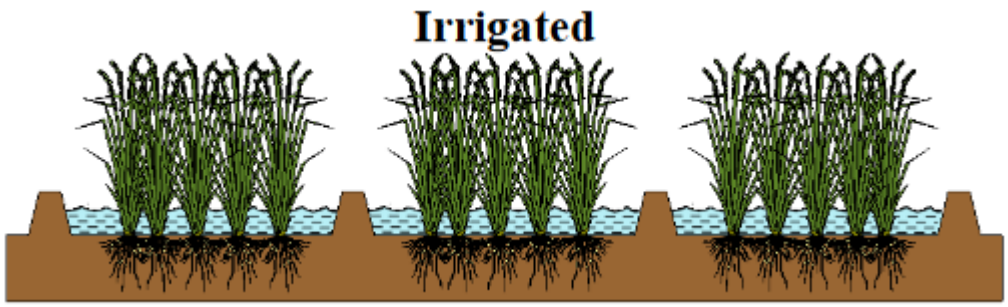
Rice is at this point created on all expanses of land under various biological conditions, which IRRI bunches as four fundamental conditions: watered, rainfed bog, upland, and flood slanted (Maclean et al, 2002).

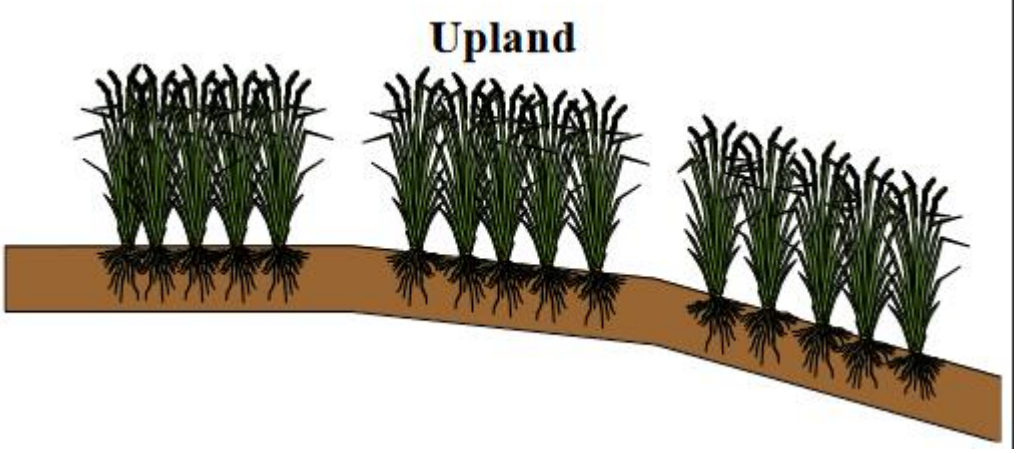
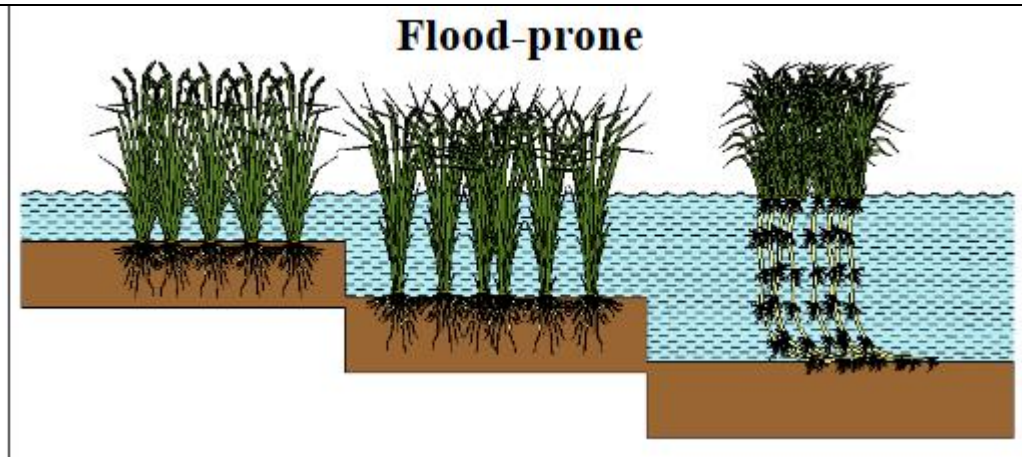
Immersed domains address over part of the world's accumulated rice grounds and 75% of outright creation. This natural framework consolidates most of the created locales in North America, Australia, and Europe, as well as a critical piece of Asia and Africa. Water framework conditions are segregated into overwhelmed wet season and immersed dry season considering precipitation openness. Overwhelmed wetseason normal environmental elements are those wherein rice is developed during the wet season and water framework water is given to enhance precipitation. Overwhelmed dry season is customary of The basic degree of weakness in water openness, soil

readiness, aggravation and weed forcefulness, and rice cultivators' permission to ebb and flow information sources are critical impediments. Rice is filled in upland circumstances in fields going from low valley bottoms to high uneven districts with inclines going from 0% to 40%. Upland soils are vivacious in nature and are rarely drenched. Upland rice, like wheat or maize, is created in rainfed fields that are ready and developed when dry. High overflow and sidelong water stream can be a difficult issue once in a while. These organic frameworks address around 13% of the world's gathered rice grounds yet only 4% of hard and fast creation. Upland rice is by and large filled in Asia (India and Bangladesh), Africa (on the sticky slants of West Africa), and South America.abitats where storm falls during rice planting.

The immense degree of weakness in water openness, soil readiness, aggravation and weed forcefulness, and rice makers' permission to introduce day inputs are huge impediments. Rice is filled in upland circumstances in fields going from low valley bottoms to high rough districts with inclines going from 0% to 40%. Upland soils are high-influence in nature and are rarely submerged. Upland rice, like wheat or maize, is created in rainfed fields that are ready and developed when dry. High flood and flat water stream can be a difficult issue once in a while. These natural frameworks address around 13% of the world's gathered rice land anyway only 4% of complete creation. Upland rice is generally filled in Asia (India and Bangladesh), Africa (on the soaked slants of West Africa), and South America.

The critical restrictions of deep water rice are on a very basic level related with serious natural strains that invalidate the greater part of the effects of the open data sources.

	- 48% of world's collected region - 75% of absolute creation - bunded evened out fields - water control (5-15 cm profundity) - water from water system (from streams, lakes, siphoned, and so forth) and precipitation - normal paddy yield: 4-10 t/ha - high info supply
	- 32% of world's gathered region - 19% of all out creation - level or somewhat slanting bunded fields - no water control (0 - 30 cm profundity) -water from rainfall - normal paddy yield: 1-3 t/ha - medium-low information supply

	-13% of world's collected region - 4% of all out creation - non-evened out unbunded fields - somewhat or profoundly slanting fields (0-40%) - no water control (0 cm or variable) - water from precipitation - normal paddy yield: 1-4 t/ha - low information supply
	-7% of world's gathered region - 2% of absolute creation - unbunded fields - level or somewhat slanting fields - no water control (0.5 - 5 meters profundity) - water from precipitation or tides - normal paddy yield: 1-1,5 t/ha - low info supply

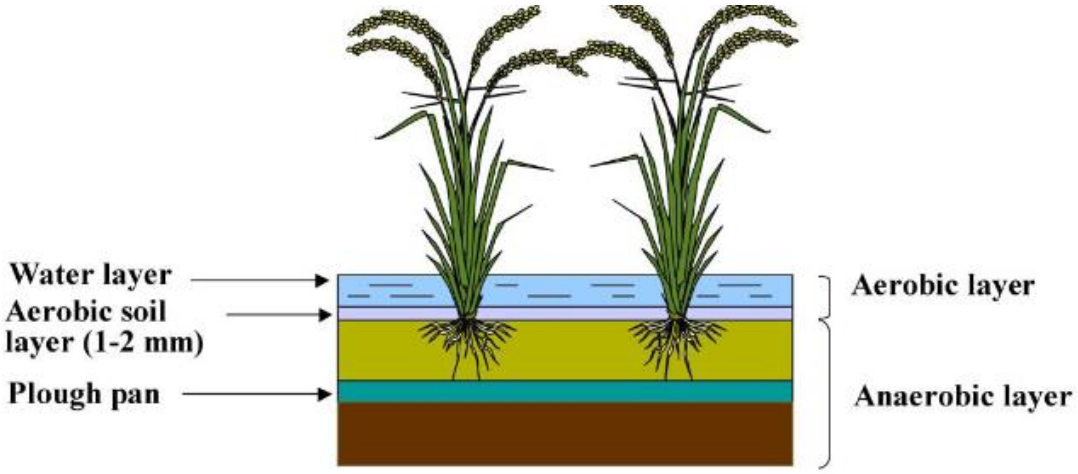
Headway of their quality through APO (Appellation of Protected Origin) attribution and direct displaying of rice by rice cultivators who clearly process their own rice crop on the estate using little rice handling units. Some place in the scope of 1980 and 2006, the amount of properties in all European rice-making countries reduced without a doubt.

For example, in the Valencia rice creating locale, the general number of farms has lessened essentially. During a comparative stretch of time, the common surface per farm extended somewhat to the decrease in the amount of estates (from 20 to 47 ha in Italy and from 1.9 to 4.7 in the Valencia district) (Finassi and Ferrero, 2004). In Italy, the district is managed by a singular substance.

different harvests Mikekelsen and Evatt (1966) portray ideal soil types as "those that safeguard water." Typically, mud and soil dirts, silty earth dirts, or residue dirts are loved. Soils with a high mud and dregs center work with slow water penetration. Rice soils should similarly be good for powerful surface waste, as a couple of parts of mechanization require the ejection of surface water. Rice is created in marshlands of an ocean side lagoon and various landscapes of autochthonous start closest to the Alps (alluded to in Italy as Baragge), which were in the past woods or untilled fields and are by and by grew only with rice since they are extraordinarily firm and negligible, with negligible regular matter substance and lavishness. The territories (September-October) (FAO, 1996). The climate in Mediterranean countries is subtropical (Mediterranean climate), with a dry summer, warm, dry, fresh mornings, and a more broadened creating season than in gentle central area climatic zones. Temperatures on typical reach from Temperatures headed off to some place in the scope of 10 and 12 degrees Celsius during rice germination and 20 and 25 degrees Celsius during crop blossoming. The Mediterranean climate is perceived by warm, dry, splendid days and a broad advancement season. different yields Mikekelsen and Evatt (1966) portray ideal soil types as "those that proportion water." Typically, soil and earth dirts, silty mud soils, or residue soils are enjoyed. Soils with a high soil and buildup obsession work with slow water saturation. Rice soils should similarly be This climate is useful for high photosynthetic rates and high rice yields, while the low relative dampness all through the creating season lessens the new

development, reality, and significance of rice infirmities. A base yearly temperature mean of 7.8 °C and a generally outrageous warm mean of 19.0 °C have been kept in NW Italy, for example. The territorial dispersal of least and mean characteristics shows Plowing and puddling routinely achieve the improvement of a thick layer under the developed soil. Puddling reduces the macroporosity of earth soils while growing their microporosity, achieving an extension in the puddled soil's water-holding limit (Sharma and De Datta, 1986) Following submersion, soil pores become completely drenched by water, making obstructs blow and collapse scattered persistently Structure falls in view of an unforeseen finish of gas exchanges among earth and air. Oxigen content decreases one small step at a time from the top to the significant levels. Due to the oxigen contained in water and the photosyntehic activity of the great effect living things in this layer, a thin oxidized soil layer stays in the fundamental 1-2 mm (Aguilar Portero, 2001) Normally, an oxidized zone is in like manner present.

Rice field formation consists in the creation of cultivation basins (plots).



Rice fields with high-impact and anaerobic layers (from Aguilar Portero, 2001)

Their shape doesn't follow the structure line, as it did in the start of rice advancement; in light of everything, they are routinely made with an upsetting rectangular shape.

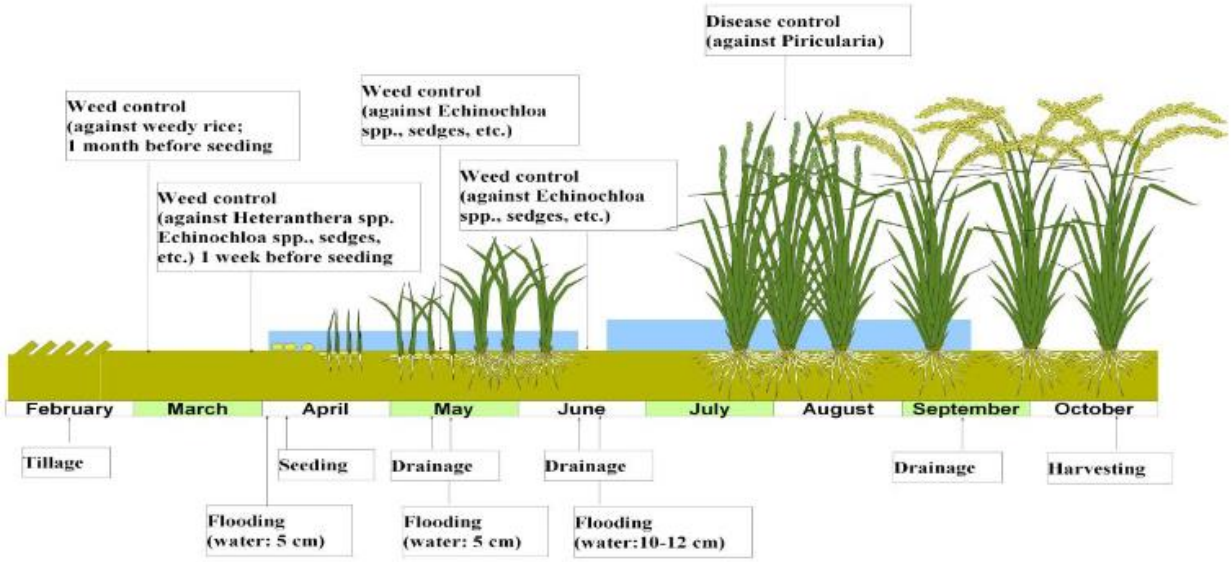
The size of a bowl not totally settled by the fascinating region incline, as well as the surface and development of the soil. Bowls can be greater than 10 ha in size where grounds are level, soils are light, and water depleting in the soil is straightforward. The most capable bowl extension in clayey and limited soils is around 5 hectares. Little kinks of 20-25 cm significance, 18-20 m isolated, are routinely revealed inside the bowl in a comparative bearing as the wrinkling. A not many even more negligible inverse Spring wrinkling is perfect for shallow soils, which commonly have a modest presence of regular matter; moderate till developing errands and planting should be finished rapidly. Advantageous developing may be essential to reduce challenge between emerging rice plants and weeds. Starting there forward, soil refined is done with a turning harrow, which can be practical even in moist soil conditions. During refined assignments, soil is a large part of the time compacted through many slips by using work vehicles fitted with unequivocal rollers and nook framed wheels to diminish water disasters (puddling). Wrinkling practices are dynamically being subbed with least refined. This extension in soil refined is essentially credited to working on the efficiency of the dry developing methodology on non-brought down soils, particularly on smooth soils (level seed bed) by enlivening the germination of weed seeds, particularly those of that limit the employable furthest reaches of equipment after submersion; - Using the counterfeit developing procedure weedy rice, going before rice developing.

2.2.2. labour cost reduction;

Decreased refined undertakings are regularly finished with draws that can work at a significance of 20 cm, followed by turning harrows for night out and smoothing soil hunks. Refined is performed at a significance of 5-10 cm while dry-developing to restrict outrageous plunge of rice seeds in the ground. If base refined and no-refined practices are used for past what a couple of years, they can reduce yield, especially on less productive soils. In this manner, when these activities are finished for a long time period, remarkable thought ought to be paid to readiness programs that properly balance the rate and length of mediation.

The most notable way is to scatter seed on fields that are brought down in a 5-10cm layer of water. Developing is done with spiral spreading gear, which include two turning plates and are also used to disperse mineral manures. Developing times range all along of April to the farthest furthest reaches of May not completely firmly established by water openness for field submersion, still hanging out there for each agribusiness region by a water framework consortium, collection decision (early or late), and environment conditions. Early cultivars are a significant part of the time developed in the second multi day stretch of May, following the clearing of weeds spread out before crop developing. Now and again late developing occurs with early arrangements because to unpropitious environment conditions that make it hard to do.

2.3. Seeding



Scheme of main agronomical practices carried out during rice cultivation.

To help faster rice germination and hold seeds back from floating and drifting, rice seeds are routinely soaked with cold water for a couple of days before being drained for 10-12 hours in holders or water framework ditches. Exactly when seeds show the essential indications of germination, they are imparted (the root tip starts to emerge from the caryopsis).

The issues with seed germination and seedling headway resulting to developing are for the most part associated with rice-field temperature conditions, as temperature reduces under 14°C, which stop the germination collaboration, are reasonably ordinary. Inconveniences are similarly achieved by misguided night out of the soil surface and lamentable arrangement decisions, which advance

weed advancement and the improvement of algal refuse on the rice seedlings. Around 40,000 segments of place where there is dry soil are exhausted with seeds, predominantly in Italy.

2.3.1 Challenges of Rice Production in Nigeria

Dry season is a serious impediment to Northern Nigerian rice creation since rice requires a lot of water for ideal new development and yield. Rice requires 1200 mm to 1600 mm of precipitation spread consistently all through its creating season. This proportion of deluge is bizarre, especially in the southern pieces of the country, which regularly get more storm than the northern parts. Dry season reality is more significant in the uplands than in the bogs (fadamas). Rice cultivars displayed for Northern Nigeria are in this manner of early and medium turn of events, with drought obstruction as well as the ability to move away from dry season.

2.3.2. Poor soil fertility

Soil productivity in Northern Nigeria has dynamically diminished due to extended strain shore wards resources achieved by fast people advancement, which is compelling farmers to practice endless altering while simultaneously using lacking manure or other soil changes. A couple of assessments have uncovered that the soils of Northern Nigeria are poor in supplements, coming up short concerning the crucial totals expected for the improvement of most gathers, including rice. For example, in the southern Guinea savanna, complete nitrogen levels range from 0.136 to 0.151 percent, in the northern Guinea savanna from 0.16 to 0.194 percent, and in the Sudan savanna from 0.141 to 0.153 percent. Both open phosphorus and replaceable potassium are deficient. There is similarly enormous micronutrient lack across northern Nigerian agroecologies, showing a prerequisite for supplementation.

2.3.3. Pest attack

Bug invasions are one of the fundamental drivers of low rice harvests in Nigeria. A wide grouping of bug irritates, root-feeders, stem drills, leaf feeders, and grain feeders thrive with the rice plant. Bugs, particularly birds, African rice nerve midges, and Striga infiltrations, are colossal constraints to rice creation in Northern Nigeria.

2.4. Important steps in growing rice

2.4.1. Site selection

In Northern Nigeria, rice can be grown in two main areas:

2.4.1.1. Lowland areas.

These are bogs on the edges of overpowered fadamas (inland valleys) and water framework structures where water is open for 412 to 5 months of the year. Water may be open in specific regions for more than 5 months.

2.4.1.2. Upland areas:

These are areas with good soil and rainfall

2.4.2.3 Recommended rice varieties

The rice cultivars suggested for Northern Nigeria are recorded. These GoSeed cultivars mature earlier and make significantly better yields than the sorts created by farmers in Northern Nigeria.

IITA (Promoting Sustainable Agriculture Project - PROSAB) research has shown that with incredible organization, a part of the prescribed rice types can create up to 37 t/ha of paddy yield. The recommended combinations furthermore yield more turners and outcompete farmers' variety in weed control

2.5. Nutritional value of rice

Rice is a supporting staple food that gives consistent energy because its key part is sugar (starch). Rice, of course, is low in nitrogenous parts, with a commonplace sythesis of these pieces of simply 8% and fat substance or lipids of 1%, and consequently it is regarded a complete sustenance for eating. Rice flour is high in starch and is used to make a grouping of food things. Brewers moreover use it to manufacture alcoholic malt in exceptional cases. In like manner, rice straw blended in with various materials is used to make porcelain, glass, and stoneware. Rice is furthermore used to make paper crush and steers bedding.

Rice synthesis and features change essentially dependent upon grouping and biological conditions under which the yield is created. Protein content in husked rice goes from 7% to 12 percent.

Nitrogen manures increase the rate level of explicit amino acids. The restorative substance of rice wheat and uncooked rice changed in the close to dietary advantage of grains. Hearty shaded rice is high in supplements B1 or thiamine (0.34 mg), B2 or riboflavin (0.05 mg), and niacin or nicotinic destructive (4.7 mg). White rice, of course, is deficient in supplements and minerals (0.09 mg of vitamin B1, 0.03 mg of vitamin B2, and 1.4 mg of niacin) since they are assembled in the outside layers of the grain, which are taken out during the cleaning or "passing on" process, while parboiled rice is plentiful in these supplements as a result of its unique dealing with.

Nutritional value of cereals per 100 grams

Cereals	**Protein (gm)**	**Fat (gm)**	**CHO (gm)**	**Minerals (gm)**	**Calcium (mg)**	**Fiber (gm)**	**Energy (K cal)**
Wheat whole	11.8	1.6	71.2	1.5	41	1.2	346
Wheat flour	12.1	1.7	69.4	2.7	48	1.9	341
Rice bran	13.5	16.2	48.4	6.6	67	4.3	393
Rice(raw)	6.8	0.5	78.2	0.6	10	0.2	345
Rice (per boiled	8.5	0.6	77.4	0.9	10	0.2	349
Maida	11	0.9	73.9	0.6	23	0.3	348

Bajra	11.6	5.0	67.5	2.3	42	1.2	361
Jowar	10.4	1.9	72.6	1.6	25	1.6	349
Ragi	7.3	1.3	72.0	2.7	344	2.6	328

Cooking cycles can cut down the supplement and mineral substance of rice; in all honesty, cooking is routinely wrapped up with water, which is thus ignored, and enormous quantities of these enhancements deteriorate in water and are lost. Because of its high edibility, rice is enthusiastically recommended in the game plan of explicit eating regimens against stomach and gastrointestinal affliction processes, as well as in the dealing with infant youngsters and the old.

2.6. Rice Varieties

Under the British Colonial rule, an improvement program for Nigerian rice was spread out during the 1920s with the advancement of the Federal Department of Agriculture at Moor Plantation Ibadan (Ukwungwu et al, 2009). The West Africa Commission pushed in 1939 the construction of a rice research center that would serve all West African countries.

Eventually, the Federal Rice Station in Bida, Niger State, which is by and by the headquarters of the National Cereals Research Institute, was laid out in 1953. (Imolehin and Wada 2000). The target of the station was to make varieties with pervasive grain quality, uniform shape and sizes,

and low breakage during handling. Thirteen (13) redesigned rice varieties were conveyed to Nigerian farmers, including two upland, eight shallow swamp, and three significant overpowered rice.

Table shows the approved rice varieties in Nigeria between 1955 and 1970.

2.7. Approved rice varieties in Nigeria, 1955 – 1970

Cultiva: Old name	New name	Year of released	Duration (days)	Plant light cm	Grain type	Yield potential (tonne/ha)	Reaction to blast
Upland rice ecosystem							
FARO 3	Agbede	1958	95-120	99-100	M	1.5-2.5	S
FARO 11	0S6	1966	115-120	103-110	M	1.5-3.5	S
Rainfed lowland rice ecosystem							
FARO 1	BG 79	1955	135-174	108-120	M	2.0-4.0	S
FARO 2	D114	1958	135-176	100-115	M	2.0-4.0	S
FARO 5 makalioka	823	1960	135-154	111-115	M	2.0-4.0	S
FARO 6	FCB	1961	176-198	150-160	M	2.0-3.0	MR
FARO 7	Maliong	1962	160-217	150-160	M	2.0-3.5	MR
FARO 8	Mass 2401	1963	155-160	110-115	M	2.5-4.5	S
FARO 8	SINDANO	1963	115-162	125-130	M	2.5-4.0	S
FARO 12	SLM 140/10	1969	145-160	135-140	M	2.5-4.5	MR
FARO 13	IR 8	1970	125-140	90-100	M	2.5-3.5	S
Deep water rice ecosystem							
FARO 4	KAV 12	1959	189-220	145-150	M	2.0-3.5	R
FARO 9	SIAM 29	1963	189-220	126-130	L	2.5-3.5	MR

M = Medium grain, L = long grain, R = resistant, MR = moderately resistant, S =Susceptible. Source: Ayotade 1991 in Imolehin and Wada 2000.

Rice fills in all agro-ecological zones, recalling Borno State's Sahel and the waterfront swamps for the southwest and south (Longtau 2003). Longtau (2003) saw six rice advancement conditions:

high nation, hydromorphic, storm dealt with bog, immersed swamp, significant inland water, and mangrove swamp. According to Damola (2010), the rice creating environment in Nigeria is ordinarily gathered into five rice conditions: storm dealt with bog, which addresses 47% of hard and fast rice creation district, deluge dealt with upland (30%), overflowed bog (counting enormous degree water framework plans and restricted scope water framework plans), significant water (5%), and mangrove swamp (under 1%). Imolehin and Wada (2000) depict the potential rice land area .Good nation science - Crops in the upland environment rely for the most part upon standard deluge for advancement and improvement. This science addresses around 55 to 60 percent of developed rice area and 30 to 35 percent of complete public rice creation (Singh et al. 1997). As shown by Longatau (2003), outrageous precipitation can cause soil deterioration, supplement sifting, and floods. Dry season has worked on the likelihood of lacking grain filling. Crop dissatisfaction was seen in various states in the year 2000, including Abeokuta, Ado-Ekiti, Abakaliki, and Ogoja in the south, and Yauri, Zamfara, and Gombe in the north.

Watered rice natural framework is a reasonably new improvement in Nigeria. To upgrade precipitation for full rice crop improvement and headway, water is given from streams, wells, boreholes, and various sources (Imolehim and Wada 2000). This environment addresses 18% of all evolved rice. which conveys under 1 ton/ha However, science contributes 10 to 14 percent of public rice yield (Singh et al, 1997).

The Niger mangrove swamp environment is arranged among coastline and new water wetlands. It could consolidate 1 million ha of rice-creating locale, yet at the present time, under 100 ha of this natural is being made (Imolehin and Wada 2000). The science offers under 2% of public rice creation and has low yields of around 1 ton/ha. The most serious issue that requires thought is the

headway of reasonable advancement for developing and further creating rice creation in this organic framework (Singh et al 1997).

3.0. CHAPTER THREE

3.1. MATERIALS AND METHOD

The Locally processed rice varieties were cultivated in the same year 2022 at different rice field across the country, all supplied by independent marketers. About 200 g of fresh samples of three different rice products, labeled as Samples , A, B, and C respectively will be bought from 2 of the top rice producing areas in Kano Metrololis as follows: Sample B (Company B), Sample C (Company C) while the foreign rice variety (Sample A-Gold from Thailand) will serve as the control. Thereafter, their husks will then be removed, the samples winnowed and air dried for physical parameters while the rest will be processed to flour and analyzed for proximate analysis. (The local rice varieties that were studied are grown on free draining soils (upland rice grown in rain fed conditions).

3.1.1.Physical measurements

Grain size and shape

A micrometer screw check with an accuracy of 0.01 mm was used to measure the length and width of ten entire cleaned grains. The got data was surveyed using the WARDA scale (1995).

Thousand g This relies upon the Dorsey-Redding, Hurburgh, Johnson, and Fox approach (1991). It included counting and weighing 100 unmilled bits at unpredictable. The resulting weight was copied by ten to get the thousand grain weight.

Total milling recovery (TMR)/Head Rice (HR)

This is the level of complete processed rice got from a known load of paddy in the wake of dehulling and cleaning (WARDA, 1995).

Yellow Rice

This is the rice that looked different (completely yellow) from the main head rice due to the high temperature during parboiling (WARDA, 1995**).**

Broken fraction

Weighing 100 g of cleaned rice and separating it into broken and entire parts yielded this result. Yet again this was done by hand with a penetrated metal sheet and troublesome hand picking and picking. Each part was measured and conveyed as a level of the principal rice weight.

Endosperm appearance (chalkiness)

Twenty gram tests were weighed into minimal level plate, a lot of mixed, then quartered using a quartering gear. Each quarter's rice grains were taken apart for the presence of dark or pale areas. These were carefully organized and measured. The got weight was represented as a level of the full scale weight for the quarter. Considering the IRTP approach, the characteristics assembled for each quarter were shown up at the midpoint of and used to score for appearance depiction (1988).

3.1.2.Red Streak

The Chromameter was utilized to decide the shade of built grains in each cleaned rice test (CR200, Minolta Co. Ltd. Japan).

3.1.3.Proximate analysis

The AOAC (1990) method was used to choose the moistness, trash, protein, lipid, and crude fiber things in rice tests. Contrast was used to learn total carb.

The soddenness, garbage, and protein content of the not totally gotten comfortable three-overlay using the Association of Official Analytical Chemists AOAC (2000) show. The fat substance was settled using the soxhlet extraction procedure, while the sugar content was overviewed using the qualification system. Starches = 100 (sogginess + garbage + fiber + protein + fat) The Atwater rule was used to measure the energy regard from the overall assessment (James 1996). Energy Value (kJ/g) = (carb x 17 kJ) + (Protein x 17 kJ) + (Other x 17 kJ) (fat x 37 kJ).

3.1.4.Statistical analysis

The assembled information was measurably dissected (ANOVA, Regression examination) in Microsoft Excel. All examinations were done in copy.

4.0. CHAPTER FOUR

4.1.RESULT AND DISCUSSION

Table 1: Percentage physical analysis

Rice Sample	Head-Rice %	Yellow Rice%	Red Streak%	Broken %	Chalky %	Immature %
Thai Foreign	89.41±0.38	2.74±0.03	1.21±0.03	4.01±0.01	0.96±0.47	1.67±0.03
Umza	74.10±0.40	5.10±0.03	9.01±0.01	3.59±0.02	6.09±0.02	2.11±0.01
Awabeel	65.43±0.02	8.64±0.01	9.16±0.04	9.94±0.01	5.70±0.21	1.13±0.01

Table2: Percentage Proximate Analysis

Rice varieties	Moisture (%)	Fat (%)	Crude protein (%)	Crude fibre %	Ash (%)	Carbohydrate (%)
Thai foreign	14.00±0.10[a]	0.50±0.01	2.58±0.01	2.00±0.10[a]	0.50±0.01[b]	79.92±0.0
Alwabeel	11.43±0.01[b]	0.50±0.01	6.22±0.01[a]	1.50±0.10[b]	1.00±0.00[b]	80.05±0.1
Umza	10.33±0.10	1.20±0.09[c]	4.64±0.10	1.50±0.10[b]	1.01±0.01[b]	82.03±0.01[a]

4.1.1.DISCUSSION

The starch content of the three rice cultivars goes from 79.92 to 82.03 percent, with a mean and standard deviation of 76.04±5.78. The characteristics are unsurprising with those as of late recorded. These high rate sugar readings show that the three rice sorts are eminent starch sources. The unpleasant protein centers shift from 2.58 to 6.22 percent, with a mean and standard deviation of 4.48±0.04. These protein levels in rice are essential since proteins are the key construction blocks for cell and tissue recovering in the body. In addition, the results reported for the three rice types are dependable with those tracked down as of now but more unmistakable than those

procured by. Rice fat contains linoleic destructive and other huge unsaturated fats, and rice doesn't contain cholesterol.

The results for the three rice collections range from 0.50 to 1.20 percent, with a mean and standard deviation of 0.73±0.04 percent, independently. These are lower values than those conveyed by (Agu et al., 2003). The deficit of fiber in the eating routine has been associated with a development in case of various afflictions in individuals. Fiber in the eating routine forms the size of poo, which laxatively influences the stomach. For generally around handled rice, the standard fiber level is 1.5 - 2.0 percent (Finello and Tinirelli 2008).

The factor of moisture content is paramount in maintenance of quality in rice during storage, because its level controls the rate of deterioration and infestation of the grains. Commonly accepted moisture content for 'safe' storage are 13% for less than 6 months' storage and 12% for long term storage (Ebuehi and Oyewole, 2007). It follows that Umza rice variety may have a longer shelf life compared to the other rice varieties due to the lower moisture content. Moisture content of any sample depends on the age, freshness and agronomic practice during cultivation, increased moisture content in rice may to likely affect the milling characteristics and palatability of cooked rice (Oko et al., 2012). The ash ranged from 0.55% to 1.01%, "Thai foreign" recorded the least while the highest was reported for 'Umza'. Ash is the inorganic residue remaining after the water and the organic matter have been removed by heating in the presence of oxidizing agents which provides measure of the total amount of minerals in foods. This value agreed with the average value reported by Anderson for wild rice and other related cereals (Anderson, 1976). The highest fat content was reported for Umza (1.50%) and the least for Thai foreign and Alwabeel (0.5%). The fat content ranged from 0.5 to 3.5%, was reported for local rice in Nigeria (Oko and Ugwu, 2011), also fat content ranged from 5.16 to 6.14% has been reported for some unpolished rice

(Anjum et al., 2007). The fat content in milled rice have been reported lower than the range obtained in this work because milling of rice removes the outer layer of the grain where most of the fats are concentrated (Frei and Becker, 2003). The effect of excess intake of dietary fat has some well-established health implications especially for the overweight. The consumption of excess amounts of saturated fats has been recognized as the most important dietary factor aiding increased level of cholesterol. Besides the cholesterol implications due to high fat intake, obesity is a factor in the causation of disease (Wardlaw and Kessel, 2002). In this regard, the samples of rice analyzed in this work could be said to be better preferred. However, rice lipids, commonly denoted as oil ('rice bran oil') due to its liquid character at room temperature, are characterized by a high nutritional value. The high proportion of unsaturated fatty acids, accounting for up to 80%, causes the liquid consistency of the oil. Because of its high level of un-saturation, rice bran oil is known to have blood cholesterol lowering effects (Oko et al., 2012). Carbohydrate is the major micronutrient in cereal grains; it ranged from 79 to 82% in all the three samples. The value is within the range reported for local rice varieties in Nigeria by Eggum (1982) and Edeogu et al. (2007). The local varieties were very rich in carbohydrate just like other cereals. The energy content ranged from 1484 to 1637 kJ /100 g, showing that rice is a good source of energy which is mainly supplied by carbohydrate. The complex carbohydrate in rice digests slowly allowing the body to utilize the energy released over a long period which is nutritionally efficient. The energy requirement of an adult is 2200 kJ/day, this indicated that consumption of these rice samples could support energy requirement for normal growth and body metabolism. Protein content ranged from 2.58 to 6.22%, "Umza" and "Alwabeel" recorded higher values though the values were not significantly different ($P \leq 0.05$) among the varieties. Protein content of 7.3% and 6.95% was reported for both Ofada and Aroso (Ebuech and Oyewole, 2007) whereas protein range of 1.58 to

6.22% was reported for some rice varieties grown in Southern-Eastern and Northern, Nigeria (Oko and Ugwu, 2011). It implies that the samples being investigated compares favourably with protein content of Thai foreign varieties.

References

Adu-Kwarteng, E., Ellis, W. O., Oduro, I., & Manful, J. T. (2003). Rice grain quality: a comparison of local varieties with new varieties under study in Ghana. *Food control*, *14*(7), 507-514.

Anderson, R. S. (1991). The origins of the International Rice Research Institute. *Minerva*, 61-89.

Ball, L., Mankiw, N. G., Romer, D., Akerlof, G. A., Rose, A., Yellen, J., & Sims, C. A. (1988). The new Keynesian economics and the output-inflation trade-off. *Brookings papers on economic activity*, *1988*(1), 1-82.

Daimon, A. (2010). Smuggling through fluid and porous African Borderlands and the state's response: the case of the Zimbabwe-South Africa Border'. In *ABORNE Conference on Cross-border Trade in Africa: The Local Politics of a Global Economy, Basel*.

David, E., Eleazu, C., Igweibor, N., Ugwu, C., Enwefa, G., & Nwigboji, N. (2019). Comparative study on the nutrients, heavy metals and pesticide composition of some locally produced and marketed rice varieties in Nigeria. *Food chemistry*, *278*, 617-624.

Dorsey-Redding, C. E. C. I. L. I. A., Hurburgh, C. R., Johnson, L. A., & Fox, S. R. (1991). Relationships among maize quality factors. *Cereal Chemistry*, *68*(6), 602-605.

Ejembi, S. A., Orkpe, F., & Bello, G. O. (2018). The Effects Of Social Factors On The Adoption Of Rice Production Technologies In Zone C Of Benue State, Nigeria. *Journal Sosial Ekonomi Pertanian*, *14*(1), 55-64.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Ferrero, A., & Tinarelli, A. (2008). Rice cultivation in the EU ecological conditions and agronomical practices. In *Pesticide risk assessment in rice paddies* (pp. 1-24). Elsevier.

Finassi, A., & Ferrero, A. (2004). Outline of the Italian farm structure. In *Challenges and opportunities for sustainable rice-based production systems* (pp. 583-585). Edizioni Mercurio.

Furuya, K., Hafuka, A., Kuroiwa, M., Satoh, H., Watanabe, Y., & Yamamura, H. (2017). Development of novel polysulfone membranes with embedded zirconium sulfate-surfactant

micelle mesostructure for phosphate recovery from water through membrane filtration. *Water research, 124,* 521-526.

Imolehin, E. D., & Wada, A. C. (2000). Meeting the rice production and consumption demands of Nigeria with improved technologies. *International Rice Commission Newsletter*, *49*, 33-41.

Imolehin, E. D., & Wada, A. C. (2000). Meeting the rice production and consumption demands of Nigeria with improved technologies. *International Rice Commission Newsletter*, *49*, 33-41.

Larson, M. M., Patel, S. H., & Vimmerstedt, J. P. (1995). Allelopathic interactions between herbaceous species and trees grown in topsoil and spoil media. *Journal of sustainable forestry*, *3*(1), 39-52.

Lei, Y., & Singh, M. P. (1997, November). A comparison of workflow metamodels. In *Proceedings of the ER-97 Workshop on Behavioral Modeling and Design Transformations: Issues and Opportunities in Conceptual Modeling*.

Lei, Y., & Singh, M. P. (1997, November). A comparison of workflow metamodels. In *Proceedings of the ER-97 Workshop on Behavioral Modeling and Design Transformations: Issues and Opportunities in Conceptual Modeling*.

Maclean, J. L., Dawe, D. C., & Hettel, G. P. (Eds.). (2002). *Rice almanac: Source book for the most important economic activity on earth*. Int. Rice Res. Inst..

Matanmi, B. M., Adesiji, G. B., Owawusi, W. O., & Oladipo, F. O. (2011). Perceived factors limiting rice production in Patigi local government area of Kwara State, Nigeria. *Journal of agriculture and social research (JASR)*, *11*(2), 40-45.

Mikkelsen, D. S., & Patrick Jr, W. H. (1968). Fertilizer use on rice. *Changing Patterns in Fertilizer Use*, 403-432.

Msagati, T. A. (2012). *The chemistry of food additives and preservatives*. John Wiley & Sons.

Nadkarni, G., Behravesh, A. H., Warda, R. D., Davis, K. G., & Sahoo, M. (1995). Low-Carbon equivalent austempered ductile irons. *Transactions of the American Foundrymen's Society.*, *103*, 93-101.

Odenigbo, A. M., Danbaba, N., & Ngadi, M. (2014). Nutrient composition and predicted glycemic index of rice varieties from Nigeria. *British Journal of Applied Science & Technology*, *4*(2), 302-318.

Ogah, E. O., Nwilene, F. E., Ukwungwu, M. N., Omoloye, A. A., & Agunbiade, T. A. (2009). Population dynamics of the African rice gall midge Orseolia oryzivora (Diptera: Cecidomyiidae) and its parasitoids in the forest and southern Guinea savanna zones of Nigeria. *International Journal of Tropical Insect Science*, *29*(2), 86-92.

Oko, A. O., Ubi, B. E., Efisue, A. A., & Dambaba, N. (2012). Comparative analysis of the chemical nutrient composition of selected local and newly introduced rice varieties grown in Ebonyi State of Nigeria. *International Journal of Agriculture and Forestry*, *2*(2), 16-23.

Pingali, P. L. (2001). Environmental consequences of agricultural commercialization in Asia. *Environment and Development Economics*, *6*(4), 483-502.

Ponnamperuma, C., & Kirk, P. (1964). Synthesis of deoxyadenosine under simulated primitive earth conditions. *Nature*, *203*(4943), 400-401.

Seto, K. C. (2011). Exploring the dynamics of migration to mega-delta cities in Asia and Africa: Contemporary drivers and future scenarios. *Global Environmental Change, 21*, S94-S107.

Sharma, P. K., De Datta, S. K., & Redulla, C. A. (1988). Tillage effects on soil physical properties and wetland rice yield. *Agronomy Journal, 80*(1), 34-39.

Terrab, A., Díez, M. J., & Heredia, F. J. (2003). Palynological, physico-chemical and colour characterization of Moroccan honeys: I. River red gum (Eucalyptus camaldulensis Dehnh) honey. *International journal of food science & technology*, *38*(4), 379-386.

Tsochatzis, E. D., Menkissoglu-Spiroudi, U., Karpouzas, D. G., & Tzimou-Tsitouridou, R. (2010). A multi-residue method for pesticide residue analysis in rice grains using matrix solid-phase dispersion extraction and high-performance liquid chromatography–diode array detection. *Analytical and Bioanalytical Chemistry*, *397*(6), 2181-2190.

Verma, D. K., & Srivastav, P. P. (2017). Proximate composition, mineral content and fatty acids analyses of aromatic and non-aromatic Indian rice. *Rice Science, 24*(1), 21-31.

Zhiyu, L. I. U. Advances In Research On Hydrological Cycle And Surface Water. China National Report On Hydrological Sciences 11.