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BOOK OF ABSTRACTS

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THEME:

CAPITALISM AND CLIMATE CHANGE IMPACT ON

FOOD Production AND ENVIRONMENTAL RESOURES

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MICROBIAL ANALYSIS AND ANTIBIOGRAM OF COOKING UTENSILS OF CAFETERIA IN AKWA IBOOM STATE POLYTECHNIC, IKOT OSURUA

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ABSTRACT

The study on the microbial analysis and antibiogram of cooking utensils of cafeteria in Akwa Ibom State Polytechnic Ikot, Osurua, was determined using standard analytical procedures. The results obtained revealed the bacterial count ranging from 1.82x106cfu/g for sample 3 to 9.0x104cfu/g for sample 8 in sampling site A, while sampling site B ranges from 1.01x106cfu/g for sample 2 to 6.0x104cfu/g for sample 7, and for sampling site C had ranges from 5.6x105cfu/g for sample 2 to 6.0x104cfu/g for sample 4. And fungal count ranges from 2.2x105cfu/g for sample 8 to 3.0x104cfu/g for sample1 in sample site A, while for sampling site B, ranges from 1.5x105cfu/g of sample 3 to 4.0x104cfu/g of sample 5, and sampling site C had ranges from 2.1x105cfu/g of sample 7, to 5.0x104cfu/g of sample 8. The bacteria genera isolated and the highest percentage frequency of occurrence was Staphylococcus spp (23%), followed by Enterobacter spp and Salmonella spp, (14%), Pseudomonas spp and Shigella spp (11%), E. coli and Proteus spp (9%), Bacillus spp (5%) and Streptopcoccus spp had the least of (4%). The result also reveal the fungal genera and the percentage frequency of occurrence in which Rhizopus spp had the highest percentage of (24.53%) followed by Mucor spp (16.98%), Aspergillus spp and Penicillium (15.09%), Streptomyces spp (11.34%), Trichosporon spp (9.43%) and Fusarium spp (7.43%) had the least. The result also revealed the antibiogram (sensitivity) tests of bacteria isolates which show that the isolates with zone of inhibition size of ≥ 18 mm were considered sensitive, 13 mm- 17 mm as intermediate and ≤ 13 mm as resistant to antibiotic. However, the presence of these bacterial and fungal isolates lead to contamination of cooking utensils of cafeteria due to poor hygiene, improper sanitation etc. which can cause food-borne diseases and this can be prevented by observing good food safety practices.

Keywords: Microbial, Antibiogram, bacteria, contamination, utensils.

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ADDRESS BY THE LOCAL CHAIRMAN

Distinguished ladies and gentlemen, on behalf of the Local organizing committee of the 3rd Annual Conference of the Society for Agricultural Environmental Resources and Management (SAEREM), I am delighted to welcome you to the Opening Ceremony. The key concepts in the theme of the present event have occupied my interest for quite sometimes, and I believe that the same can be said for members of this LOC, and all the attendees here gathered. It is very obvious that the management of the Nigeria environmental and agricultural resources which one loaded with a lot of potential has continued to suffer tremendous setbacks in the hands of our political leaders.

It is crystal clear that the Nigeria agriculture is blessed with great potentials but no one can eat potentials. Crude oil is not human food that can be eaten, even after it has been processed into different products. Nigeria needs food for consumption. For instance one cup of rice cost one hundred naira in 2016, five cups of garri were sold at one hundred naira. Comparatively in 2020 one cup of rice goes for two hundred naira and less than one cup of garri for a hundred naira. These are cost of vital agricultural products in the face of massive youth in the face of massive youth unemployment, hunger, diseases and disorders. Also, we are living in unhealthy fragile ecosystem surrounded by pollutants and toxins that enter into our water, air and soil. Therefore, we desire a nation where agriculture and nature exist in harmony coupled with sound management practices for optimum and healthiest food production that will be sufficient to meet the needs of the Nigerian populace. In realization of this wonderful goal, that our theme "Capitalism and Climate Change Impact on Food Production and Environmental Resources" has come to address in the next few days, of this conference. Participants will prove skeptics wrong and demonstrate that both agriculture and environment, when properly managed can make a better nation through careful utilization of our resources, since we are blessed with massive land and water resources.

Therefore delighted to receive our Vice Chancellor Prof. Zana Akpagu (Chief Host),Prof. A. A. Ayuk (Dean of Agriculture and Chairman Committee of Deans) and the lead and Keynote Address presenters to this Conference.
We are here to learn quite a lot from Prof. Bisong, the Key Lecturer and the plenary lectures that follow this opening ceremony.
Distinguished guests, ladies and gentlemen, we thank you all for honouring our invitation and efforts by attending this event. We hope that you have a wonderful, pleasant and rewarding experience during this meeting.
On behalf of the LOC, I wish to appreciate all the members of the SACREM Executive, especially Dr. Nyong for all their supports towards hosting this event. We also extend our profound gratitude to the VC and the administration of UNICAL Keynote Speakers and Supporters of this programme. I sincerely thank you.

Best regards,

PROF. NKEREUWEM M. JOHN
Chairman, Local Organizing Committee
SAEREM Annual National Conference
UNICAL 2020

BACTERIOLOGICAL ANALYSIS AND ANTIBIOGRAM OF STUDENT HOSTEL RESTROOMS IN AKWA IBOM STATE POLYTECHNIC.

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ABSTRACT
Restrooms are the major sources of microbial transmission and hidden source of infection when not cleaned routinely. Bacteriological assessment and antibiogram of student's hostel restroom were studied using standard analytical procedures. A total of 20 samples were obtained from restroom walls, door handles and toilet seat of female and male hostel restroom respectively. Result obtained reveals that the hostel restrooms were heavily contaminated with bacterial pathogens. The isolated bacteria were Escherichia sp, Streptococcus sp, Bacillus sp, Streptomyces sp and Staphylococcus sp. The bacterial count ranges from 3.3x102 (CFU) to 5.7x102 (CFU) with restroom walls having the highest bacterial count and toilet seat with the least bacterial count. From the result obtained revealed that Escherichia sp had the highest percentage occurrence of (52.5%, 53.3%) in toilet seat and the least were recorded in door handles (8.7%, 9.1%) respectively in female and male hostel restrooms., Streptococcus sp had (26.1%, 18.2%) in door handles and the least were recorded in toilet seat (15%, 13.3%) respectively in female and male hostel restroom., Bacillus sp had (28.0%, 25.6%) in restroom walls and the least was seen in door handles (21.7%,24.2%) respectively in female and male hostel restrooms., Streptomyces sp had (8.8%, 5.1%) in restroom walls and the least was seen in toilet seat (2.5%) respectively in female and male hostel restrooms., Staphylococcus sp had (41.3%, 42.4%) in door handles and the least was seen in toilet seat (7.5%, 6.7%) respectively in female and male hostel restrooms. Ciprofloxacin was highly sensitive to Escherichia sp, Streptococcus sp, Bacillus sp and Streptomyces sp while Rifampicin was highly sensitive to Staphylococcus sp., Norfloxacin was resistance to Staphylococcus sp, Streptococcus sp., Gentamycin, Erythromycin, Ampiclox and Amoxilin were resistance to Bacillus sp, Streptomyces sp. This study suggests that there is need for proper routine cleaning and disinfecting the restrooms as this will help to check the spread of bacterial pathogens which can cause diseases to the ushers.

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ABSTRACT
This research work was carried out to determine the bacterial effect of aqueous and ethanolic extracts of garlic on Staphylococcus aureus as an alternative medicine for the treatment of infections caused by this organism. Disk diffusion technique and broth dilution method were used with different concentration of the extracts to assess the activity. Garlic extracts showed excellent inhibiting effect on Staphylococcus aureus at 100mg/ml to 50mg/ml and 100mg/ml of the aqueous extract and ethanolic extract respectively. The MIC of Staphylococcus aureus was 70mg/ml for aqueous extract and 100mg/ml for ethanolic extract. The bio active compounds (phytochemicals) in garlic extracts showed the presence of flavonoids, alkaloids, sakowski, liebermans and keller killianis. The potent bacterial effect of garlic (Allium sativum) truly recommends it as a good antibacterial seed/plant.

Keywords: ***aqueous, ethanolic, Staphylococcus, Dick diffusion, antibacterial.***

ABSTRACT:

Pot experiment was conducted to evaluate the effectiveness of poultry manure (PM) on crude oil simulated Coastal Plain Sand of Obio Akpa in Akwa Ibom State. Each pot weighing 3kg was simulated to 0.2 and 5% (w/w) with Bonny light crude oil of relative's density (specific gravity) of 0.835kgm3. With unsimulated soil as control and amended with PM. Treatments were replicated three (3) times, completely randomized and arranged in a green house of Akwa Ibom State University for 42days. The result showed that at the end of the experiment, soil ph significantly increased with increased in crude oil percent applied. This study recommends that at 2% crude oil population, the soil should be amended with PM or any other suitable microbial food for the desired microbial contaminants degradation to proceeds.

KEY WORDS: *Pollutant, Simulation, Remediation.*

INFLUENCE OF DIFFERENT ORGANIC SOIL AMENDMENTS ON THE GROWTH AND BIOMASS ACCUMULATION OF Khaya grandifoliola SEEDLINGS

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ABSTRACT

Khaya grandifoliola, also known as Benin mahogany belongs to the Meliaceae (Mahogany) family and native to the tropical region. It is a medium to large-sized tree that can grow up to 40 meters tall. A study on the effect of different organic amendment on the seedlings growth and biomass production of Khaya grandifoliola was conducted in the greenhouse of the Department of Forestry and Wildlife, Faculty of Agriculture, University of Benin, Nigeria. A completely randomized design (CRD) with eight replicates was employed to assess the effect of these treatments viz; poultry droppings, cow dung, compost and topsoil (Control) on the growth performance of the test plant seedlings. The seedlings were assessed for height, number of leaves, collar circumference, fresh and dry weight for a period of 20 weeks. Analysis of variance of the various treatments showed significant difference ($p<0.05$) among the soil amendments. Generally, poultry droppings had the highest mean value in all parameters assessed in the experiment, while the control had the least.

CAPITALISM, CLIMATE CHANGE & ENVIRONMENTAL RESOURCE DEGRADATION& MANAGEMENT: DRIVERS, IMPACTS AND CONTROLS.

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Synopsis

The state of continuous depleting of environmental resources with an overarching effect evidenced by climate change is a global concern today.This has been attributed to various human activities that is rooted in the social and economic systems of nations. Global economic production systems can be broadly categorized as capitalist or free market, socialist or centrally planned, and the mixed economy that integrates elements of market economy and planned economy. The arguments in the literature has been highly contentious and varied as to which of these production systems account more for environmental resource degradation and the global climate crisis. Scholars, depending on their ideological leanings have taken different stands in the argument. The relationships they therefore draw on the effects of given economic production system and environmental resource degradation tilts the arguments in favor of production systems they are politically more comfortable with. This paper acknowledges the growing trend towards capitalist modes of production among many countries of the world, even in countries previously characterized by socialist modes of production. It therefore seeks to examine the general effects of the capitalist mode of production systems on the status of the environment. In doing this, it categorizes countries on the extent to which their economic production systems are informed by the presence or absence of capitalist modes of production. Employing the DPSIR Framework and the Economic Freedom Index (EFI) that rank countries based on their capitalist production attributes, it analyses the extent to which these systems are predictors of Environmental Performance Indicators of the various countries. The policy implications and management responses of the observed patterns are explored with the view to achieve environmental sustainability.

Key Words: Capitalism, Environment, Degradation, Climate Change, sustainability.

SUSTAINABLE AGRICULTURE: A NEXUS FOR ENVIRONMENTAL RESOURCES MANAGEMENT

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ABSTRACT

Environmental resources made up of atmospheric, water, vegetative and mineral are resources that support man and his immediate needs. However, these resources face the challenge of mismanagement which puts the survival of man in danger in the nearest future. This challenge birthed the need for sustainable agriculture which is a concept that secures the interest of the economy, environment and the individuals that live within the environment with respect to the available environmental resources. Its application and utilization has served as a nexus for the management of these environmental resources. The contribution of sustainable agriculture in the management of environmental resources are evident in the improved agroecosystem and yield and the management of soil and atmospheric resources. The activities of sustainable agriculture have supported continuous availability of these resources and the sustenance of man with respect to his needs. In summary, sustainable agriculture is a system that should be embraced by all to promote the continuous existence of man and his immediate resources.

ABSTRACT

This study examined the efficiency of resources used by rice farmers on inland valleys of Central Cross River State, Nigeria during the 2019 rice cropping season. Primary data were used to conduct the study. The data were collected from 120 respondents with the aid of questionnaire using a multi-stage sampling procedure. Descriptive statistics, multiple regression analysis and the allocative efficiency index were used to achieve the objectives of the study. The descriptive statistics revealed that majority of the rice farmers (60.8%) were males, 60% were married, and 35% were within the age range of 31-40years, 82% had a family size of between 6-10persons, 82.5% had some forms of formal education, 37.5% had a rice farming experience of between 11-15years, and 87% had a farm size of between 0.1-2hectares.The multiple regression analysis revealed that the variable of farm size (X1,), farm capital (X3), fertilizer (X5) and herbicides (X6) had positive and significant relationship with rice output. The allocative efficiency index revealed that rice farmers in the study area were not allocatively efficient as farm size, seeds, fertilizer and herbicides were all greater than one (1) which indicated that these productive resources were under-utilized. The study recommends that for rice farmers to increase their output level in the area, they need to employ more of the productive resources that have allocative efficiency index of greater than one.

KEY WORDS: *Resource use, rice production, Inland valleys.*

MICROBIAL CONTAMINATION OF BAMBARA SEED (Vigna subterranean) IN THREE MARKETS IN UMUAHIA, ABIA STATE.

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ABSTRACT

A survey was conducted in three Umuahia markets namely; AhiaUkwuOlokoro, UbaniModern and Ndoro markets. The major aim of this research was to determine the microbial contamination level of Vigna subterranean seeds. The study was conducted at the laboratory of the Department of Plant Health Mangement, Michael Okpara University of Agriculture, Umudike, Nigeria. The seeds were washed and sterilized with 0.5% sodium hypochlorite and rinsed three times in sterile water. The sterilized seeds were then inoculated onto nutrient agar medium inside 20ml Petri dishes and allowed for 24 - 48hours at 30oC and 60 - 70% relative humidity. Results obtained showed that all the seeds from the three markets were contaminated ranging from 200 – 240. This experiment shows that variable white bambara seed from Ndoro Market with 60.00% microbial contamination scored the highest and so farmers and marketers should prefer the ones from AhiaUkwuOlokoro with 53.33%

Keywords: *Vigna subterranean seeds, microbial contamination, sterilized, inoculated.*

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ABSTRACT

Experiment was conducted in The Teaching and Research Farm of Akwa Ibom State University, Obio Akpa Campus to determined microbial (fungi & bacterial) densities and morphologies in rhizosphere soil on maize and okra in Obio Akpa. The result showed that Okra engendered more species and morphological types of Fungi and Bacteria.

Key Words: *Densities, Morphologies and Rhizosphere*

EXTENSION SERVICES AND IMPACT OF CLIMATE CHANGE ON FOOD PRODUCTION

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ABSTRACT

Climate change and its associated uncertainties implies that extension services need to regularly access new knowledge and extend it in an adequate and timely manner to the farmers. It also entails harnessing the local, using the two sources of knowledge (extension and farmers) to improve adaptation practices.Demonstration of Climate Resilient Technologies to the farmers may be undertaken by the Extension personnel in the areas of-Natural resource management, Crop Production, Livestock and Fisheries, institutional Management. Extension officers are expected to provide and disseminate information to farmers. Other services expected of extension officers, in their role and responsibilities, include providing institutional support and facilitating farmer's needs to support agricultural production.Agricultural extension has key role to play in initiating the change. This is because adaptations to climate change impacts require change in knowledge, attitudes, resilience capacities and skills of the people and agricultural extension can bring this change.Climate change is a complex problem involving varied interactions between the environment, natural resources (land, crops, animals and water) and peoples. These interactions are likely to change the ecological and agricultural landscape, and therefore influence agricultural production analyses of the issues involved and well informed opinions clearly indicate that the looming effects of climate change are potentially awesome.The greatest threats and effects of climate change are on food security and agriculture. Likely Effects of climate change on key sectors at Global Level include water, food, industrial settlement and society, health problems etc.

Key Words: *Extension, Services, Impact, Climate, Change and Food*

EFFICIENCY OF RESOURCE USE FOR RICE PRODUCTIONON INLANDVALLEYS OF CENTRAL CROSS RIVER STATE, NIGERIA.

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NTRODUCTION

Sustainable agriculture as atopic has been the talk of decades and in recent time as government, enterprises and academics have seen the need to address its necessity (Howell, 1989). However, its context is of a broad perspective, hence the need to have a proper understanding of the concept. Sustainable agriculture is a system that has emanated due to high demand for food and services for sustenance and survival of the increasing population of the world. In addition, the issues of global warming, climate change and industrialization have further made sustainable agriculture very crucial as it has showcased agriculture not to be limited to only animal, energy and food production but also an influencing factor for maintenance of ecosystem, man's health and climate (FMECD, 2015). Weil (1988) provided an outline for the definition of sustainable agriculture and this was noted as follows;

- Sustainable agriculture is a system that enhances and maintains the number, quality and long-term economic viability of farming and other agro-businesses in an area.
- It is a system that promotes the diversity, integrity and long-term productivity of the managed agricultural ecosystem and the surrounding natural ecosystems.
- It is a system that increases safety, health and aesthetic satisfaction of agricultural producers and consumers.

Furthermore, Weil (1990) came up with a summarized definition viz “Sustainable agriculture is a system that enhances environmental quality and the resources on which agriculture depends for a long term, through providing human food, boosting economy and improvement of the quality of farmers and the society at large”.
In general, the definitions of Weil highlights three important concepts that are key components of sustainable agriculture and they are economic concern, environmental concern and public welfare concern.

ENVIRONMENTAL RESOURCES

Guatam & Rastogi (2002) defines resources as components of the environment that are capable of providing solutions to man's need. However, Areola et al. (1999) defined environmental resources as a phenomena, comprising natural, organic and inorganic, that are developed to assist and support man in his time of need within his environment.
The environment which is made up biotic and abiotic components and their respective interactions possess different types of resources. According to Tulu (2002), there are three types of resources and they include

A. Continuous: These are resources that are always available despite their mismanagement and it includes wind, gravity and solar energy.
B. Renewable: These are resources that can be regenerated as long as they are not damaged e.g soil, flora, water and fauna.
C. Non-renewable: These are resources that cannot be regenerated once depleted as they are fixed. Examples include crude oil, colombite, coal, gold and many others.

I. and they include:

a. Industrial minerals such as marble, limestone, gypsum, gravel and sand.

b. Mineral fuels such as coal, crude oil, natural gas and lignite.

c. Precious metals which include diamond, gems, silver and gold.

d. Metallic mineral such as zinc, copper, ore, tin and iron.

THE CONCEPT OF NEXUS

Nexus is a word describing the act of tying or binding something together in Latin. However, the word was first used or introduced in relation to environmental resources management by the UN University project "Food-Energy Nexus Programme" in 1980s (Sachs & Silk, 1990). The project was aimed at promoting sustainability and green economy as the approach could improve energy, water and food security through the integration of governance and management across various sectors (Hoff, 2011). The nexus focus on environmental resources like water, soil and wastes which further showed the inter-relatedness and dependence of these resources as wastes are sources of nutrient to soil for the production of food and water a necessity for food production as well as for the degradation of waste (Lal, 2013). In general, nexus indicates the connection of resources as they support the production, conversion or degradation of one another.

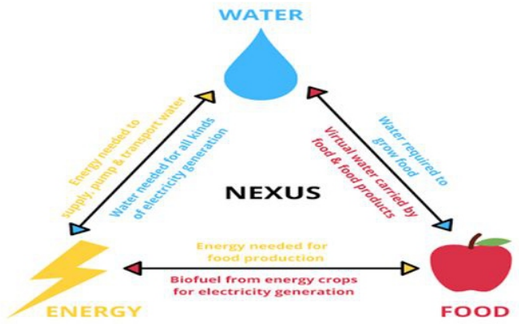

Plate 1: The nexus approach (source: https://www.eschooltoday.com)

ENVIRONMENTAL RESOURCES MANAGEMENT THROUGH SUSTAINABLE AGRICULTURE

The availability of these resources calls for desperate and deliberate measures for its maintenance and management as environmental resources do not just support the needs of man but also a major ingredient for the development of nations as well as the standard of living of people within it (Mayhew, 1997). Therefore, resources management is a vital tool that plans the harvesting, development and utilization of available resources within the environment (Ladan, 2009).

sodium (10.1±0.05) and magnesium (53.1±0.022) respectively. Anti-nutrient assessment revealed that the peels of sweet orange had highest concentrations of flavonoid (6.8±0.01) and oxalate (0.11±0.00) respectively. Highest values for polyphenol and phytate were recorded for grape peels. Rough lemon and lime peels had highest values for saponin and tannin respectively. Three acids were investigated namely citric, malic and tartaric. The peels of grape fruits recorded the highest concentrations of citric (1.5±0.00) and malic (2.4±0.16) acids while lime peels had the highest value for tartaric acid. In conclusion, the peels of these five citrus plants possessed appreciable amounts of nutrient, anti-nutrient and acids that could be used for other pharmaceutical purposes.

Key words: *Citrus peels, acids and nutrient composition*

What Drives Crop Farmers' Adaptation to Climate Change? Evidence from Smallholder Farmers in Kogi Agricultural Zones, Nigeria

By

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ABSTRACT

Prevailing scenarios in Kogi agricultural zones of Nigeria, such as; the environment becoming hotter and drier, rainy seasons getting unpredictable and increasingly erratic and different variations are clear evidence of climate change which alternate cropping date or duration, and has grown to become a major concern for sustainable agricultural production. This study determined factors that drive crop farmers' adaptation to climate change in Kogi Agricultural Zones, Nigeria using a randomly selected one hundred and fifty (150) farmers as respondents. Relevant primary data obtained through questionnaire administration in March – June 2018 were analyzed using descriptive and inferential statistical tools. The Tobit regression model was used to determine the drivers of adaptation to climate change. The socioeconomic characteristics of the sampled respondents showed that 78.67% were males and a mean age of 40 years was recorded among the crop farmers. The result further showed that majority of the farmers were aware of the effect of climate change (sigma score = 5.714) with respect to the following items: hot environment (sigma score = 5.300), irregular rainfall (sigma score = 5.300), and yield reduction (sigma score = 5.082). The Tobit regression result indicated that age (β = 0.028), household size (β = -0.072), membership of cooperative society (β = 0.439) and number of extension contacts (β = 0.026) were significant factors that drive smallholder crop farmers' adaptation to climate change. For informed policy decisions; the government (national and sub-national) and other relevant stakeholders should encourage farmers to join agricultural cooperative societies and also continue to support the extension service delivery system to increase farmers' adaptation capacities.

Keywords: *Climate Change, Adaptation, Extension Contact, Membership of Cooperative Society*

MICROBIAL (FUNGI & BACTERIAL) DENSITIES AND MORPHOLOGIES IN RHIZOSPHERE SOIL ON MAIZE AND OKRA IN OBIO AKPA

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STUDIES ON CHEMICAL PROPERTIES OF THREE UTILIZED AGROWASTES IN NIGERIA

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ABSTRACT

Studies on chemical properties of three utilized agrowastes were conducted in the Department of Plant Science and Biotechnology, Rivers State University. The agro-wastes investigated were sawdust, wood ash and cassava bran. Proximate composition of the assessed agrowastes gave highest values for moisture (9.52±0.003), lipid (4.23±0.04) and carbohydrate (64.11±0.02) in cassava bran. Fibre and protein were highest in sawdust while ash content was highest for wood ash. Mineral assessment showed that sawdust had highest concentrations of iron (1.52±0.03), phosphorus (12.02±0.02) and potassium (11.01±0.02). Wood ash recorded highest values for calcium and magnesium. Highest value for sodium (0.70±0.00) was observed for cassava bran. Anti-nutrient screening revealed phytate, tannin and saponin with the highest values recorded in cassava bran. However, polyphenoland flavonoidrecorded (2.81±0.02) and (4.21±0.01) for sawdust respectively. The cyanide concentration of the assessed cassava bran (2.52±0.03) was within the acceptable limit of FAO and WHO. In general, these agrowastes materials still possess essential nutrients and anti-nutrients that can be further utilized.

Key words: Agrowastes, nutrient, anti-nutrient and utilization

EVALUATION OF NUTRIENT, ANTI-NUTRIENT AND ACIDS COMPOSITIONS OF FIVE CITRUS PEELS

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ABSTRACT

Research studies on the nutrient, anti-nutrient and acid compositions of five citrus peels were carried out in the Department of Plant Science and Biotechnology, Rivers State University. The different citrus peels used for the study were those of sweet orange, lime, grape, rough lemon and tangerine. Investigations on the proximate composition revealed that highest values for carbohydrate (11.95±0.03), protein (15.5±0.25) and energy (139.8±0.07) were found in rough lemon while highest concentrations of ash and lipid were recorded for sweet orange peels. Lime and tangerine peels had values for moisture (75.85±0.33) and fibre(2.5±0.004) respectively. Mineral content determination showed that lime peels had highest calcium (15.1±0.11) and phosphorus (18.0±0.00). However, highest values for potassium and iron were recorded for grape peels. Rough lemon and tangerine had highest values for

Maigari (2000) defined resource management as a process of decision making that involves the allocation of resources over time and space based on the need, desire and aspirations of man within the framework of his technological inventiveness, political and social institutions and his legal and administrative framework.

Sustainable agriculture has contributed to several environmental resource management and its application are still in use. Practical examples of environmental resources management through sustainable development include the following;

1. Improved Agroecosytem: Several agroecosytems have been influenced and damaged through civilization, industrialization and urbanization as modernised agricultural system has caused a drift in the natural ecosystem with the sole aim of increasing productivity (Pretty, 2008). However, sustainable agriculture has helped to retain the desired productivity without destroying the immediate ecosystem. This has addressed the menace already caused by modernized agriculture (Rydberg & Jansen, 2002). The introduction of sustainable agriculture policies against poaching of wildlife and animals and the illegal felling of trees has gone a long way to preserve the ecosystem and the environment (Stefanski&Pasteris, 2008). The study of Gliessman (2005) summarised the impact of sustainable agriculture on restoring the natural ecosystem (Table 1).

Table 1:The impact of sustainable agriculture on restoring the natural ecosystem

property	natural ecosystem	modern agroecosystem	sustainable agroecosystem
productivity	medium	high	medium (possibly high)
species diversity	high	low	medium
functional diversity	high	low	medium–high
output stability	medium	low–medium	high
biomass accumulation	high	low	medium–high
nutrient recycling	closed	open	semi-closed
trophic relationships	complex	simple	intermediate
natural population regulation	high	low	medium–high
resilience	high	low	medium
dependence on external inputs	low	high	medium
human displacement of ecological processes	low	high	low–medium
sustainability	high	low	high

2. Improved Yield: The continuous increase in the world's population has necessitated the need to improve and increase harvest yield. Sustainable agriculture through deliberate breeding and cultivation techniques to obtain crop and animal with high resistance to pest and diseases and adverse climatic factors have supported the rapid increase in yield. FMECD (2015) noted the increased rate of global cereal production over the past 50years due to the use of high-productivity developed seeds. The use of waste crop materials after harvest for the formulation of animal feed has also supported the increased yield in livestock farming. The utilization of these wastes also helps to retain the aesthetics of the environment (FAO, 2016). The report of Dixon et al. (2001) further summarised the influence of sustainable agriculture on yield in 57 countries (Table 2).

Table 2:The influence of sustainable agriculture on yield in 57 countries

FAO farm system category[a]	no. of farmers adopting	no. of hectares under sustainable agriculture	average % increase in crop yields[b]
smallholder irrigated	177 287	357 940	129.8 (±21.5)
wetland rice	8 711 236	7 007 564	22.3 (±2.8)
smallholder rainfed humid	1 704 958	1 081 071	102.2 (±9.0)
smallholder rainfed highland	401 699	725 535	107.3 (±14.7)
smallholder rainfed dry/cold	604 804	737 896	99.2 (±12.5)
dualistic mixed	537 311	26 846 750	76.5 (±12.6)
coastal artisanal	220 000	160 000	62.0 (±20.0)
urban-based and kitchen garden	207 479	36 147	146.0 (±32.9)
all projects	12 564 774	36 952 903	79.2 (±4.5)

3. **IMPROVED SOIL MANAGEMENT:** The advocacy of integrated farming system through sustainable agriculture has not only assisted to manage the structure of soil but also its texture as it discourages extensive monocroping and encourages mixed cropping. More so, the incooperatoon of more nutrients to the soil from animal dungs. The organic matter generated and deposited in the soil also promotes soil functionality through increasing its water holding capacity and biomass production (Bouma, 2016). Furthermore, the implementation of integrated pest and disease management (IPM& IDM) programmes have assisted to protect the soil and the immediate environment from unhealthy pesticides, fungicides and herbicides application as it encourages other biological and cultural methods of pest and disease control (Wilson, 2001; Hassanaliet al., 2008).

4. **Atmospheric Resource Management:** The persistent changes in the environment due to global warming and climate change have attracted a great deal of concern and sustainable agriculture has played a role in the management of atmospheric resources that contribute to global climatic challenges (Pretty, 2008). The encouragement of green world through tree planting by sustainable agriculture has not only supported the removal of abundant atmospheric carbon mono and dioxides and the supply of oxygen but also the removal of other greenhouse gases. In addition, the availability of these trees also support as wind breaks and create aesthetic environments for relaxation (Wastonet al., 2000; Royal Society, 2001).

CONCLUSION

Environmental resources though threatened by mismanagement could be restored and maintained through the adoption of sustainable agriculture. Adherence to the laid down sustainable agricultural policies and rules have not only preserved the availability of these environmental resources but also the wellbeing of man and his immediate environment.

analysis of variance (ANOVA) and the mean separation was done using Duncan Multiple Range Test (DMRT) at the probability of 5%. Soil samples of 0. 15cm depth were collected using soil auger at different positions in Rivers State University. The soil samples were air dried, ground and passed through 2mm sieve for laboratory analysis. Generally, there were significant (P< 0.05) increase in the total nitrogen, available phosphorus and exchange potassium present in the soil sample. Results indicate that Top Soil had 0.05% of Total Nitrogen, Available Phosphorus 42.11mg/Kg and Exchangeable potassium 0.02mol/kg. Results showed that height, leaf area, number of leaves increased (P<0.05) with the type of soil Media used. A mixture of Top soil + River Sand had 22.39± 8.71 was found to be best that supported the growth of okazi (Gnetum africanum) followed by Top Soil alone. The number of leaves for the four soil media is 2.00 ± 0.00cm2 each showed no significant difference (P>0.05). Result showed that the highest height was seen in Top Soil + River Sand with 9.50 ± 1.78cm and the least was in Rivers sand alone with 2.60±0.89cm. It is therefore recommended that farmers who grow Gnetum africanum are advised to prepare media using Top soil + River sand for a better performance of G. africanum in Rivers State, Nigeria.

KEYWORDS: *Bio-Diversity , Conservation, Gnetum africanum, Soil Media, Seedling growth*

COMPARATIVE STUDIES ON THE NQUTRIENT COMPOSITIONS OF FOUR VARIETIES OF EGG PLANT (Solanummelongena)

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ABSTRACT

Comparative studies on the nutrient compositions of four varieties of eggplant (Solanummelongena) werecarried out in the Department of Plant Science and Biotechnology, Rivers State University. Aubergine, local garden egg (anara), yellow and green garden egg were the varieties bought and identified. Proximateinvestigation gave the following values for carbohydrate(8.05±0.011) and fibre(1.15±0.02)in the green variety while protein and lipid contents had highest values for the local garden egg. However, equal values for ash were observed for both yellow and green varieties.Aubergine variety recorded highest moisture content(95.0±0.008). Mineral and vitamin assessed revealed the occurrence of magnesium, calcium, potassium, iron, sodium, phosphorus, vitamins A and C in all four varieties tested. It was further revealed that the yellow garden egg recorded the highest values for calcium, potassium, iron and vitamin A, while Aubergine recorded the highest concentrations of magnesium(6.1±0.21) and sodium(6.5±0.13). Highest values for vitamin C and potassium were recorded for the local garden egg and green variety respectively. Phytochemical evaluation showed that the local garden egg variety had the highest contents of oxalate, carotenoid and polyphenol. Highest value forsaponin(0.05±0.00) was observed for the green variety. However,green and local garden egg had equal values for phytate. Tannin was found in equal amount in the yellow and green varieties while local garden egg and the yellow variety recorded equal amount of flavonoid. In general, the different garden egg varieties showed varying effects on the nutrient compositions of the assessed S. melongena.

Key words: Solanummelongena, variety and nutrient composition

Keywords: *Fungi, Citrullus colocynthis, nutritional status, anti-nutrient, processed.*

EFFECT OF CLIMATE CHANGE ON FISH PRODUCTION IN NIGERIA

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ABSTRACT

Climate change is an important factor that affect both the production of crops and animals. This is so particularly in Africa and developing countries where agricultural production depends on the vagaries of nature. This study examined the effect of climate change on fish production in Nigeria (1960 – 2016). The specific objectives were to estimate the trend in fish production for the period and to examine the long run relationship between fish production and climatic, and other economic variables. Secondary data on climatic parameters and fish production were obtained from publications of the National Bureau of Statistics (NBS).The trend in fish production was estimated using trend analysis while theAutoregressive Distributed Lag (ARDL) model - Bounds testing methodology was used to examine the long run relationship between fish production and climatic variables. The result of trend analysis showed that the coefficient of fish production has a positive coefficient implying an increasing trend. The result of the ARDL model revealed that carbon dioxide,temperature and price had a positive and significant long run effects on the quantity of fish produced while rainfall and inflation rate showed a negative long run effect on the fish output.Findings from the study clearly indicated that an increase in some climatic factors directly influence the output of fish in the country. We recommend that fish production in controlled environment and price stability would boost fish output.

Key Words: *Climate Change, Fish Production, ARDL Model, Long-run, Short-run*

EFFECT OF SOIL MEDIA ON SEEDLING GROWTH OF AN ENDANGERED BIO-DIVERSITY SPECIES GNETUM AFRICANUM(OKAZI)

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ABSTRACT

This Study is concerned with the Effects of Soil Media on Seedling growth of okazi (Gnetum africanum Welw). The general objective is to determine the effect of soil media on growth rate of okazi (G. africanum). The experiment was conducted at the Arboretum of Forestry and Environment Department, Rivers State University, Nkpolu-Oroworukwo Port Harcourt. The experiment were laid in a Completely Randomized Design which was (CRD) replicated four times. Top soil alone, Top soil + River sand, Top soil +River sand + Clay, River sand alone were used as planting media. Data collected were subjected to

REFRENCES

Akintola, F. O. (1983). Mineral energy resources. In Oguntoyinbo J. S. et al (Eds): A geography of Nigerian development. Heinemann Educational Books (Nig.) Limited.

Areaola, O. M. M., Onuweluzo, F. A. &Omotoso, O. (1999). Exam focus geography for SSCE & JME. University Press Plc Ibadan.

Bouma, J. (2016). Implications of the nexus approach when assessing water and soil quality as a function of soil and liquid waste management, in Hettiarachchi&Ardakanian (eds), Environmental Resource Management and the Nexus Approach. Springer Int. Publ., Switzerland, 179-209.

Dixon, J., Gulliver, A. & Gibbon, D. (2001). Farming systems and poverty. Rome, Itally: FAO.

FAO, (2016). Sustainable agriculture: A tool to strengthen food security and nutrition in Latin America and the Caribbean. FAO, 15754E/1/07.16, PP 1-48.

Federal Ministry for Economic Cooperation and Development (FMECD), (2015). What is sustainable agriculture? GIZ publication, 1-32.

Gliessman, S. R. (2005). Agroecology and agroecosystems. In: The earthscan reader in sustainable agriculture (Ed. J. Pretty). London, Uk: Earthscan.

Guatam, A. &Rastogi, S. (2002). Resources geography. Int. Publishing House, Meerut, India.

Hassanali, A., Herren, H., Khan, Z. R., Pickett, J. A. & Woodcock, C. M. (2008). Integrated pest management: The push-pull approach for controlling insect pests and weeds of cereals and its potential for other agricultural systems including animal husbandry. Phil. Trans. Royal Society B, 363: 611-621.

Hoff, H. (2011). Understanding the nexus. Background paper for Bonn 2011 conference: The water, energy and food security, nexus. Stockholm: Stockholm Environmental Institute.

Howell, D. (1989). Organic agriculture: what the states are doing. Centre for science in the public interest. Washington DC.

Ladan, S. I. (2009). Environmental resources management for self-reliance in Nigeria. Danmasani, 2(1-4): 80-91.

Lal, R. (2013). The nexus of soil, water and wastes. UNU-FLORES Lecture Series No. 1. Dresden: UNN-FLORES.

Maigari, A. I. (2002). Introduction of environmental problems and management. Wa'adallah Environmental Consult (WADEC) Kano.

Mayhew, S. (1997). Oxford dictionary of Geography (2nd edition). Oxford University Press, Kent England.

Pretty, J. (2008). Agricultural sustainability: Concepts, principles and evidence. Phil. Trans. Royal Society B, 363: 447-465.

Royal Society, (2001). The role of land carbon sinks in mitigating global carbon change. London, UK: Royal Society.

Rydberg, T. & Jansen, J. (2002). Comparison on horse and tractor using energy analysis. Ecol. Eng., 19: 13-28.

Sachs, I. & Silk, D. (1990). Food and energy: Strategies for sustainable development. Tokyo: The United Nations University.

Stefanski, R, &Pasteris, P. (2008). Management of natural and environmental resources for sustainable agriculture. Proceedings of the USDA/WMO Workshop on management of natural and environmental resources for sustainable agricultural development, 13-16 Feb., 2006, Portland, Oregon, USA. Washington, D.C., USA: United States Department of Agriculture; Geneva, Switzerland: World Meterological Organization; Technical Bulletin WAOB-2008, NRCS-2008 and AGM-10, WMO/TD No. 1428, 211pp.

Tulu, T. (2002). Soil and water conservation for sustainable agriculture. Mega Publishing Enterprise, Addis Ababa, Ethiopia.

Waston, R. T., Noble, I. R., Bolin, B., Ravindranath, N. H., Verardo, D. J. &Dokken, D. T. (2000). IPCC special report on land use, land-use change and forestry (eds). A special report of the intergovernmental panel on climatic change. IPCC Secretariat, World Metrological Organization, Geneva, Switzerland. http://ww.ipcc.ch/.

Weil, R. R. (1988). Developing an operational definition of sustainable agriculture. In Abstract of Int. Conf. on Sustainable Agric. Systems, Columbus, OH. 19-23 Sept. Ohio State University, Columbus, 121.

Weil, R. R. (1990). Defining and using the concepts of sustainable Agriculture. J. Agric. Educ., 19(2): 126-130.

Wilson, C. (2001). Why farmers continue to use pesticides despite environmental, health and sustainability costs. Ecol. Econ., 39: 449-462.

ABSTRACT

The Land Use Act, Cap 202 LFN 1990 of Nigeria, provides that where farmlands are compulsorily acquired by government, compensation shall be paid to the affected farmers. While the Act indicated the type of value to be captured, it did not stipulate the method "The Appropriate Officer" should use in assessing it. "The Appropriate Officers" have therefore been issuing out arbitrary figures to the dissatisfaction of dispossessed farmers. Assessing the satisfaction level of the farmers with the amount of compensation being paid to them under the extant law, is very important for policy review as well as very vital for comprehensive risk assessment of farms in a country with increasing need for government acquisition of farmlands. This work sought the opinion of a group of crop farmers whose land rights were compulsorily acquired by government, on the compensation paid. The finding is that the farmers feel that their assets are highly under-valued for compensation purpose under the operational law (the Land Use Act) and are therefore greatly dissatisfied with the compensation paid to them. The view of the researchers is for the Appropriate Officer to adopt Total Economic Value based on internationally-recommended method of valuation stipulated in the 2012 Food and Agriculture Organization (FAO)'s Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGRGTLFF). At worst, the Appropriate Officer should adopt market value basis for the compensation computations.

Comparative Studies on Microbial and Nutritional Analysis of Self Processed and Commercially Processed Citrullus colocynthis (egusi) Seeds

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ABSTRACT

The study investigated and compared the fungal contamination and nutritional status of self processed and commercially processed Citrullus colocynthis seed flour sold in the open market in Port Harcourt metropolis, Rivers State Nigeria. Commercially processed seed flour had higher incidence of fungal contamination relative to the self processed seed flour. Six fungal organisms with varying percentage incidence were isolated viz; Aspergillus niger (55%), Aspergillus flavus (50%), Penicilium italicum (20%), Botryodiplodia theobromae (30%), Fusarium oxysporium (25%) and Rhizopus stolonifer (40%) while three fungal organisms were isolated from self processed flour which include Aspergillus niger (15%), Aspergillus flavus (10%) and penicilium italicum (5%). The highest percentage incidence was observed for A. niger while P. italicum recorded the least. Proximate parameters assessed were moisture, ash, fiber, lipid, carbohydrate and protein. Decreased value for moisture, lipid, carbohydrate and protein were seen in the commercially processed flour relative to the self processed sample. However, ash and fibre had equal value for both samples. Finding from the mineral analysis revealed that both samples of C. colocynthis seed flour had equal values of phosphorus, iron and potassium. However, sodium and magnesium had lower values, while calcium recorded higher values in commercially processed sample relative to self processed sample.

ABSTRACT

This main objective of this research work was to ascertain the Determinants of Climate Change Adaptation in Ikot Ekpene local government area, Akwa Ibom State, Nigeria. The specific objectives were to; identify the socio-economic characteristics of arable crop farmers in the study area, identify farmer's awareness of climate change issues, examine the effect of climate change on arable crop production in the study area, identify the degree of effectiveness of the adaptation measures used by the farmers, identify the constraints to adaptation measures. Data was collected with the aid of a well-structured questionnaire administered to 120 farmers selected from two clans of the LGA through a multistage sampling technique used in selecting the arable Crop farmers. Descriptive statistics and multi regression analysis were used to analyze the objectives of the study. The result for the socio-economic characteristics revealed that 56.4% of the respondents were male and 43.6% were female, the reason being that the researcher administered most of the questionnaire to male respondents. The mean of the major age ranges (31-50, 51=60) was 43.5, 69.1% were married and majority of the respondents had formal education, 68% of the respondents had 11-20 years of experience in arable crop farming, The results of farmers' annual income showed that majority (47.3%) of the farmers were low income farmers. Only 11.8% of the farmers had earned above N 200,000 annually from the sales of their farm produce. Majority of the respondents about 88.18% (X=3.22) claimed to have idea of climate change, Noticeable increase temperature (X=2.99), Also 42.72% with mean of (X=2.48) of the respondents is aware of experience poor and unpredictable yield. Also 85.46% (X =3.18) of the respondents agreed knowing the risk of rainfall irregularities, since late rainfall has adverse effect on crop growth and yield. Other variables include occurrences of drought (X =1.74), moisture stress causes severe damages (X =2.20), indicating that 70% do not really know or experience such in their area. Increasing pests and diseases (X =2.99), implying that 73.64% notice increase in pest and diseases in the study area. The mean of measures adapted by respondents included, Change planting and harvesting time (x=3.99), Prevent bush burning (x=3.81), Plant legumes (x=3.85), Practice crop rotation (x=3.82), Treatment of soil (x=3.73), Use improved /drought resistant variety (x=3.63), Control erosion (x=4.49).

Key Words : *Determinants ,Climate Change, Adaptation, Arable Crops*

Analysis of the Satisfaction Level of Nigerian Crop Farmers under the Compensation Provisions of the Land Use Act

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CLIMATE CHANGE: IMPACTS ON SUSTAINABLE FOOD PRODUCTION ENVIRONMENTAL AND HUMAN RESOURCES

A LEAD PAPER PRESENTED BY PROF. A. C. AMADIOHA, MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE, AT THE 3RD NATIONAL ANNUAL CONFERENCE OF SOCIETY FOR AGRICULTURE, ENVIRONMENTAL RESOURCES AND MANAGEMENT (SAEREM) HOLDING AT UNIVERSITY OF CALABAR, CROSS RIVER STATE, 15TH – 18TH NOVEMBER, 2020

INTRODUCTION

One of the greatest challenges we face globally in the twenty-first century is to sustainably feed nine to ten billion people by 2050 while at the same time reducing environmental impact such as green-house gas (GHG) emissions, biodiversity loss, land use change and loss of ecosystem services. To this end, food security must be delivered through sustainable food production and at the same time we must also reduce the environmental impact of agriculture which contributes about 30 % of the GHG emissions that drive climate change. Each challenge is in itself enormous, requiring solutions that co-deliver on all aspects. The status quo is not an option and tinkering with the current food production systems is unlikely to deliver the food and ecosystems services we need in the future therefore radical changes in food production and consumption are likely to be required over the coming decades. The aim of this paper is to outline some of the likely impacts of climate change on agriculture, the mitigation measures available within agriculture to reduce GHG emissions and the very significant challenge of feeding nine to ten billion people sustainably under a future climate, with reduced emissions of GHG. I will therefore examine how food production might be increased while at the same time reducing greenhouse gas (GHG) emissions from agriculture which contributes to climate change and accounting for future climate threats and then examine what sustainable food production under a future climate might look like

CLIMATE IMPACT ON FOOD SECURITY

Feeding of nine to ten billion people by 2050 presents an enormous challenge (1). A number of options have been proposed to help address the issue, including closing the yield gap (i.e. making the difference between the attainable high yield and actually realized smaller yield), increasing the production potential of crops (largely through the use of new technologies and investment in research), reducing waste, changing diets and expanding aquaculture. These options need to be coordinated in a multifaceted manner and linked to global strategy to ensure sustainable and equitable food security (1). At the same time as increasing food production, we also need to significantly decrease the climate impact of food production (2) as well as improving the resilience of food production to future environmental change. Other non-climate related needs are to protect our freshwater resources (3), protect biodiversity (4), move towards healthier diets (5) and reduce the adverse impact of food production on a whole range of ecosystem services (6). The expansion of agriculture into forests and natural ecosystems (7) has significantly contributed to the loss of ecosystem services thereby giving added impetus to the realization that future increases in food supply need to be met without increasing the agricultural area, i.e. to derive more agricultural products from the same land area (1,8).

the main means of intensifying crop production is through increased yield per unit area together with a smaller contribution from an increased number of crops grown in a seasonal cycle. Hence, some form of sustainable intensification of food production will be required (9); but more fundamental changes in food production (and consumption) will also be needed if we are to meet future challenges. According to the United Nations definition, 'food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'. At the same time as delivering food security, we must also reduce the environmental impact of food production. Food security is underpinned by effective food systems, which are a set of dynamic interactions between and within biogeophysical and human environments. They include a number of activities such as producing and processing food; packaging and distributing food; and retailing and consuming food, which lead to a number of associated outcomes some of which contribute to food security (i.e. food avail-ability, access to food and food utilization) and others which relate to environmental and other social welfare concerns (10). Since food security is diminished when food systems are disrupted or stressed, food security policy must address the whole food system. Although food availability increased globally by 26 % between1970 and 2000 (11), Africa remains the only continent that is yet to achieve food surplus with some 800–1,200 million people remaining malnourished. According to Hazell and Wood (12) the hunger problem in Africa is fundamentally one of income distribution rather than of food shortages per se. While the hungry people are too poor to buy the food produced and suffer malnourishment, the rich people have excessive food intake and suffer from obesity and associated chronic illnesses.

Increasing global food production will therefore not solve these problems. The majority of the poor people live in rural areas where they depend primarily on agriculture and related activities for both food and their livelihoods. These areas are often characterized by a fragile and naturally poor resource base of soil, land and water meaning that money to invest in improving crop and livestock husbandry is limited or non-existent (13). Land use and issues of food security are intimately linked and the interplay has been made explicit in the context of climate change (14,15). Food security is therefore a multi-faceted challenge, involving much more than just food production. Indeed, food production is only one of the challenges of making food available (which also relies on distribution and exchange), and food availability, is only one aspect of food security which also includes access to food and food utilization.

THE CLIMATE FOOTPRINT OF AGRICULTURE

Agriculture as part of the climate problem

Agriculture releases significant amounts of CO2, CH4 and N2O to the atmosphere. CO2 is released largely from microbial decay or burning of plant litter and soil organic matter. CH4 is produced when organic materials decompose under anoxic conditions, notably from fermentative digestion by ruminant livestock, stored manures and rice grown under flooded conditions. N2O is produced by the microbial transformation of N in soils and manures, and is often enhanced where the available N exceeds plant requirements, especially under wet conditions (2).

The total global contribution of agriculture to GHG emissions considering all direct emissions (such as GHG emissions from soil and livestock) and indirect emissions (such as fossil fuel use, production of agrochemicals and land conversion to agriculture) is between 17 and 32 % of all global anthropogenic GHG emissions, including land use changes (16). In the last century, there

ABSTRACT

The determination of air pollutants in Abattoir, Ntak Inyang in Uyo L.G.A was carried out using standard analytical techniques. The pollutants monitored were NO2, SO2, H2S, CO, NH3, Cl2, TVOC, CH2O, PM2.5, PM10, Temp,Relative humidity (RH), Pressure and Wind Speed (WS). The results for the concentration of air pollutant and their Air Quality Index (AQI) reveals as follows NO2 (1.36 ± 0.32(ppm), AQ1=1360). SO2 (2.44 ± 1.98(ppm), AQ1=488). H2S (3.38 ± 1940(ppm), AQ1=19450). CO (1.79±1.61(ppm), AQ1=334). NH3 (7.8±2.26(ppm), AQ1=156). Cl2 (1.47± 1.29(ppm), AQ1= 147). HCN (11.56±7.93(mg/m3), AQ1=115,600). TVOC (164±0.46(mg/m3), AQ1=328). CH2O (0.23±0.12(mg/m3), AQ1=0.276). PM2.5 (43.2±0.95(µg/m3), AQ1=172.8). PM10 (74.8±1.15(µg/m3), AQ1=149.6). Temp (27.5±4.6oC).

Relative humidity (RH) (74.6 ± 4.6%), Press (1006.7±0.84(kpa). W.S (1.56±0(m/s)). The result showed that NO2, SO2, H2S, CO, NH3, Cl2, HCN, TVOC, PM2.5 and PM10 were higher than that of FEPA standard limit. The correlation analysis revealed that NO2 shows positive relationship with H2S, and W.S at 0.05 significant level and negatively with Cl2 and Press at 0.01 significant

level, and negatively with PM2.5 and PM10 at 0.05 significant level. SO2 correlated positively with CO at 0.01 significant level, TVOC and CH2O at 0.05 significant level. SO2-NH3 at 0.05 significant level but negatively. H2S shows a relationship with Temp but positively at 0.01 significant level and 0.05 significant level with HCN, H2S also correlated negatively with NH3 and Press at 0.01 significant level. While CO shows a correlation with NH3 at 0.05 significant level but negatively. NH3-RH positively at 0.01 significant, NH3-Press at 0.05 significant level. Also, NH3 shows a negative relationship with TVOC, CH2O and Temp at 0.05 significant level. Cl2 correlated strongly but positively with Press at 0.01significant level, Cl2-PM2.5 and PM10 at 0.05 significant level and a negative relationship with W.S at 0.05 significant level. HCN-WS negatively at a 0.05 significant level. TVOC correlated positively with CH2O and negatively with RH at 0.01 significant level, and a positive relationship with PM2.5 and PM10 at 0.05 significant level. CH2O correlated negatively with RH at 0.01 significant level and positively with PM2.5 and PM10 at 0.05 significant level. PM2.5 shows a positively relationship with PM10 at 0.01 significant level. This result in an indication of the presence of possible air pollutants in the of the study area which may results in many health problems.

Key words: *Pollution, Air Pollution and meteorological parameters.*

DETERMINANTS OF CLIMATE CHANGE ADAPTATION AMONG ARABLE CROPS FARMERS IN AKWA IBOM STATE, NIGERIA

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Household size, having children below 12 years, female head, married head and conflict were significant($p \leq 0.001$)factors that positively influenced households coping strategies. However, education, number of plots of land and income were factors that negatively and significantly($p \leq 0.001$) affected households coping strategy. The study recommended a constant monitoring and appropriate intervention to ameliorate the sufferings that conflicts inflict on these people especially households with children and those with female heads.

Keywords: Violent conflict, coping strategies, food security, households

NEED FOR YOUTHS ENGAGEMENT IN COCOA PRODUCTION IN NIGERIA: CHALLENGES AND PROSPECTS

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ABSTRACT

The contribution of agriculture to the aggregate gross domestic product (GDP) of Nigeria is still very low; this may be attributed partly to the few number of youths that actively participate in agriculture. An efficient agricultural sector would in no doubt enable a country to generate employment opportunities that will stimulate economic growth and development. The dynamism of the agricultural sector is undoubtedly a springboard for youth empowerment towards a sustainable socio – economic development. This paper asserts that the agricultural sector is the key driver of sustainability of most developed nations in the world. Specifically, the paper focuses on the need for youth engagement in cocoa production in Nigeria; for this will revolutionized the agricultural sector through sustainable development via agro-business in Nigeria. The enormous potentials of youths in Nigeria provides opportunities for the stimulation of agro businesses, thereby reducing youth unemployment towards the achievement of sustainable development.

DETERMINATION OF SOME AIR POLLUTANTS AND METEOROLOGICAL PARAMETERS IN ABATTOIR, NTAK INYANG IN UYO L.G.A OF AKWA IBOM STATE IN NIGERIA

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have been substantial changes in agriculture, with the uptake of synthetic fertilizers, development of new crop varieties ('Green Revolution') and the adoption of large-scale farming systems. Direct emissions from agriculture contribute between 10–12 % to global GHG emissions. These emissions are mainly in the form of CH4 and N2O whereas the net flux of CO2 is thought to be small (2,17,18). However, the clearing of native vegetation for agriculture (i.e. land use change rather than agriculture per se) releases large quantities of ecosystem carbon such as CO2. N2O emissions from soils and CH4 from enteric fermentation of cattle constituted the largest sources, 38 and 32 % respectively of total non-CO2 emissions from agriculture in 2005. Biomass burning (12 %), rice production (11 %) and manure management (7 %) accounted for the rest. The magnitude and relative importance of the different sources of GHG emissions vary widely between regions. Globally, agricultural CH4 and N2O emissions have increased by 17 % from 1990 to 2005, and are projected to increase by another 35–60 % by 2030 driven by growing N fertilizer use and increased livestock production (19).

In addition to these direct agriculture emissions, the production of agrochemicals is another important source of GHG emissions. Production of fertilizers contributes significantly to the overall impact of industrialized agriculture because it is energy intensive, and adds a significant amount of between 0.6 and 1.2 % of the world's total GHG emission. The greatest sources of GHG emissions from fertilizer production is the energy required, which emits CO2 and nitrate production which generates more CO2-eq in the form of N2O (16). Mosier and Kroeze (20) and the US Environmental Protection Agency (EPA) (21) estimated that N2O emissions will increase by about 50 % by 2020 (relative to 1990). If CH4 emissions grow in direct proportion to increases in livestock numbers, then global livestock-related CH4 production (from enteric fermentation and manure management) is expected to increase by 60 % in the period1990–2030 (19). According to the US-Environmental Protection Agency (21), aggregate agricultural emissions are projected to increase by about 13 % during the decades 2000–2010 and 2010–2020. Assuming similar rates of increase (10–15 %) for 2020–2030, agricultural emissions might be expected to rise by 2030. With projected global median emissions, agriculture would contribute about 15 % to direct emissions (17) equating to a 3 % increase of its contribution to total human GHG emissions.

Agriculture as part of the climate solution

In addition to being a significant part of the climate problem, agriculture may be part of the solution because it has significant climate change mitigation potential. The most prominent options for mitigation in agriculture emissions (2, 22, 23, 24) are by:

1. Cropland management through:

a. Avoiding bare fallow: Bare soil is prone to erosion and nutrient leaching and contains less carbon than the same field with vegetation. An important solution is 'catch' and 'cover' crops, which cover the soil in between the actual crop and in fallow periods respectively.
b. Using an appropriate amount of N fertilizer by avoiding applications in excess of immediate plant requirements, by applying it at the right time and by placing it more precisely in the soil.
a. Reducing the reliance on fertilizers by adopting cropping systems such as use of rotations with legume crops which has a high mitigation potential.
b. No burning of crop residues in the field.
c. Reducing tillage: Reduced tillage without the use of herbicides in organic farming systems has positive benefits for carbon sequestration in the soil.

2. Grazing land management such as reducing grazing intensity or reducing the frequency and intensity of fires (by active fire management). These measures typically lead to increased tree and shrub cover, resulting in a CO2 sink in both soil and biomass.

3. Restoration of organic soils that are drained for crop production and restoration of degraded lands to increase carbon sinks.

4. Avoiding drainage of wet lands and carrying out erosion control.

5. Improved water and rice management in the off-rice season. CH4 emissions can be reduced by improved water management, especially by keeping the soil as dry as possible and avoiding water logging.

6. Lower but still significant mitigation is possible with set-asides, land use change (e.g., conversion of crop-land to grassland) and agro-forestry as well as improved livestock and manure management.

7. Increased efficiency in the manufacturing of fertilizers. Improvements would be related to greater energy efficiency in NH3 production plants (29 %), introduction of new N2O reduction technology (32 %) and other general energy saving measures in manufacturing (39 %).

The challenge of reducing agricultural GHG emissions is intricately linked with the other challenges related to sustainable agricultural production. The greatest challenge of agriculture during the twenty-first century is to feed the increasing number of increasingly wealthy people on earth while maintaining soil and water resources (1). The world population is expected to increase from approximately seven to nine billion people between 2010 and 2050. At the same time, consumption of food per capita is increasing. This is projected to lead to a doubling of global meat consumption and a 60 % increase in world cereal consumption from 2000 to 2050 (25). While this projected increase in production is certainly feasible, it is likely to come at a high cost for environment and biodiversity unless action is taken to develop and implement farming systems that are considerably more sustainable (in all aspects) than currently seen.

CLIMATE CHANGE IMPACT ON FOOD PRODUCTION

Food production from agriculture is extremely dependent on temperature and rainfall and therefore vulnerable to climate change (26). The overall impacts of climate change on agriculture are expected to be negative and will threaten global food security. In a landmark assessment of the potential impacts of climate change on agriculture, Nelson et al. (26) concluded that despite gains in some crops in some regions, under future climate change, increased temperatures will not only reduce crop yields but will encourage weed and pest proliferation whereas changes in precipitation patterns will increase the likelihood of crop failures in the short term, and decline in production in the long term. Their analysis showed that populations in developing countries, which are already food insecure and vulnerable to climate change, are likely to be the worst affected (26). The results of the analysis of Nelson et al.(26) suggested unequivocally that despite gains in productivity in some regions, agriculture and human wellbeing will be negatively affected by climate change. The impacts of climate change on agriculture and human wellbeing are complex and include:

INFLUENCE OF TILLAGE TYPES AND POTASSIUM FERTILIZER APPLICATION ON SOIL PROPERTIES AND YIELD OF WHITE YAM (Dioscorea rotundata) ON AN ULTISOL OF SOUTH EASTERN NIGERIA

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ABSTRACT

A field experiment was conducted at Akwa Ibom State University Teaching and Research Farm, Obio Akpa in 2018 to evaluate the influence of tillage systems and K fertilizer application on some selected soil properties and yield of white yam (Dioscorea rotundata). A 3x4 factorial experiment was laid out in a randomized complete block design (RCBD). Three tillage types; flat till (FT), mound till (MT) and ridge till (RT) constituted the main plots, while four K rates(Control O kg/ha, 100, 200 and 300 kg/ha) occupied the subplots. The experiment was replicated three times. The land was cleared, and mapped into main and subplots according to the design. Initial and postharvest soil samples were collected across treatment plots, processed and analysed for some selected soil and yam yield properties. Yam tubers averaging 600g were planted and yield data collected at harvest. The results showed that tillage when applied alone and in combination with different K- fertilizer rates improved selected soil and white yam yield properties generally at ($P<0.05$) over control. Flat till (FT) gave the highest mean soil organic matter of 4.91% followed by Ridge till (4.40%) while the least mean soil organic matter(4.28%) was obtained under Mound till(MT). Soil exch. Mg increased in order of RT(2.83col/kg)>MT(2.14cmol/kg) > FT(1.62cmol/kg) respectively. BS(%) improved under different tillage thus; RT(89.12%),> MT(81.54%) > FT(75.61%) respectively. Application of 300kg/ha K x RT increased mean soil calcium by 68.69 %, over other rates of application. Ridge till increased white syam tuber weight up to 0.0841kg, and tuber length by 12.25cm, over other tillage systems. Application of K-fertilizer alone at 300kg/ha increased mean white yam number per stand, up to 2.7 and mean tuber weight by 0.93kg/plant, over other rates of application. Application of 300kg/ha K- fertilizer under Ridge tillage produced longest white yam tubers averaging 16.67cm, followed by 200kg/ha with mean tuber length (15cm) and the least mean tuber length(9.67cm) was obtained when 100kg/ha of K fertilizer was applied under RT representing 73.45, 33.4 and 6.60 percent respectively over control. Ridge tillage (RT) combined with 300kg/ha of K- fertilizer is recommended for white yam farmers in the study area.

Key words : Tillage types, K fertilizer and White yam.

Household Food Insecurity Coping Strategies during Violent Conflict in Taraba State Nigeria

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ABSTRACT

Communal conflicts resulting from competition for natural resource control, and differences in ethnic identity and value systems have impacted negatively on Nigerian economy. One major consequence of this conflict often not considered is food insecurity. Thisstudy investigated the food insecurity coping strategies adopted by households in Taraba State during conflict. Primary data for this study were collected from 450 randomly selected households. The data for the study were analysed using descriptive and inferential statistics. Food insecurity coping strategies index was used in capturing the food security status/levels of the households. Comparing the coping strategies index (CSI) of households in conflict and non-conflict areas of the state, Chi-square result showed a significant difference between the food security levels of the two groups. Households in conflict areas significantly ($p \leq 0.01$) used more food insecurity coping strategies and erosive coping strategies like begging for food than their counterpart. Households in conflict areas also depended heavily on food aid (18%).

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VENUE: UNIVERSITY OF CALABAR,
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CHAIRMAN: PROF. SAM UDOH
RAPPORTEUR: PROF. A. A. MARKSON

ABSTRACT NO.	TTLE OF ABSTRACTS	AUTHOR(S)
SC2020/UNC011	Effect of Climate Change on Fish Production in Nigeria	Ajuma IdakwoEti-Ukwu, Steven J. Ibitoye and Ezekiel Ojuh Haruna
SC2020/UNC012	Effect of Soil Media on Seedling Growth of an endangered Bio-diversity species Gnetum africanum (Okazi)	Nnadi, P.C.
SC2020/UNC013	Comparative studies on the nutrient compositions of four varieties of egg plant (*solanummelongena*)	Chuku, E. C., Agbagwa, S. S. And Worlu, C.
SC2020/UNC014	Studies on Chemical properties of three Utilized Agrowastes in Nigeria	Agbagwa, S. S.; Chuku E. C. and Worlu, C.
SC2020/UNC015	Evaluation of nutrient, anti-nutrient and acids compositions of five citrus peels	Chuku, E. C., Agbagwa, S. S. and Wekhe, O.
SC2020/UNC016	What Drives Crop Farmers' Adaptation to Climate Change? Evidence from Smallholder Farmers in Kogi Agricultural Zones, Nigeria	Ibitoye, S.J., Shaibu, U.M., Omojola, E.O. and Adejoh, S.O
SC2020/UNC017	Microbial (Fungi & Bacterial) Densities And Morphologies In Rhizosphere Soil On Maize And Okra In Obio Akpa	Etukudoh, N. E. Otobong, Anthony Essien. Wenibo Andrew, and Chukwumati John
SC2020/UNC018	Extension Services and impact of Climate Change on Food Production	Paul, A. H., Amen, N. E., and Allison B. R.
SC2020/UNC019	Efficiency of Resource use for Rice Production on in land valleys of Central Cross River State, Nigeria.	Oniah, M. O., Ovat, K., Willie, I. B. and Odedele, S. O.
SC2020/UNC020	Microbial Contamination of Bambara seed (*Vigna Subterranean)* in three markets in Umuahia, Abia State.	Opara Emma Umunna and Okpara Uzoamaka Gloria
SC2020/UNC021	Bioremediation Of A Crude Oil Using Poultry Manure On A Coastal Plain Sand Of Obio Akpa, Southern Nigeria	Etukudoh , Ndarake Emmanuel and Gbarabe Roland
SC2020/UNC022	Influence Of Different Organic Soil Amendments On The Growth And Biomass Accumulation Of *Khaya Grandifoliola* Seedlings	Adeyemi T. O. A, Osadolor N., Agboje I. and Imogoh S.
SC2020/UNC023	Drought And Food Security Challenges In Sub-Saharan Africa: The Benue State Scenario, Nigeria	Oko, p. E., Asaasuen, T., Etuk, I, I. And Arikpo, I. A.

a. The biological effects on crop yields.
b. The resulting impacts on outcomes including production, prices and consumption of agricultural products and
c. The impacts on per capita energy consumption and child malnutrition.

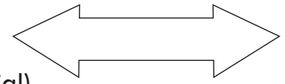
In summary, Nelson et al.(26) found that:
(i) Climate change will cause yield declines for the most important crops in developing countries.
(ii) Climate change will have varying effects on irrigated yields.
(iii) Climate change will result in price increases for rice, wheat, maize and soya beans (the most important agricultural crops) with higher feed prices resulting in higher meat prices, reducing the growth in meat consumption slightly and causing a more substantial fall in cereal consumption,
(iv) Food availability in 2050 will decline relative to 2000 levels throughout the developing world, which will increase child malnutrition by 20 %.
(v) Climate change will eliminate much of the improvement made in child nourishment.

They concluded that aggressive agricultural productivity investments of 7.1–7.3 billion US$ are required to raise energy consumption enough to offset the negative impacts of climate change on the health and wellbeing of children. Climate extremes associated with future climate change (e.g. droughts, heat waves and storms) are also expected to adversely affect food production. Since climate change is expected to adversely affect global food production, sustainable food production in the future will be even more difficult to achieve, making climate mitigation even more important (27, 28).

SUSTAINABLE FOOD PRODUCTION UNDER A FUTURE CLIMATE CHANGE

This section, examines how production and consumption-based measures (Fig. 1) might be used to address the huge challenges of sustainable food production under a future climate change.

Production-based measures
e.g. Closed yield gap
Improved varieties (higher yield potential)



Consumption-based measures
e.g. changing diets
Reduced food waste

Fig. 1: The relationship between the production- and consumption-based measures (and the interactions between them) that make an impact upon food production under a future climate.

Production-based measures

Granted that there are some new technologies and innovations emerging to improve yields such as minimum and conservation tillage to improve soils, precision farming to apply inputs taking account of spatial heterogeneity and adoption of improved cultivars (mainly via conventional breeding), these are largely based on 'old' knowledge and are hardly novel.

A primary requirement for the future is to produce higher yields with inputs that do not lead to environmental problems either on- or off-site. Nutrient additions that are inadequate relative to crop off-take degrade land through nutrient mining whereas additions that are excessive degrade land, water and air through leaching, eutrophication and gaseous emissions respectively (29)

Ideally, nutrient additions (whether as mineral fertilizers or manures) and soil biota should be managed to deliver nutrients to crops synchronously with demand (30) but this has proved difficult to achieve in practice because applications must be made before the demand exists and large canopies of crops do not permit application of solid sources to soils.

In addition to improving the efficiency with which crops use nutrients and water, another key requirement is to increase the amount of solar energy harvested per unit of fossil energy expended. Concerns about the amount of fossil-fuel energy expended in crop production and food processing are not new (31,32), but have recently come to the fore again as energy costs have increased and concerns about CO2 emissions and the need to develop low carbon cropping practices have emerged. The energy required to produce N fertilizers is substantial (typically about 60 MJ/kg N), so one of the most effective means of improving energy efficiency in cropping systems is to introduce legumes into crop rotation, although this may also reduce energy output (33, 34, 35). Tilman et al.(36) concluded that securing high yields on the existing crop-lands of nations where yields are suboptimal is very important if global crop demand is to be met with minimal environmental impact. At the high-tech end are options such as the genetic modification of living organisms and the use of cloned livestock and nanotechnology (1,37,38) while at the low-tech end are options such as the closure of yield gaps, for example by the redistribution of inputs such as N fertilizer from regions which over-fertilize such as China, to regions where N supply is limited such as sub-Saharan Africa (39,40).

Foley et al. (40) examined the closure of the yield gap as a mechanism of sustainable intensification (in some regions) by rebalancing the distribution of inputs to optimize production. Cassman et al.(41) noted that many regions of the globe are over-fertilized, whereas others are under-fertilized. Foley et al.(40) also showed that the benefits and impacts of irrigation are not evenly distributed and that water needed for crop production varies greatly across the globe. They suggested that redistributing these imbalances could largely close the yield gap, and bring yields to within 95 % of their potential for important food and feed crops. Closing the yield gap of crops to 75 % of their potential, would give a global production increase of 1.1 billion tonnes which is about 28 % increase (40). Other agronomic mechanisms for increasing crop productivity include better matching of nutrient supply to crop need (e.g. improved fertilizer management and precision farming), better recycling of nutrients, improved soil management (to reduce erosion, maintain fertility and improve nutrient status) and better matching of crops with the bio-climatic regions where they thrive.

Godfray et al.(1) examined the possibility of increasing crop production limits, and suggested that by 2050, it is possible to manipulate traits controlled by many genes and confer desirable traits (such as improved N and water use efficiency). Cloned animals with innate resistance could also reduce losses from disease. Globally, genetic manipulation could play a role in future sustainable intensification, though public opposition to genetic modification remains in some regions of the world.

Consumption-based measures

While increases in agricultural production through sustainable intensification have received some attention (9,35,36), efficiency improvements in the entire food chain and dietary changes towards less land demanding food have begun to be explored only recently. Wirsenius et al.(42) examined scenarios of enhanced food supply that minimized the use of land to include:

i. Faster growth in feed-to-food efficiency in animal food production.
ii. Decreased food wastage and
iii. Dietary changes with reduced meat demand.

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ABSTRACT NO.	TTLE OF ABSTRACTS	AUTHOR(S)
SC2020/UNC01	Capitalism, Climate Change & Environmental Resource Degradation& Management: Drivers, Impacts and Controls.	Prof. Francis E. Bisong
SC2020/UNC02	Sustainable Agriculture: A Nexus For Environmental Resources Management	Prof. E. C. Chuku,
SC2020/UNC03	Climate Change: Impacts On Sustainable Food Production Environmental And Human Resources	Prof. A. C. Amadioha
SC2020/UNC04	Influence Of Tillage Types And Potassium Fertilizer Application On Soil Properties And Yield Of White Yam *(Dioscorea Rotundata)* On An Ultisol Of South Eastern Nigeria	Udoh, Okon Edet, Uduak, Itakufok George and Jonah, Sifon Solomon
SC2020/UNC05	Household Food Insecurity Coping Strategies during Violent Conflict in Taraba State Nigeria	Chinweoke Uzoamaka Ike*[*], Uchua, T. Donald[1], and Chinasa Sylvia Onyenekwe[2]
SC2020/UNC06	Need For Youths Engagement In Cocoa Production In Nigeria: Challenges And Prospects	Odedele, S. O. and Oniah, M. O
SC2020/UNC07	Determination of some air pollutants and Meteorological parameters in abattoir, Ntak Inyang in Uyo L.G.A of Akwa Ibom State in Nigeria	Jonah, A. E.
SC2020/UNC08	Determinants Of Climate Change Adaptation Among Arable Crops Farmers In Akwa Ibom State, Nigeria	Nyong, Eteyen and Wenibo, Andrew
SC2020/UNC09	Analysis of the Satisfaction Level of Nigerian Crop Farmers under the Compensation Provisions of the Land Use Act	Israel Okechukwu Ogbonna, and Prof. Godfrey Okon Udo,
SC2020/UNC010	Comparative Studies on Microbial and Nutritional Analysis of Self Processed and Commercially Processed *Citrullus colocynthis* (egusi) Seeds	Emiri U. N. and Enaregha E. B.

43. Royal Society of London (2009) Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture. London: Royal Society.

44. FAO (2006) World Agriculture Towards 2030/2050. Rome: Food and Agriculture Organization.

45. Stehfest E, Bouwmann L, van Vuuren D. (2009) Climate benefits of changing diet. Clim Change 95, 83–102.

46. Willett WC (2001) Eat, Drink, and be Healthy: The Harvard Medical School Guide to Healthy Eating. New York: Simon& Schuster.

47. Popp A, Lotze-Campen H & Bodirsky B (2010) Food consumption, diet shifts and associated non-CO2 green house gases from agricultural production. Global Environ Change20, 451–462.

48. Gill M, Smith P & Wilkinson JM (2010) Mitigating climate change: the role of domestic livestock.Animal4, 323–333.

49. Macdiarmid J, Kyle J, Horgan G. (2011) Live well: A Balance of Healthy and Sustainable food Choices. London: WWF-UK. Available at http://assets.wwf.org.uk/downloads/livewell_report_jan11.pdf

50. Gustavsson J, Cederberg C, Sonesson U. (2011) Global Food Losses and Food Waste. Extent, Causes and Prevention. Rome: Food and Agriculture Organization. Available athttp://www.fao.org/docrep/014/mb060e/mb060e00.pdf

51 Pete Smith and Peter J. Gregory (2013) Climate change and sustainable food production Proceedings of the Nutrition Society (2013),72, 21–28.

They found that reduced meat demand could significantly reduce the demand for agricultural land (42). Projections of food demand, which include population changes and also changes in per-capita wealth, suggest that we will need 70–100 % more food by 2050 (43). Part of this increase in demand is driven by a greatly increased demand for livestock products (meat and dairy) in developing economies. Given that the conversion efficiency of plant to animal matter conversion is in the region of 10 % (1), and that about a third of the world's cereal production is fed to animals (44), a reduction in livestock product consumption could greatly reduce the need for more land. On average, the production of beef protein requires several times the amount of land and water than the production of vegetable proteins (45). While meat currently represents only 15 % of the total global human diet, approximately 80 % of the agricultural land is used for animal grazing or the production of feed and fodder for animals (44). Then what would happen if the global population ate less meat? Stehfest et al.(45) examined this question that under the most extreme scenario, where no animal products are consumed at all, adequate food production in 2050 could be achieved on less land than is currently used, allowing considerable forest regeneration, and reducing land-based GHG emissions to one-third in 2050. In addition to reducing pressure on agricultural land, a global transition to a low meat, healthy diet would significantly decrease GHG emissions (46, 47) and reduce the mitigation costs to achieve a stabilization target by about 50 % in 2050 (45). However, Gill et al.(48) showed that the situation is not quite so straightforward since there are large areas of land that are unsuitable for crop growth, and on these areas ruminant agriculture is the most effective way of converting non-human-edible food (grass) into human-edible food (meat and dairy products).

In addition to dietary changes, waste reduction is often cited as a demand-side option for reducing food security concerns (1,37,40). About 30–40 % of food in both developed and developing countries is currently wasted. In developing countries this is dominated by pre-consumer losses whereas in developed countries food waste is dominated by post-consumer losses. Globally, about 1.3 billion tonnes of food is wasted each year (49, 50). Therefore, reducing waste, especially from the most resource intensive food products (meat and dairy), could play a role in delivering food security (40) and reduce the need for sustainable intensification, since more of the food produced would be consumed. While waste reduction alone will not allow us to meet our 2050 food security goals, its contribution is of the same magnitude as the redistribution of nutrients and water to close the yield gap examined by Foley et al.(40). In terms of food security, Gustavsson et al. (50) concluded that because many small holder farmers in developing countries exist on the edge of food insecurity, a reduction in food losses in developing countries could have an immediate and significant impact on their livelihoods.

IMPACT OF CLIMATE CHANGE ON ENVIRONMENTAL AND HUMAN RESOURCES

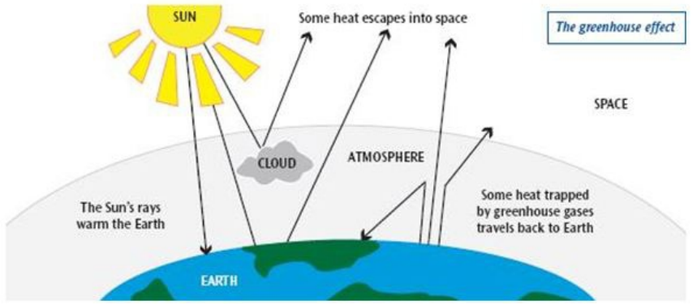

Fig. 2: The green house effect (Warming of the earth)

Climate change is the long-term change in climate and is usually used in the context of man-made climate change whereas the greenhouse effect is the term used to describe the warming of the Earth. If there were no greenhouse gases the Earth would be a frozen, lifeless ball in space, but too many gases make the planet warm up causing dangerous climate change.

Due to human activities such as burning fossil fuels and cutting down trees, greenhouse gases have increased and so increased the heat trapped in the atmosphere (Fig. 2). The main greenhouse gas is carbon dioxide (CO_2) which is caused by individuals, mostly from energy used in the home, industries, driving and air travel. The effects of climate change can be seen in Nigeria and around the world. Globally, extreme weather is predicted to become more common and to have a negative impact on humans, animals and plants. Climate change affects many aspects of our lives in Nigeria, our environment, business and public services. Scientists have identified some of the likely effects of this climate change in the following areas:

Temperatures

- It is likely that average temperatures in Nigeria will rise.
- Hotter temperatures will become more frequent and cold weather will become increasingly rare.

Rainfall

- The amount and frequency of rain will change.
- Wet season will be wetter and dry season will become hotter and more prolonged.
- There will be increased local flooding with more flash flooding occurring.
- This will result in increased pressure on water resources in the country.

Severe weather: Severe weather events are likely to increase, such as flooding, droughts and heat waves.

Rising sea levels: Sea levels could rise by the end of the century leading to further coastal erosion and flood risks.

Agriculture: Farming and crops will be affected by changes in weather throughout the world which could impact on the types of crop grown, where they are grown and their availability.

Wildlife

- Some birds, fish and land animals are under threat as their environment changes due to temperature changes. Some of these species will not be able to adapt to these changes in their environment and therefore die.
- The plants, trees and shrubs that can grow in Nigeria will change.

Health

- The food we eat and the water we drink will be affected by the climate.
- There will be a change in the types of heat and cold related illnesses. For example the risk of diseases such as skin cancers and heat stokes may increase.
- The elderly and very young will be most vulnerable to temperature changes.

Homes and lifestyle

- People may suffer water shortage, if drought occurs.
- The cost of living will increase, such as food, fuel and insurance.
- The home of people may be damaged by floods.
- Extreme weather may affect the work place, schools and transport links.

25. FAO (2009) State of Food Insecurity in the World 2009.Rome: Food and Agriculture Organization.

26. Nelson GC, Rosegrant MW, Koo J.(2009) Climate Change. Impact on Agriculture and Costs of Adaptation, Climate change and sustainable food production p. 19. Washington, DC: International Food Policy Research Institute, pp. 19.

27. Smith P & Olesen JE (2010) Synergies between mitigation of, and adaptation to, climate change in agriculture. J AgricSci148, 543–552.

28. Evans LT (1998) Feeding the Ten Billion: Plants and Population Growth. Cambridge: Cambridge University Press.

29. Vitousek PM, Naylor R, Crews T.(2009) Nutrient imbalances in agricultural development. Science 324, 1519–1520.

30. Myers RJK, Palm CA, Cuevas E. (1994) The synchronization of nutrient mineralization and plant nutrient demand. In The Biological Management of Tropical Soil Fertility, pp. 81–116 [PL Woomer and MJ Swift, editors]. Chichester: John Wiley & Sons.

31. Pimental D, Jurd LE, Bellotti AC.(1973) Food production and the energy crisis. Science 182, 443–449.

32. Spedding CRW & Walsingham JM (1976) The production and use of energy in agriculture. J Agric Econ. 27, 19–30.

33. Pimental D & Pimental MH (2008) Food, Energy and Society, 3rd ed., Boca Raton, FL: CRC Press.

34. Hoeppner JW, Entz MH, McConkey BG.(2005) Energy use and efficiency in two Canadian organic and conventional crop production systems. Renew Agric Food Syst. 21, 60–67.

35. Smith P (2012) Delivering food security without increasing pressure on land. Global Food Security (In the Press).

36. Tilman D, Balzer C, Hill J. (2011) Global food demand and the sustainable intensification of agriculture. . Proc Natl. Acad. Sci USA108, 20260–20264.

37. Foresight (2011) The Future of Food and Farming. Final Project Report. London: The Government Office for Science.

38. IAASTD (2008) International Assessment of Agricultural Knowledge, Science and Technology for Development: Executive Summary of the Synthesis Report. Available at http://www.agassessment.org/index.cfm?Page=About_IAASTD&ItemID=2.

39. Porter JR, Challinor A, Ewert F. (2010) Food security: focus on agriculture.Science328, 172–173.

40. Foley JA, Ramankutty N, Brauman KA. (2011) Solutions for a cultivated planet. Nature 478, 337–342.

41. Cassman KG, Dobermann A & Walters DT (2002) Agroecosystems, nitrogen-use efficiency, and nitrogen management.Ambio31, 132–140.

42. Wirsenius S, Azar C & Berndes G (2010) How much land is needed for global food production under scenarios of dietary changes and livestock productivity increases in 2030?AgricSyst103, 621–638.

Food supply
Severe changes in global climate are projected to affect livelihood systems and consequently food security. Changes in global climate have made droughts and floods become more frequent, occasioning loss of farm lands and agricultural products, livelihood, migration and insecurity (51). This has caused both resource degradation and environmental degradation leading to poor harvest and food insecurity.

CONCLUSION:
The scale of the problems of food security, reducing climate impact and providing resilience to future climate change, means that we are not in a position to choose between production- and consumption-based food production systems; we clearly need both. The more we manage demand for land-intensive food products, the less we need to intensify production. As Popp et al.(47) noted that, for GHG emission reduction potential in agriculture, the greatest reduction potentials are realized through a combination of technological and food consumption-based measures. The same combined approach is also likely to be most effective for addressing future food security. Many of the suggested solutions for delivering food security will also co-deliver on reducing GHG emissions in agriculture. Measures that increase food production but increase GHG emissions, such as the widespread use of additional N fertilizer that fuelled the Green Revolution in the past, will not be suitable for meeting the challenges of the future. Measures that improve the efficiency of agriculture (i.e maximize food outputs relative to agricultural inputs), or reduce demand for food products (i.e. dietary changes and reduced waste) will be beneficial for both food security and GHG emission reduction. These are the improvements that need to be made if we are to rise to the biggest challenge humanity will face in this 21st century.

REFERENCES

1. Godfray HCJ, Beddington JR, Crute IR (2010) Food Security: the challenge of feeding 9 billion people. Science 327, 812–818.

2. Smith P, Martino D, Cai Z. (2008) Greenhouse gas mitigation in agriculture. Phil Trans R Soc B363, 789–813.

3. Frenken K & Kiersch B (2011) Monitoring Agricultural Water Use at Country Level. Experiences of a Pilot Project in Benin and Ethiopia. FAO Land and Water Discussion Paper 9. Rome: Food and Agriculture Organization. Avail-able at http://www.fao.org/nr/water/docs/FAO_LW_Discussion _Paper_9.pdf.

4. FAO (2010) Final Document: International Scientific Symposium Biodiversity and Sustainable Diets: United Against Hunger, 3–5 November 2010. Rome: Food and Agriculture Organization.

5. WHO (2004) Global Strategy on Diet, Physical Activity and Health. Rome: World Health Organization. Available athttp://www.who.int/dietphysicalactivity/strategy/eb11344/en/index. html

6. Firbank L, Bradbury R, Jenkins A (2011) Enclosed farmland. In: UK National Ecosystem Assessment. Understanding Nature's Value to Society. Technical Report, pp. 197–239. Cambridge: UNEP-WCMC.

7. Bruinsma J (2003) World Agriculture: Towards 2015/2030, an FAO Perspective. London: Earthscan Publications.

8. Smith P, Gregory PJ, van Vuuren D .(2010) Com-petition for land. Phil Trans R Soc B365, 2941–2957.

9. Garnett T & Godfray C (2012) Sustainable Intensification in Agriculture. Navigating a Course through Competing Food System Priorities. Oxford, UK: Food Climate Research Net-work and the Oxford Martin Programme on the Future of Food, University of Oxford.

10. Ericksen PJ (2008) Conceptualizing food systems for global environmental change research. Global Environ Change18,234–245.

11. Rosegrant MW, Paisner M, Meijer S (2001) 2020 Global Food Outlook: Trends, Alternatives and Choices. Washington, DC: International Food Policy Research Institute.

12. Hazell P & Wood S (2008) Drivers of change in global agriculture. Phil Trans R Soc B363, 495–515.

13. von Braun J, Rosegrant MW, Pandya-Lorch R.(2005) New Risks and Opportunities for Food Security: Scenario Analyses for 2015 and 2050. Washington, DC: International Food Policy Research Institute.

14. Gregory,PJ, Ingram JSI & Brklacich. M. (2005) Climate change and food security. Phil Trans R Soc B360,2139–2148.

15. Ingram JSI, Gregory PJ & Izac A-M (2008) The role of agronomic research in climate change and food security policy. Agric Ecosyst Environ126, 4–12.

16. Bellarby J, Foereid B, Hastings A. (2008) Cool Farming: Climate Impacts of Agriculture and Mitigation Potential, p. 43. Amsterdam, NL: Greenpeace International.

17. Smith P, Martino D, Cai Z. (2007a) Agriculture. In Climate change 2007: Mitigation. Contribution of Working group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 497–540 [B Metz, OR Davidson, PR Bosch, R Dave and LA Meyer, editors], Cambridge, UK/New York, NY, USA: Cambridge University Press.

18. Smith P, Martino D, Cai Z.(2007b) Policy and technological constraints to implementation of greenhouse gas mitigation options in agriculture. Agric Ecosyst Environ118,6–28.

19. FAO (2002) World Agriculture: Towards 2015/2030. Rome: Food and Agriculture Organization.

20. Mosier A & Kroeze, C (2000) Potential impact on the global atmospheric N2O budget of the increased nitrogen input required to meet future global food demands. Chemosphere-Global Change Sci2, 465–473.

21. US-EPA (2006) Global Anthropogenic non-CO2 Green house Gas Emissions: 1990–2020. EPA 430-R-06-005.Washington, DC: United States Environmental Protection Agency.

22. Wang B, Neue H & Samonte H (1997) Effect of cultivar difference on methane emissions. Agric Ecosyst Environ62, 31–40.

23. Smith P (2008) Land use change and soil organic carbon dynamics. Nutr Cycl Agroecosyst81, 169–178.

24. Smith P (2012) Agricultural greenhouse gas mitigation potential globally, in Europe and in the UK: what have we learned in the last 20 years? Global Change Biol18, 35–43.