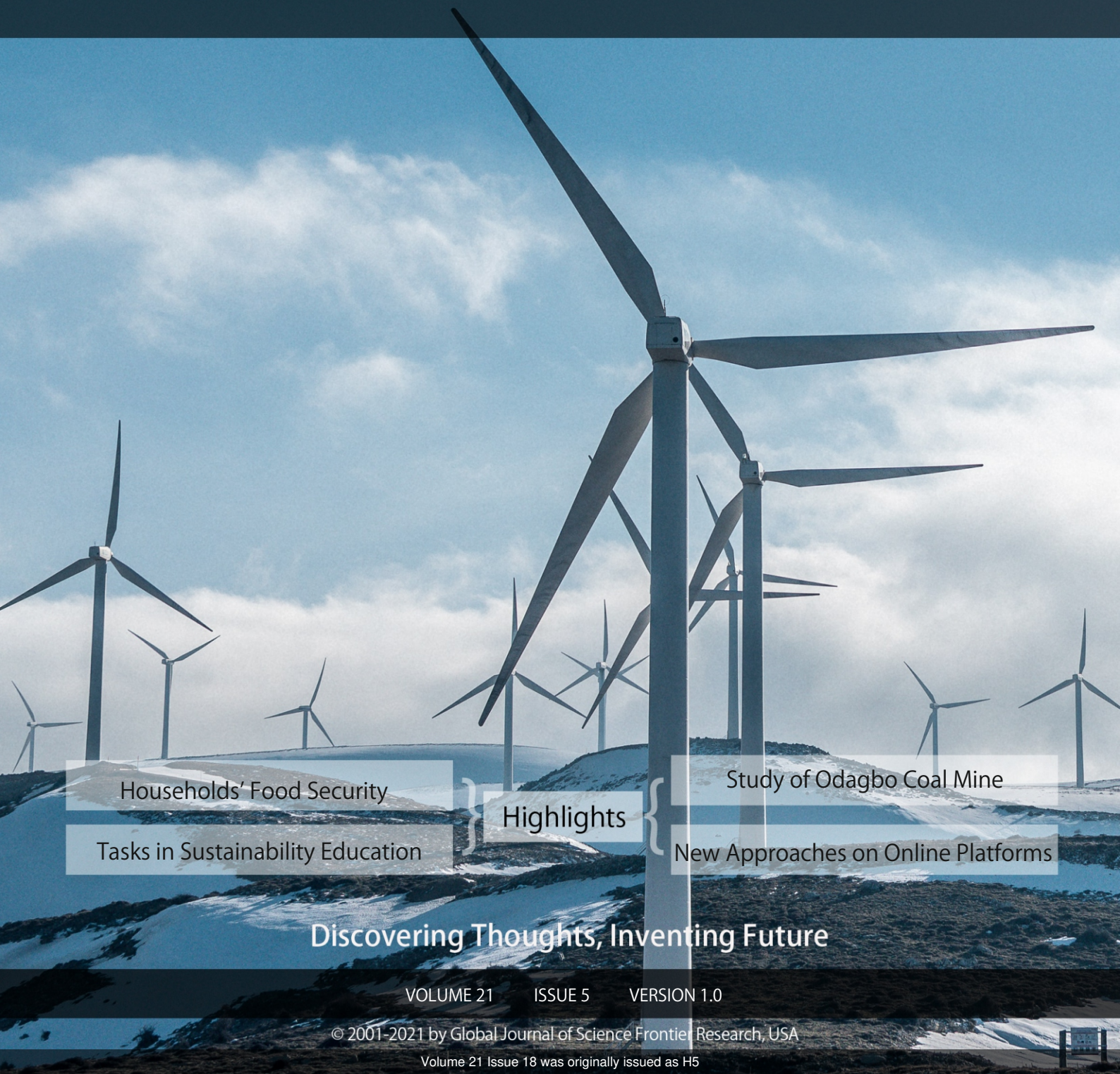
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Households' Food Security

Tasks in Sustainability Education

Highlights

Study of Odagbo Coal Mine

New Approaches on Online Platforms

Discovering Thoughts, Inventing Future

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Toward Better Tasks in Sustainability Education: Search for New Approaches on Online Platforms

By Katja N. Andersen

Université du Luxembourg

Abstract- The O-TAPSE study deals with the question to what extent the sustainable development goals (SDGs) formulated by the UN (2015) are addressed in the latest online tasks for primary science education. The tasks of three online platforms were evaluated by four primary school teachers with regard to the occurrence of content on the SDGs. The results of the study and their analysis show a clear need for action to further implement these contents in online tasks.

Keywords: sustainability education, task development, primary science education, sustainable development goals.

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Katja N. Andersen

Abstract- The O-TAPSE study deals with the question to what extent the sustainable development goals (SDGs) formulated by the UN (2015) are addressed in the latest online tasks for primary science education. The tasks of three online platforms were evaluated by four primary school teachers with regard to the occurrence of content on the SDGs. The results of the study and their analysis show a clear need for action to further implement these contents in online tasks.

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I. Introduction

Sustainability education has become an important topic in the educational sciences since the 2009 Bonn Declaration at the latest. On the subject of sustainability education, individual studies have been carried out, which deal with the representation of this topic in primary schools (cf. Andersen, 2018; Hus, 2013; Jones et al., 2012; Lloyd & Gray, 2014). The question regarding the representation of contents to sustainable development in textbooks has been pursued by the TAPSE study using the example of Luxembourgish primary school (see Andersen, 2018). Following on from the demands of the 2009 Bonn Declaration (UNESCO, 2009), the 2012 Report on the UN Decade of Education for Sustainable Development (UNESCO, 2012) and the Global Education Monitoring Report (UNESCO, 2016), the TAPSE study could show that there is still considerable unrealized potential with regards implementing environmental issues in Luxembourgish primary science textbooks and the need to anchor content on sustainability education more explicitly (Andersen, 2018). After new tasks in primary science education have recently been developed in online formats (e.g., bbb, 2020; DIPF, 2021; HKM, 2020; Maué, Schönheit & Trauth, 2019), the question arises, to what extent the new tasks stimulate the engagement with content on sustainable development. Considering that in 2015 the 2030 Agenda for Sustainable Development (UN, 2015) set new targets for the next 15 years, today, after the first third of the period, it is necessary to ask which of these targets have been anchored in the newly developed primary science tasks. The O-TAPSE study (Online Tasks in Primary Science Education) addresses this question in a multi-stage process.

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II. Theoretical Framework: Theories of Sustainable Development

Understanding theories of sustainable development is the key to reflecting on the concept behind the 2030 Agenda for Sustainable Development. Enders and Remig (2016) claim that sustainable development cannot only been viewed as "the establishment of a permanent, globally practicable and future-capable mode of life and economics, but as a complex array of problems involving a wide range of social-scientific and humanistic disciplines". Taking such a wide view of sustainable development as a starting point, the O-TAPSE study follows on from a theoretical approach that overlaps the established academic boundaries. It views the concept of development according to Todaro and Smith (2006) as a multi-faceted process, implying reduction of inequality, economic growth, eradication of absolute poverty as well as changes in social structures, attitudes, and institutions. With reference to the concept of sustainability according to Stoddart (2011), the O-TAPSE study is based on a definition that encompasses the equitable and efficient distribution of resources within and between generations and within the limits of a finite ecosystem. Based on a systematic literature analysis, Mensah (2019) comes to the conclusion that sustainable development is a core concept of the global development policy and agenda. According to Mensah (2019) and based on the findings of Browning and Rigolon (2019), sustainable development can be defined as a development paradigm and a concept that calls for improving living standards without endangering the earth's ecosystems or causing environmental problems such as deforestation or water and air pollution that can lead to problems such as species extinction or climate change.

In the 2030 universal Agenda for Sustainable Development (UN, 2015), 17 Sustainable Development Goals (SDGs) and 169 targets were anchored, which aim at stimulating action over the next 15 years in areas of critical importance for humanity and the planet. This includes the five areas (a) people, (b) planet, (c) prosperity, (d) peace, and (e) partnership (UN, 2015, p. 2). The area, which is entitled *people*, aims to end poverty and hunger, ensuring that all people are able to fulfil their potential with equal rights and in a healthy environment. The second area focuses on protecting the

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planet from degradation, including sustainable consumption and production, sustainable management of its natural resources, and urgent action against climate change to meet the needs of present and future generations. The area *prosperity* aims to enable all people to lead a fulfilling life and to achieve economic, social and technological progress in harmony with nature. *Peace* is the fourth area of the SDGs and involves promoting peaceful and inclusive societies free from fear and violence. The final area, *partnership*, aims to mobilize the resources needed to implement the above mentioned objectives in the context of a global partnership for sustainable development, based on a spirit of increased global solidarity, focusing in particular on the needs of the poorest and most vulnerable and involving all countries, stakeholders and people (see for detail UN, 2015).

The O-TAPSE criteria catalogue (Fig. 1) follows on from the above mentioned five fields of action with the corresponding 17 SDGs, which are defined by the UN (2015) as follows: (a) no poverty; (b) no hunger; (c) good health and well-being; (d) quality education; (e) gender equality; (f) clean water and sanitation; (g) affordable and clean energy; (h) decent work and economic growth; (i) industry, innovation and infrastructure; (j) reduced inequalities; (k) sustainable cities and communities; (l) responsible consumption and production; (m) climate action; (n) life below water; (o) life on land; (p) peace, justice and strong institution; and (q) partnerships for the goals. For the compilation of the O-TAPSE criteria catalogue, these SDGs and the 169 associated targets build the foundation to develop higher categories and assign analysis criteria to them (see Fig. 1).

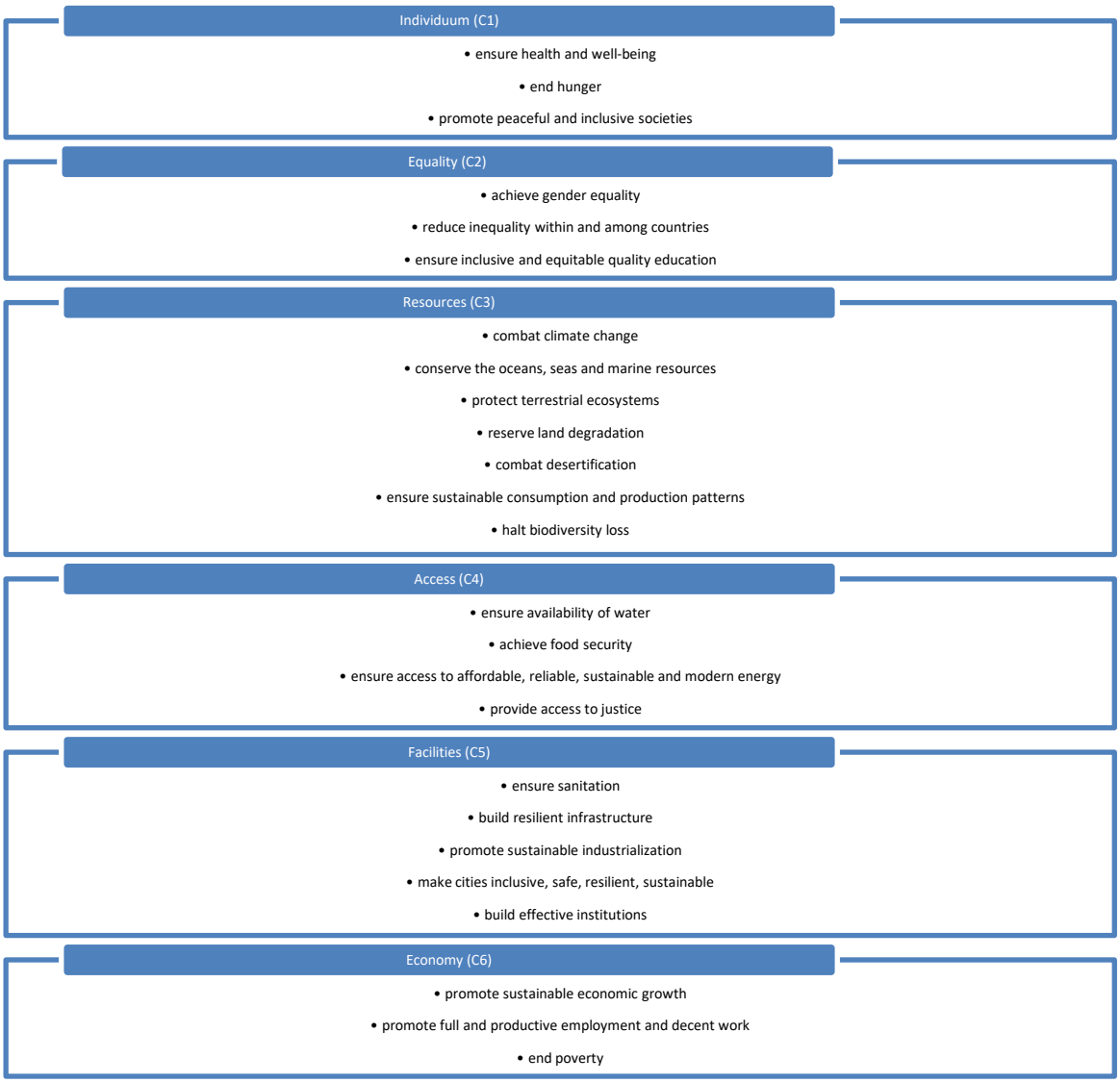


Fig. 1: O-TAPSE criteria catalogue with focus on sustainable development (developed on the basis of UN, 2015)

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III. Methodology and Questions of the Study

Based on such an understanding of sustainable development and its goals, the O-TAPSE study investigates the potentials of newly developed online tasks for activating learning in the context of sustainable development. The study is divided into three research steps (Fig. 2). In Step 1, three websites for primary school learning and teaching were selected, aiming to identify websites that have uploaded new primary science tasks over the last year. As Luxembourg and Germany – both teaching in the German language at primary schools – use similar or identical textbooks and tasks, websites were chosen that are used by both countries. This is to meet the demand set out in the 2030 agenda to consider the SDGs from a global perspective (UN, 2015).

In Step 2, all tasks on the selected websites were analyzed with regard to the appearance of contents related to sustainable development. The analysis of the tasks is based on the O-TAPSE criteria catalogue to ensure that the extensive quota of 17 SDGs and 169 targets as outlined by the UN (2015) are sufficiently taken into account without overburdening the evaluators. Therefore, the criteria catalogue with six core criteria (C1-C6; see Fig. 1) was developed against the background to compress the extensive 17 SDGs and 169 targets. The overarching objective of the analysis is to investigate the question, in which form the contents of sustainable development as listed in C1 to C6 become visible in tasks of the selected three online platforms. Four primary school teachers, two from Luxembourg and two from Germany, are included in the evaluation, all of whom have more than 10 years of experience in teaching science subjects. Within the group of teachers, the tasks are discussed with regard to the occurrence of criteria C1 to C6. In concrete terms, the evaluator group decides whether the sub-items defined in C1 to C6 are related to sustainability education (a) explicitly, (b) implicitly, or (c) do not address such content. In this context, the term "implicit" refers to potentials for tackling sustainable development contents, which, however, have to be activated by additional inputs from the teacher. In Step 2, it is indicated by the evaluators within the criteria catalogue which of the criteria and their sub-items occur in each task.

In Step 3, the evaluators comment on the sub-items that were identified in Step 2 as having potentials to activate sustainability education or as addressing it explicitly. The comments of the evaluators were written on the evaluation sheet next to the identified sub-items. The analysis was carried out on the basis of the O-TAPSE evaluation forms completed by the evaluators. All tasks of the three online platforms were compared in terms of which contents of the SDGs were addressed from the evaluators' point of view and whether these contents were perceived as implicitly or explicitly addressed.

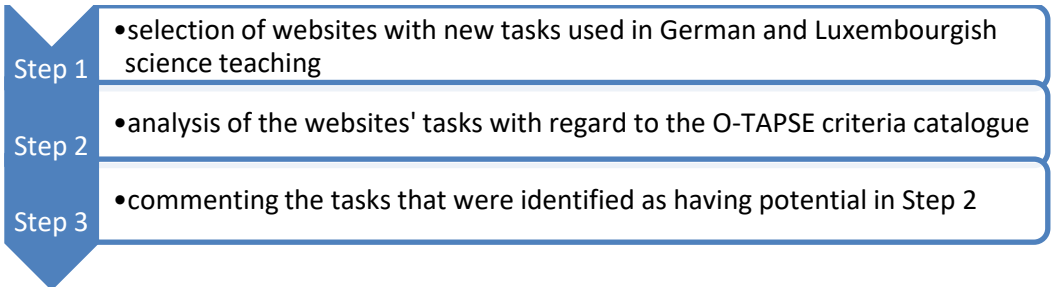


Fig. 2: O-TAPSE research design

IV. Findings: The Occurrence of Contents of Sustainable Development in Online Tasks

The evaluators selected the online platforms "Lernspiele zu den Themen Mathematik, Natur, Naturwissenschaft und Technik" (learning games on the topics of mathematics, nature, science and technology; HKM, 2020), "Kostenlose Lernspiele für die Grundschule und die Sekundarstufe I und II" (free learning games for primary schools and secondary schools I and II; DIPF, 2021) and "Materialkompass: Unterrichtsmaterialien auf dem Bildungsserver Berlin-Brandenburg" (material compass: teaching materials on the education server Berlin-Brandenburg; bbb, 2020) because they perceive these platforms as always up-to-date and often use them to extract tasks for their teaching. The group discussion has shown that contents of sustainable development could be identified in individual tasks on all three platforms. The criteria individuum (C1) and resources (C3) were identified most often, although this was almost only implicitly the case. Content of other categories (access, C4; facilities, C5) was detected less frequently and categories C2 (equality) and C6 (economy) were almost not detected at all. In the vast majority of tasks from the three online portals, however, no potentials for activating sustainability education were identified. At the same time, only very isolated tasks were identified by the evaluators that explicitly address

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contents of sustainable development. One of these tasks, explicitly addressing sustainability education, is presented below in detail in its evaluation by the evaluators.

Explicit potential for activating sustainability education was identified in the task "Unterschiedliche Energieformen" (different forms of energy; DIPF, 2021), which consists of six worksheets. Sheets 1 and 2 provide information on the various forms of energy. Seven forms of energy are presented on the basis of short descriptions. These are: "movement energy", "positional energy", "chemical energy", "radiation energy", "heat energy", "electrical energy" and "nuclear energy" (translation by author). Each form of energy is explained using examples. Sheet 3 contains six pictures showing the mentioned forms of energy (except nuclear energy); for example, a reservoir with a dam and solar cells on a roof are presented. Below the pictures are shown lines on which the corresponding energy form should be written. On Sheets 4 to 6, the cards of a memory game are depicted. Sheets 4 and 5 contain 12 picture cards that exemplify everyday applications of energy forms (e.g. windmill, cyclists riding on the road, a ski jumper at the starting position of a ski jumping hill, a plate with boiled spaghetti). Sheet 6 shows word cards with the terms "movement energy", "positional energy", "chemical energy", "radiation energy", "electrical energy" and "nuclear energy". The heat energy introduced on Sheet 2 is not found on the word cards. In the task, it is formulated that three matching cards are to be found, for each triple two pictures and a word card (e.g. picture of a windmill plus picture of two cyclists plus word card "movement energy").

In the framework of the group discussion, the evaluators rated this task as "not addressed" in relation to 22 of the total 25 sub-items. The evaluators rated two sub-items as having "potential to be addressed through additional input" and one sub-item they saw "explicitly addressed" (see Fig. 3). The two sub-items that were rated as implicitly addressed are distributed among the criteria C3 (resources) and C4 (access). The identified sub-item of category C3 refers to the content "combat climate change" and was commented by the evaluators with the addition "addressed by differentiating between renewable and non-renewable energy sources". This sub-item was rated by the evaluators as implicitly addressed. The two sub-items identified from the category access (C4) were, firstly, the content "ensure availability of water", commented by the evaluators with the addition "addressing hydropower and the kinetic energy of flowing water", which was rated as implicitly addressed in the task. Secondly, from the same category, the content "ensure access to affordable, reliable, sustainable and modern energy" was assessed as explicitly addressed, commented by the evaluators with the addition "differentiating between renewable and non-renewable energy sources and associated forms of useful energy". The overall overview results in the following findings related to the task "different forms of energy" (Fig. 3).

	not addressed	implicitly addressed	explicitly addressed
Individuum (C1)	• ensure health and well-being; • end hunger; • promote peaceful and inclusive societies		
Equality (C2)	• achieve gender equality; • reduce inequality within and among countries; • ensure inclusive and equitable quality education		
Resources (C3)	• conserve the oceans, seas and marine resources; • protect terrestrial ecosystems; • reserve land degradation; • combat desertification; • ensure sustainable consumption and production patterns; • halt biodiversity loss	• combat climate change (addressed by differentiating between renewable and non-renewable energy sources)	
Access (C4)	• achieve food security; • provide access to justice	• ensure availability of water (by addressing hydropower and the kinetic energy of flowing water)	• ensure access to affordable, reliable, sustainable and modern energy (by differentiating between renewable and

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			non-renewable energy sources and associated forms of useful energy)
Facilities (C5)	• ensure sanitation; • build resilient infrastructure; • promote sustainable industrialization; • make cities inclusive, safe, resilient, sustainable; • build effective institutions		
Economy (C6)	• promote sustainable economic growth; • promote full and productive employment and decent work; • end poverty		

Fig. 3: Evaluation of task example "different forms of energy" based on the O-TAPSE criteria catalogue

V. Discussion and Conclusion

The results of the O-TAPSE study show that there is still a great potential to anchor the SDGs in online tasks for primary school students. This is confirmed by previous studies, which found a deficient implementation of tasks to sustainability education for the field of textbooks of the subject primary science education (Andersen, 2018).The results of the O-TAPSE study give cause for urgent action, since the study used the latest tasks as analytical material and yet the SDGs were not prominently addressed, especially not in the explicit sense. There is cause for concern that the SDGs are not touched at all in the context of the majority of the tasks and, in relation to the tasks in which the SDGs are reflected, almost only in an implicit sense, so that the competence of the teaching staff is needed to actually activate a reflection on the SDGs in class. This shows that the SDGs are still under-represented in primary education tasks, as they are not touched at all in the context of the majority of newly developed online tasks and almost only implicitly in the tasks in which the SDGs shine through. Thus, it requires the competence of the teacher to actually activate a reflection on the SDGs among the students. The conclusion is that the SDGs are still not sufficiently included in the development of tasks in primary science education and that this should be more taken into account in future task profiles, especially in explicit addressing, so that SDG contents are reflected by the pupils independently of the competence of the teacher.

Literature

1. Andersen, K. N. (2018). Evaluation of school tasks in the light of sustainability education: textbook research in science education in Luxembourgish primary schools. Environmental Education Research, 24(9), 1301–1319.
2. Bildungsserver Berlin-Brandenburg (bbb) (2020). Materialkompass: Unterrichtsmaterialien auf dem Bildungsserver Berlin-Brandenburg. https://bildungsserver.berlin-brandenburg.de/sachunterricht.
3. Browning, M., & Rigolon, A. (2019). School green space and its impact on academic performance: A systematic literature review. International Journal of Environmental Research and Public Health, 16(3), 429.
4. Deutsches Institut für Internationale Pädagogische Forschung (DIPF) (2021). Kostenlose Lernspiele für die Grundschule und die Sekundarstufe I und II. Published on Deutscher Bildungsserver on 10.02.2021. https://www.bildungsserver.de/Spiel-Spass-und-Spannung-12511-de.html.
5. Enders, J. C., & Remig, M. (2016). Theories of Sustainable Development. London/New York: Routledge.
6. Hessisches Kultusministerium (HKM) (2020). Lernspiele zu den Themen Mathematik, Natur, Naturwissenschaft und Technik. https://lernarchiv.bildung.hessen.de/grundschule/spiel_logik/lernspiele/index.html.
7. Hus, V. (2013). "How Teachers Evaluate the Environmental Studies Subject Textbook Sets." Education and Science 38(167), 289–299.
8. Jones, M., Dailami, N., Weitkamp, E., Salmon, D., Kimberlee, R., Morley, A., & Orme, J. (2012). Food sustainability education as a route to healthier eating: evaluation of a multi-component school programme in English primary schools. Health Education Research, 27 (3), 448–458.
9. Lloyd, A., & Gray, T. (2014). Place-based outdoor learning and environmental sustainability within Australian Primary Schools. Journal of Sustainability Education, September 2014.

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10. Maué, B., Schönheit, E., & Trauth, J. (2019). Unterrichtsmaterialien Papier: von Natur bis Kultur. Forum Ökologie & Papier/Papier & Ökologie e.V.
11. Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review, Cogent Social Sciences, 5(1), 1653531.
12. Stoddart, H., Schneeberger, K., Dodds, F., Shaw, A., Bottero, M., Cornforth, J., & White, R. (2011). A pocket guide to sustainable development governance. Stakeholder Forum 2011.
13. Todaro, M. P., & Smith, S. C. (2006). Economic development. Reading: Addison-Wesley.
14. United Nations (UN) (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015. https://unece.org/DAM/trans/roadsafe/docs/A-70-260e.pdf.
15. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2016). Global Education Monitoring Report. Education for People and Planet: Creating Sustainable Futures for All. Paris: UNESCO.
16. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2012). Shaping the Education of Tomorrow: 2012 Report on the UN Decade of Education for Sustainable Development, Abridged. Paris: UNESCO.
17. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2009). Bonn Declaration. Bonn: UNESCO.

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An Overview of Artisanal Coal Mining and its Impacts on the Environment: A Case Study of Odagbo Coal Mine, North Central Nigeria

By Momoh, A, Odewumi, S. C, Abalaka, I. E., Ojonimi, I. T, Diyelmak, V, Adamu, M. S, Daku, S. S. & Aminu, M. D

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Abstract- Mining as an activity is crucial for economic growth in most countries of the world, but issues of environmental concern are poorly managed by artisanal miners. Artisanal mining is a means of sustaining livelihood that is usually characterized by exploitation of marginal deposits, a very low degree of mechanization, low level of occupational safety and in very dangerous conditions. The objective of this study was to assess the environmental impacts of coal mining at Odagbo and suggestion of useful measures at dealing with these problems for sustainable environmental management. A literature review, field investigations and stakeholder's consultations were used for this study. The environmental problems that were identified are incidence of acid mine drainage (AMD), deforestation, scarification of the entire landscape and decline in agricultural production.

Keywords: *artisanal mining, acid mine drainage, deforestation, scarification, odagbo.*

GJSFR-H Classification: *FOR Code: 040399*



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Momoh, A [α], Odewumi, S. C [σ], Abalaka, I. E. [ρ], Ojonimi, I. T [ω], Diyelmak, V [¥], Adamu, M. S [§], Daku, S. S. [χ] & Aminu, M. D [v]

Abstract- Mining as an activity is crucial for economic growth in most countries of the world, but issues of environmental concern are poorly managed by artisanal miners. Artisanal mining is a means of sustaining livelihood that is usually characterized by exploitation of marginal deposits, a very low degree of mechanization, low level of occupational safety and in very dangerous conditions. The objective of this study was to assess the environmental impacts of coal mining at Odagbo and suggestion of useful measures at dealing with these problems for sustainable environmental management. A literature review, field investigations and stakeholder's consultations were used for this study. The environmental problems that were identified are incidence of acid mine drainage (AMD), deforestation, scarification of the entire landscape and decline in agricultural production. This study recommends that government should implement the mining laws that will ensure sustainable development of the artisanal mining sector in Nigeria for the overall growth of the economy and protection of the environment. Also, artisanal miners should be trained to acquire competencies in sustainable mining techniques in order to mitigate these environmental problems. Further, government should consider allocating some mining leases for artisanal mining activities. These will reduce haphazard destruction of the forest in search for productive coal deposit. Coal mining should be carried out with minimal impacts on the environment and steps should be taken to reclaim degraded land by afforestation projects and back filling of exposed land with the overburden.

Keywords: artisanal mining, acid mine drainage, deforestation, scarification, odagbo.

I. Introduction

Mining is an activity that separate useful ore from waste rocks which often impacts the local geological and ecological environment. Research has shown that about 20 million small scale and artisanal miners are in operation across 30 countries of the world (Que et al. 2018; Ericsson 2011). Proceeds from mining are used for construction of infrastructures such as roads, schools and hospitals for the human populace (UNECA 2004).

Coal was discovered in Nigeria in 1909 but exploitation, development and mining started in 1950 when Nigeria Coal Corporation (NCC) was established (MMSD 2014). Nigeria's Federal Government effort at diversifying her economy from a mono economy of oil and gas to exploitation of her abundant solid minerals and agriculture has led to an upsurge in the mining of coal for generation of electricity and export to other countries of the world. Coal is being mined by artisanal miners on a small scale alongside with large scale mining firms such as Dangote Industries, Eta Zuma Nigeria Limited and Weco Nigeria Limited.

Odagbo coal deposit was estimated at about 100 million tones, a paltry of this amount was mined by NCC for rail project and very few tonnages were exported to foreign countries (MMSD 2014). The Odagbo coal mine was abandoned for several years until NCC entered into a production sharing agreement with Nordic Industries Limited and they succeeded in producing 2, 712 tonnes of coal from the mine in 2001 (MMSD 2014).

Till date, total amount of coal that was mined by artisanal miners are not known as they lack basic skills of keeping adequate records of production. Odagbo coal is of sub-bituminous grade which could be used for boiler fuel, production of high calorific gas, domestic heating and production of chemicals such as waxes, resins and dyes (MMSD 2014).

Nigeria's power generating capacity is in the range of about 7000 MW which is far below the country's demand of 30,000 MW. The power output could not sustain most industrial plants in Nigeria hence most cement producing companies in Nigeria notably, Lafarge Cement PLC, Dangote Cement PLC, Sokoto Cement PLC and Ashaka Cement Limited have developed coal- fired power plants to generate electricity for their operations. With these initiatives, artisanal miners were exploiting the abundant coal deposits at Odagbo and other adjoining communities for the supply of coal to these cement companies and export to China, Vietnam and other Asian countries. As the demand for coal to meet the energy requirements of

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these cement plants increases, so also is the destruction of the entire landscape where coal are being mined from.

Artisanal mining is a poverty driven activity which is practiced by poorly educated populace with few employment alternatives (Funoh 2014). It is characterized by a very low level of occupational safety, reduced degree of mechanization (Fig. 1), low level of income and without cognizance of environmental issues from mining operations (World Bank Group 2005; Hentschel et al. 2002).

The objective of this study was to assess the impacts of artisanal coal mining on the environment within Odagbo enclave and to suggest useful strategies that will entrench sustainable environmental management practices.

II. Research Methodology

The data for this study were acquired through a thorough review of documentation from existing reports, a literature review of books, articles and laws relating to mining in Nigeria. Field visits to Odagbo coal mining sites were conducted in March 2019 for visual observation and Focus Group Discussions were organized with artisanal miners on their perceptions and views on impacts of artisanal coal mining on the environment.

III. Geology and Coal Mineralization

Odagbo is situated between latitudes 7° 28′ 30″ N and 7° 29′ 00″ and longitudes 7° 43′30″ E and 7° 44′ 0″ in north central Nigeria (Fig. 2). It has a landmass of about 6 km^2.

The area is a typical example of scarp and valley topography (Momoh, et al. 2017). The soils in the area are loamy and sandy soils, they were derived from Ajali sandstones (Emmanuel 2015). The mean annual temperature is 27° C and annual precipitation is between 1,100 mm and 1,300 mm (Emmanuel 2015). The major land use of the area is farming. Inhabitants of the area and some miners are engaged in the cultivation of cassava, yams, maize, groundnuts and plantain.

The Odagbo coal deposit lies in the Lower Benue Trough, the stratigraphic succession was underlined by Albian Asu River Group (Fig.3).

The Asu River Group is made up of shales, limestones and thin lenses of sandstones (Ameh, 2013). Overlying the Asu River Group is the Turonian Nkalagu Formation, which consists of black shales, limestones and siltstones. The Campanian Nkporo Formation which is predominantly marine shales rests on the Nkalagu Formation. Overlying the Nkporo formation is the Maastrichtian Mamu Formation. The Mamu Formation is often referred to as Lower coal Measures of the Anambra Sedimentary Basin of south eastern Nigeria (Obianuju 2005). The Mamu Formation is made up of shale, carbonaceous shale, sandstones and mudstones with coal at many levels in Mamu Formation (Nwajide 2013). Resting on top of the Mamu Formation is the Ajali Formation which is made up of friable sandstone (Orajaka et al. 1999).

IV. Artisanal Coal Mining Methods

Two mining methods are being used by the artisanal miners for the exploitation of Odagbo coal deposits. Open cast mining (Fig.4). This is a surface mining method of extracting coal from the seam by removing the overburden with an excavator.

Open cast mining method was adopted in areas where the overburden is thin. This method of mining changes the geological and hydrological conditions of the area. Streams are diverted from their normal courses to different routes and this diversion changes the landscape of the entire area. The overburden that was removed is used to build dams around the pits to prevent water from flowing into the mine. The mined coals are carried in sacks to suitable location before they will be loaded into trucks for transportation to designated buyers.

Another form of mining in the area is Lotto mining method (Fig. 5). It is a form of subsurface mining that involves the use of hoe, shovels and diggers to dig holes of several metres into the subsurface layer pending when the artisanal miner will strike the coal seam.

On striking the coal seam, the coal are shoveled into sacks and carried up to the surface by the miners on their head to a loading point (Fig. 6). The miners carry torch and hurricane lamps to illuminate their work places. Pumps are occasionally sent underground to get rid of groundwater in order to prevent flooding of the mining hole.

This form of mining is characterized by low productivity, lack of capital, poor technology and miners work in a very hazardous condition as there are no support pillars to protect the hole from caving in (Emel et al. 2011). The mining holes are uncovered and these can form death traps to man and animals.

V. Impacts of Artisanal Coal Mining on the Environment

Physical, chemical and biological changes in the environment result from mining operations. These are scarification of the landscape, decline in agricultural production, biodiversity and ecosystem loss, deforestation, water and soil pollution (Mishra 2005).

VI. Scarification of the Entire Landscape

Miners excavate large portion of the landscape to extract coal from the seam. Waste matter (Spoils and overburden) were deposited on the edges of the open pit mines (Fig. 7). The spoils and overburden were

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transported downstream and these could have adverse effects on the aquatic habitat because of increased sedimentation and turbidity of the river within the area.

These pits measured up to 50 x 20 m and about 100m deep. Some of the open pit mines that were abandoned are now filled with water. The abandoned mine pits are death traps to cattle, sheep and goats in the area. Research has shown that these ponds were enriched in Pb, As, Hg and U (Momoh et al. 2017).

VII. Decline in Agricultural Production

Most farmers whose farmlands were close to the mines have abandoned agricultural activities because the artisanal miners have taken over quite a large chunk of their arable farmland. Those farmers that are still in the business, acid mine drainage from the mines drains onto their farms, resulting in deterioration of soil quality which significantly reduced agricultural produce from such farmlands (Fig.8). Goats, cattle's and sheep's that normally graze on these lands were malnourished because the grasses which they feed on are very scanty in the area.

Inadequate land for farming activities has significantly reduced the quality of agricultural produce from the area.

VIII. Deforestation and Biodiversity Loss

Odagbo is a densely rain forested area, but around the mines, no single tree was found in the entire area. Miners deliberately cut down the forest to have a very large mining area. The artisanal coal mining also gave room to logging business in the area. Most of the trees that were cut down by the miners are transported to major cities and sold in timber markets. The open cast mining and cutting of trees in the area has exposed the area to landslides and soil erosion. These environmental problems have led to the collapse of the trees within the vicinity of the mines. Several species of grass and herbs were noticed in areas that are very far from the mining fields. However, biodiversity in the mining area were found to be very low or completely absent.

IX. Diversion and Surface Water Pollution

Rivers that run through the mining fields were diverted from their original courses to pave way for mining. Mine tailings and mine spoils were deposited on the fringes of these rivers and leachates from these tailings drains into these rivers. Huge quantities of over burden were left on the banks of these rivers. These overburden were transported down the river courses and these leads to sedimentation of the rivers, this could adversely affect the aquatic habitat in the area. Also, acid mine drainage was observed to have drained from the mining pits into the river channel. This will decrease the pH load of the rivers and it will affect human life as most of the villagers that lives downstream the river courses use this river for their domestic activities.

X. Strategies for Sustainable Mining

Mining is sustainable when it is conducted in a manner that it balances economic, environmental and social considerations (Lawrence 2005) In view of this, a concerted effort should be made by all stakeholders in the allocation of mineable lands, regularization and training of artisanal miners in order to make artisanal mining a tool for sustainable development.

Sections 90 and 91 of the Nigerian Minerals and Mining Act, 2007 clearly spelt out that extension services and training should be provided by Directorate of Mines to artisanal miners in Nigeria. The government should enforce and implement these regulations by training artisanal miners in the management of wastes and disposal of tailings from mining activities. Also, the newly established Solid Minerals Development Fund should assist the artisanal miners to acquire improved tools and equipment for coal mining and protection of the environment.

Donor agencies and International Organizations such as World Bank, Department for International Development (DFID), United Nations Industrial Development Organization (UNIDO) and United States Agency for International Development (USAID) should assist in the area of technological transfer and proffers solution to sustainable development in small scale mining sector of Nigeria's economy.

Artisanal miners should as a matter of policy immediately embark on reclamation of pits after mining is completed, so that mined out pits do not serve as death traps for livestock and breeding grounds for mosquitoes in the area.

Academic institutions in Nigeria should improve miner's livelihood by teaching sustainable mining techniques to mitigate the adverse impacts of coal mining on the environment. Also, they should be able to design appropriate technology in the mining of coal and finding solutions to the problems of achieving sustainable coal mining in Nigeria.

XI. Conclusion

Coal mining has significantly impacted the environment, the observed impacts in this community are deforestation of the landscape, decline in agricultural production, scarification of the landscape and incidence of acid mine drainage. These impacts could be reduced by applications of appropriate mining techniques. Accumulation of large mine spoils and overburden can be avoided by returning these wastes to the excavation when mining ceases. An eco-park project could be embarked upon by the locals and artisanal miners alongside with coal mining by planting economic

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trees such as palm trees and fruit bearing trees in the area. The newly established Artisanal Mining Directorate of the Ministry of Mines and Steel Development should teach Artisanal Miners sustainable mining techniques, this will mitigate the adverse impacts of mining on the environment and they should give them technical assistance by carrying prospection and allocation of specific areas for artisanal mining activities for the overall sustainable development of abundant coal deposits in Nigeria.



Fig. 1: An Artisanal Miner using a digger to excavate a Coal Seam

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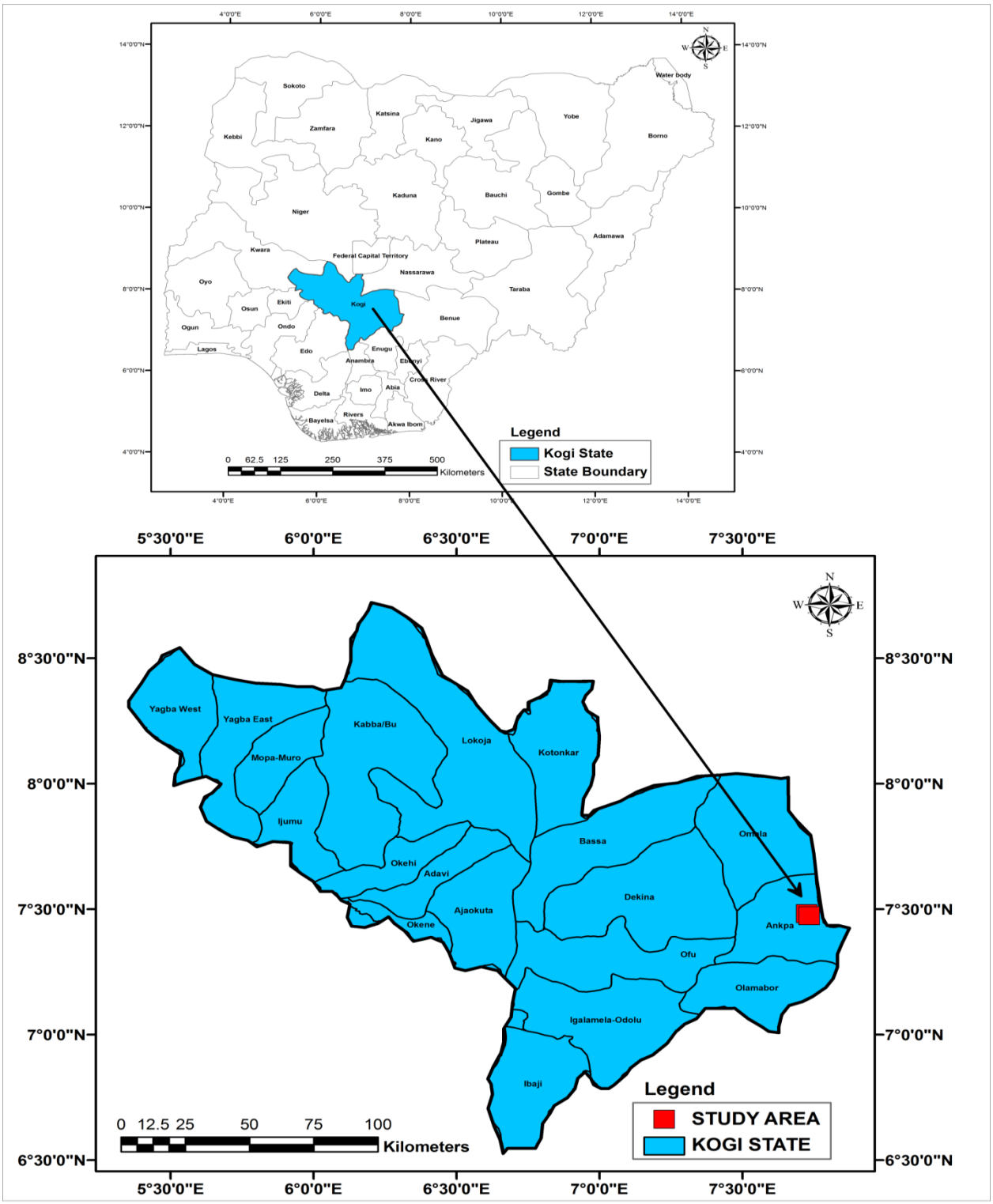


Fig. 2: Location Map of the Study Area

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Fig. 3: Stratigraphic Section of Odagbo Coal Mine

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Fig. 4: An Abandoned Open Cast Mine filled with acid mine drainage

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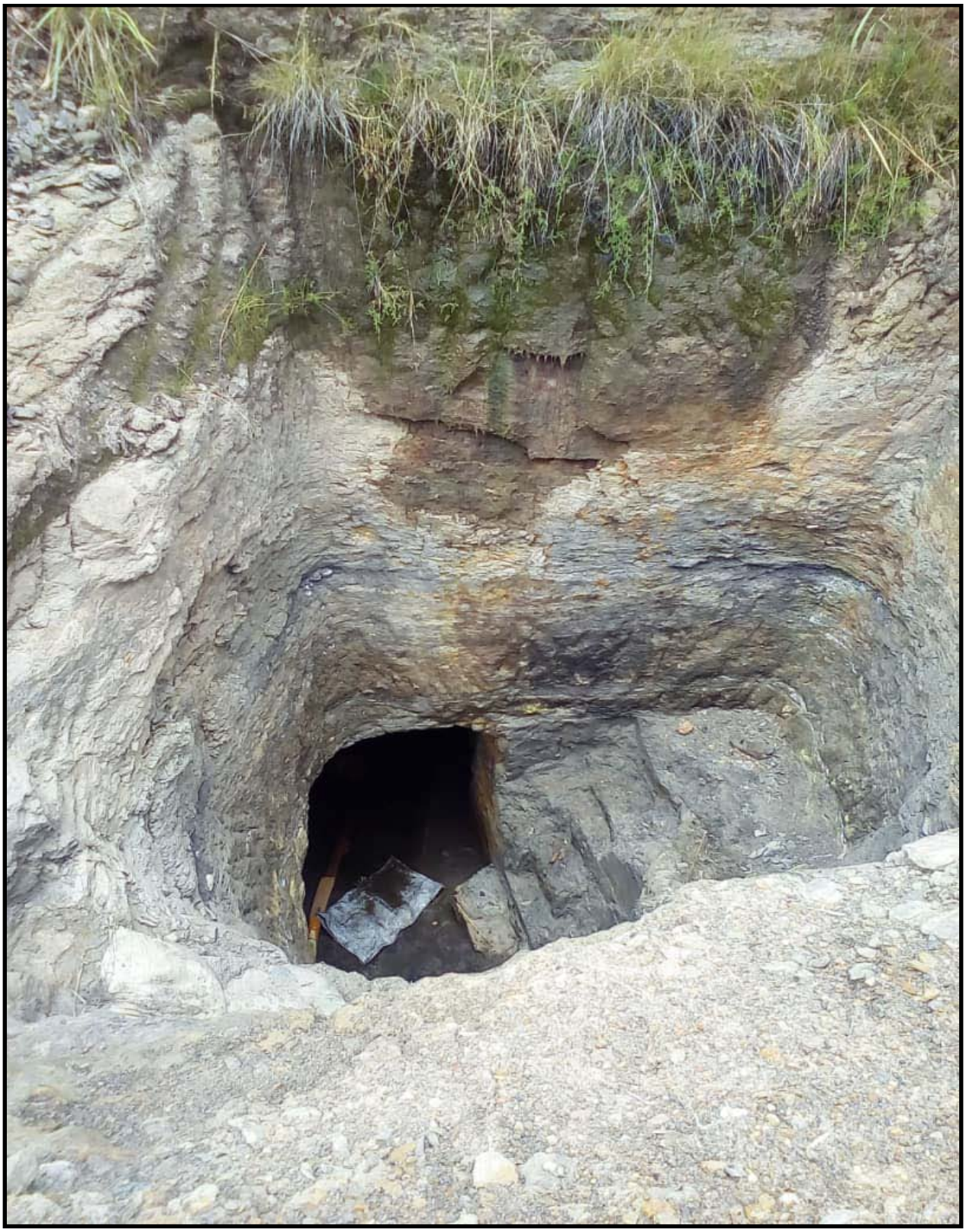


Fig. 5: A Lotto Mining Pit at Odagbo Coal Mine

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Fig. 6: Artisanal Miner carrying Coal from a Lotto Pit

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Fig. 7: Acid Mine Drainage seeping onto Agricultural Land

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Fig. 8: Deforestation of Odagbo Landscape

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References

1. Ameh EG. Multivariate statistical analyses and enrichment of heavy metal contamination of soils around Okaba coal mine. American-Eurasian Journal of Agronomy. 2013; 6(1): 9-13.
2. Emmanuel PR. Geochemical assessment of acid mine drainage from Odagbo coal mine, Nigeria. Unpublished BSc thesis, University of Jos, Nigeria. 2015; pp.3-40.
3. Emel J, Mathew TH, Madoshi HM, Extracting Sovereignty: Capital, Territory and gold mine in Tanzania. Political Geography, 2011; 30: 70-79.
4. Ericsson M, Lof F. (2011). Overview of state Ownership in the Global Minerals Industry, Long Term Trends and Future: World Bank Report. Washington, DC, USA. 2011; p. 235 – 321.
5. Funoh KN. The impacts of artisanal gold mining on local livelihoods and the environment in the forested

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areas of Cameroon. Working Paper; Bogar Indonesia 2014; 150.
6. Hentchell T, Hruschka F, Priester M. (2002). Global report on artisanal and small scale mining. London. 2002; p. 108 - 134.
7. Lawrence DC. Safety rules and regulations on mine sites - the problem and a solution. Journal of Safety Research, 2005; 1: 39-50.
8. Momoh A, Rotji EP, Odewumi SC, Opuwari M, Ojo JO, Olorunyomi A, (2017). Preliminary investigations of trace elements in acid mine drainage from Odagbo Coal Mine, North central Nigeria, Journal of Environment and Earth Science 2017; (7)11: 90-96.
9. Ministry of Mines and Steel Development, (MMSD). Coal Exploration and Power Generating Opportunites in Nigeria. A publication of MMSD. 2014; P. 5
10. Mishra PP. Mining and environmental problems in the Ib valley coalfield of Orissa, India. In Marker, B.R., Petterson, M.G. and McEvoy, F (eds) 2005. Sustainable Minerals Development in the Developing World. Geological Society, London. Special Publications 2005; 250. 141-147.
11. Nwajide CS. Geology of Nigeria's Sedimentary Basins, 1st Edition, Lagos CSS Bookshops Ltd. 2013. p. 356 – 378.
12. Obianuju PU. Palynological study of the Okaba Coal Mine Section in the Anambra Basin, South eastern Nigeria. Journal of Mining and Geology, 2005; 41(2): 193-203.
13. Orajaka IP, Onwuemesi, G., Egboka, B.C.E Nwankwo, G.I. Nigerian Coal. Mining Magazine, 1999; pp. 446-451.
14. UNECA. Managing Mineral Wealth: Training Materials on Management of Minerals Wealth and the Role of Mineral Ealth in Socio-economic Development. 1st ed. Addis Ababa, Ethiopia: United Nations Economic Commisiion for Africa (UNECA). 2004. http://www.africaminingvision.org.
15. World Bank. World Development Report. Oxford: University Press for the World Bank. 2005; pp. 453 - 476
16. Que S, Wang L, Awuah O. Chen Y, Yang W. The Status of Local Community in Mining Sustainable Development beyond the Triple Bottom Line. Sustainability, 2018: 10, 1749., doi: 10.33390/.

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Assessment of Households' Food Security and Hunger Level among Communities in ILE-IFE, Nigeria

By Dada Victoria Tobi

Obafemi Awolowo University

Abstract- This study assessed households' food security level among different communities in Ile-Ife. To achieve this, ten different communities with varying demography including educational and economic backgrounds were identified within the study area. Field Survey method was used in which survey of market prices of food stuff, diet and nutrition, social well-being, food accessibility and affordability as well as price fluctuation and variation in household's social backgrounds were the considered parameter. The results revealed that food insecurity is still high among the selected communities in Ile-Ife whereby 41% of the households cannot guarantee their households food for a month, while some have one or more household members skipped a meal in a day for lack of food whenever there is food shortage. Food insecure households have their households' head as mostly artisans and were more likely to have no educational background. However, households with the high income earning heads are more food secured compared to households with a low income head. Poverty, poor economic activity, low agricultural productivity, lack of access to basic services like health facilities and food markets all play significant role on food security.

Keywords: *households, food security, huger level and food budget.*

GJSFR-H Classification: *FOR Code: 090899*



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I. Introduction

The world at large has long been concerned about food security and the eradication of hunger especially of the vulnerable groups. This led to setting aside 16th and 17th of October every year as the international days for food security and eradication of poverty respectively (EBS, 2009) and its inclusion in the Millennium Development Goals (MDGs) in 2015. Despite this, about 925 million people are still suffering from the menace of food insecurity across the globe in which 235 million food insecure people are from sub-Sahara Africa (FAO, 2010).

One of the more frequently applied indices of the level of development is the status of food security and that of its antithesis, hunger. Commonly, food security is being defined as 'access by all people at all times to enough food for an active, healthy life' (World Food Programme, 1991). This signifies that the ultimate goal of food security is for individual to be able to acquire food needed at all times and to be able to utilize the food to meet the body's needs. The definition of food security is based on three important pillars, viz; food availability, access and utilization. However, the concept of food security has shifted from the mere equation of food production to access, availability, stability and utilization because a country can actually produce more, with its citizens having access to less in such a way that it exists in Nigeria (Yusuf, 2008).

In Nigeria, food security has declined in the 1980s due to rapid population growth, economic stagnation, and civil strife (IITA, 2004).

The decline is more severe as population growth is on the increase while food production is on the decline in Nigeria (FAO, 2003). During the decade of the 1990s, the food gap in Nigeria is expected to be more than quadruple to 5million tons of grain equivalent, an amount far beyond either the ability of Nigeria as a nation to import or developed countries to supply through food aid (FAO, 2003). This had imparted on the food security level of the country.

However, Food insecurity today has a devastating impact on families and on the countries in which they live. Where the food insecure make up a substantial portion on the total population, as they do in some parts of Africa, the impact can overwhelm a country's development opportunities (UNDP, 2009). Food insecure people are, by definition, unable to lead, they drain the social service budgets of the poorest developing countries and they lack the simple physical energy needed to contribute fully to their own livelihood. According to Chen and Kates (1996), the easiest way to observe food security is to examine its absence, which is the persistence of hunger and its many guises, food is not secured, nor poverty eradicated by the mere declarations of days. Food insecurity can be minimised. The policy options for reducing food insecurity are seen as depending on whether the case is chronic or transitory. Measures to address chronic food insecurity would include, increasing the food supply, focusing on the development assistance or income transfers for the poor and helping the poor to obtain knowledge about nutrition and health practises. Transitory food insecurity could be ameliorated by stabilizing supplies, prices and assisting vulnerable groups with emergency employment programmes, income transfers or food.

The effect of climate change on food production, absence of food security and associated

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coping strategies are increasingly being studied in Africa (EBS, 2009). There has, however, been very little emphasis on the roles that demographic status (such as; occupation, income, family size and educational status) play in mitigating extreme poverty and food insecurity. There is also limited information about how the various inter-relationships between individuals and households affect their food security status. This could be via the roles these play in facilitating household ability to produce food or generate income.

Furthermore, very little is known about how the shifts in family structure within many African countries towards a more western model have affected the agricultural production possibilities and food security status of families across the continent. Social and demographic status plays an instrumental role in the daily lives of all humans, particularly in developing countries where these relationships bridge the gaps caused by numerous market and institutional failures. However, studies on demographic status and household welfare or poverty in Nigeria are very few, and are mostly limited to one state or one region (Yusuf, 2008). Little or no empirical work investigating the links between demographic status and food security exist. Generally, literature has comprehensively documented studies on crop production, importation and food security in Nigeria. However, the food security at the Ile-Ife community level and the role that economic status plays is yet to be assessed, hence this study.

a) The objectives of this study are to;

- Assess households' food security and hunger levels among different communities with varying educational and economic backgrounds in Ile-Ife and its environ; and
- Examine the impacts of varying demography on the household food security level among the selected communities in Ile-Ife.

II. Research Methodology

Ile-Ife lies within latitudes $7^0$28′N - $7^0$45′N and longitudes $4^0$30′E - $4^0$35′E. It has an elevation of about 375m above the sea level (Ajala and Olayiwola, 2013). The town has two Local Government Areas; namely Ife Central and Ife East Local Government. It has a total population of 355,818 people (NPC, 2006). The area has two climatic seasons of dry and wet. During the wet season, the mean daily temperature can be as low as 23^0C while it may be as high as 30^0C during the dry season. The area experiences double rainfall maxima characterized by two high rainfall peaks in June and September with a short dry season and longer dry season falling between and after each peak. The mean annual rainfall is about 1500 mm (Ifabiyi, 2008). The climate supports tropical rainforest vegetation.

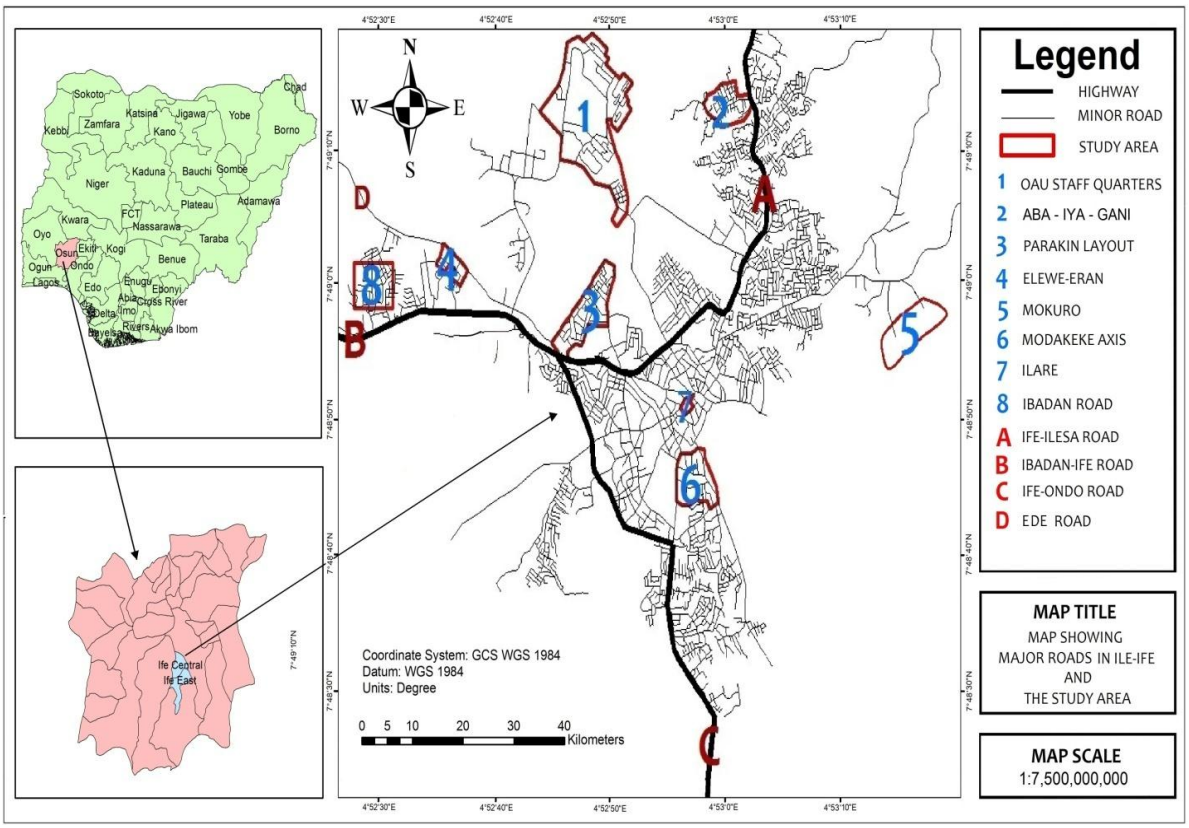


Figure 1: Map of Ile-Ife in Osun State, Nigeria

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In this study, the sample population was drawn from Ile-Ife and its environs to capture Low Income-high population density areas, Medium Income-medium population density areas and High Income-low population density areas. The use of the classification model adopted from Okunmadewa et al, (2007) to study the interplay of migration and urban expansion on health and environment in Lagos metropolis. The three types of settlements drawn from the study area include Parakin which represents High Income-Low Population density area, Ibadan Road as the Medium Income-medium population density area and Ilare as the Low Income- high population density area.

The sampling technique used for this study is a multi-stage sampling technique. Firstly, the use of the classification criterion adopted from Okuneye *et al*.(2007) in which metropolis was classified as described above. A sum of 450 randomly selected respondents was drawn from the two Local Government Areas (LGAs) in Ile-Ife. In each LGA, the street listings of the 2006 National Census were used to draw a random list of five streets followed by a systematic random sampling in other to select 10 houses (first house was selected by the use of random numbers, subsequently, every fourth house was then selected) per street from which a household was then selected. The socio-economic, economic, household food consumption and risk structure investigations were then carried out in Ile-Ife and its environs. These include: Parakin, Ibadan Road, Ilare, Mokuro, Ibadan Road, Aba- Iya-Gani, Boosa, Eleweeran, O.A.U senior staff Quarters and Eku-Isobo communities. The study made use of both primary and secondary data. The primary data were generated through an extensive fieldwork survey of market prices of food stuffs. Information on prices of food items, food security levels with respect to demographic backgrounds were obtained from the use of modified United States Department of Agriculture (USDA,2012) Food and Hunger Investigation Module (FHIM) structured questionnaire (Appendix I shows the modified question in italics). Key informants included community heads, landlords, tenants, and household heads. The National Population figures of 2006 were used as a guide in administering the structured questionnaire using 1% of the population per community and simple random sampling technique (So as to be fair in choosing the sampled population). Allotting equal copies of questionnaire to the selected communities is impossible due to the differences in the total population of each community. However, more than a questionnaire was administered in a house that is occupied by more than a household. In all, a total number of 455 copies of questionnaire were administered within the three communities in this study all of these 450 copies were completely filled by the respondents. The test instrument (questionnaire) was first validated using a few numbers of dummy respondents before it was finally administered. This helped to re-structure some of the items in the questionnaire for better understanding and suggested the need for the interpretation of the questionnaire to the respondents in his or her native language and to ensure the filling of the questionnaire based on the answers given by the respondents.

The data collected were collated and analyzed using inferential (Chi-square, t-test and Analysis of Variance- ANOVA) and descriptive (Tables, Percentages, Frequencies, Mean) statistical techniques to describe the socio-economic characteristics of the households.

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III. Results and Discussion

Table 1: Distribution of Respondents by Socio-Economic Characteristics

Characteristics	Frequency	Percentage
Location		
Aba-Iya-Gani	42	9.33
Boosa	32	7.11
Eleweran	20	4.44
Ibadan road	40	8.88
Ilare	116	25.77
Eku-isobo and Iraye	39	8.66
Mokuro	75	16.66
Parakin	44	9.77
OAU Senior Staff Quarters	40	8.88
Total	450	100
Sex		
Male	193	42.80
Female	257	57.20
Total	450	100
Marital Status		
Single	46	10.20
Married	333	74.10
Divorced	42	9.30
Widow/widower	29	6.40
Total	450	100
Age		
20-30 years	83	18.40
31-40 years	186	41.30
41-50 years	141	31.30
51 and above	40	9.00
Total	450	100
Size of Household		
Less than or = 4	241	53.60
Greater than 4	209	46.40
Total	450	100
Minimum =2	Maximum =10	

Source: Author's Fieldwork, 2019

revealed that Ilare (11,685 people; 55.335% of the total population) is the most populous community in the study areas. This was probably due to as a result of the division of the town into three main categories which are; the core (the zone during the pre-colonial period), the intermediate and periphery. In the core, this is where the palace is located and this is usually where the first settlers did settle in and then there comes the expansion of the town. Community like Parakin belonged to the category of the periphery which means it came to being as a result of the expansion and modernization and it is regarded as the community of

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the rich in Ile-Ife. This is in line with (Badiora and Afon, 2013) division of the town to the three categories. Also, Parakin is the residential area for the high income earners.

There were more female respondents (57.20%) than the male (Table 1). This was probably due to the fact that as at the time of this survey the females were the ones at home because they were the ones who usually take care of the household. Secondly, since women are the ones in-charge of household cooking and supplies, the questions were best answered by the females. Households' size of greater than 4 was recorded most in Ilare (44.08%). The average household size in this study is ranged between 2 and maximum 10. The mean household size in the overall communities was about 4 members per household. This shows that the substantial proportion of the households had household sizes lesser than the mean household size. The household size has a great implication on food security. A large or small household is expected to consume more or less food as the case may be. However, a large household could pose a threat to food security especially in a household with many children and elderly people (Agboola, 2005 and Oluyole *et al.,* 2016).

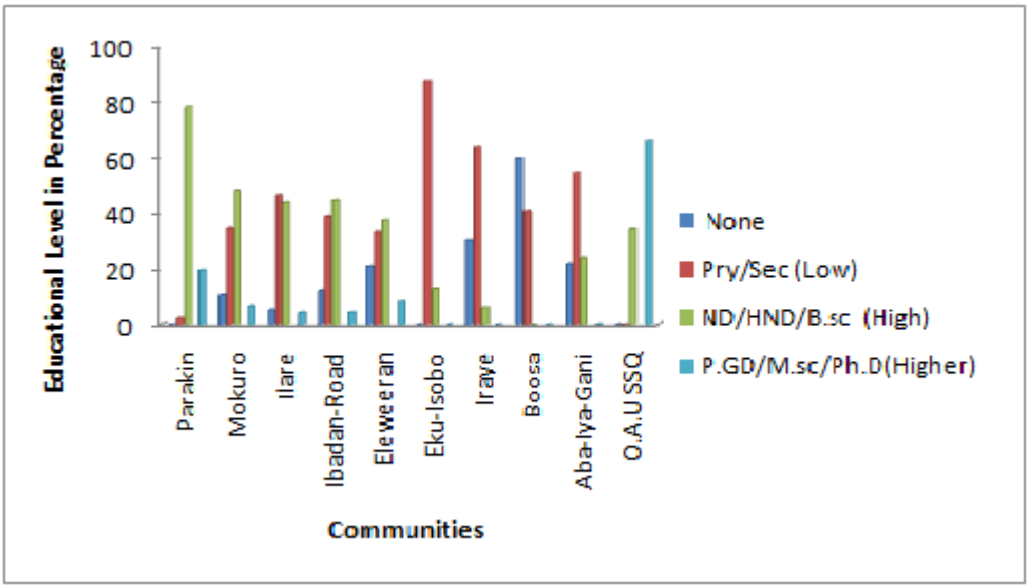


Figure 2: Educational level of Household Heads

In this study, results showed that Ibadan road (12.24%) had the highest number of household heads with no level of Education while Parakin is the only community with the least percentage of respondents with Primary/Secondary education and the highest percentage of respondents with ND/HND/B.Sc. or equivalent (Fig.1). This is so because Parakin is being referred to as the community of the rich. All of these show the varying educational levels of the household heads across the selected communities and could even influence their occupations. A low fraction of farmers were recorded in some communities. However, not all communities engage in farming and this could be owned to the fact that nowadays people have neglected farming; everyone wants a white collar job. Only few communities in this study have their residents who are into farming. This could be as a result of the influence of the educational institution, the presence of the Teaching hospital, and the existence of the zonal offices of the government ministries who have gainfully employed the dwellers of Ile-Ife into one or the other capacity to function.

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Table 2: Monthly Income Status of the Respondents in the Selected Communities

	Monthly Income Status (Thousand (₦))							
Percentages	**0-10**	**11-20**	**21-40**	**41-70**	**71-100**	**101-400**	**Others**	**Total**
Communities								
Parakin	7.14	9.52	30.95	30.95	47.62	4.76	0.0	100
Mokuro	4.00	21.33	20.00	33.33	16.00	5.33	0.0	100
Ilare	3.70	30.56	38.89	19.44	7.41	0.0	0.0	100
Ibadan Road	23.91	28.26	15.22	19.57	10.87	2.17	0.0	100
Eleweeran	8.70	39.13	39.13	8.70	4.35	0.0	0.0	100
Eku-Isobo	54.55	45.45	0.0	0.0	0.0	0.0	0.0	100
Iraye	31.03	48.28	6.90	3.45	10.34	0.0	0.0	100
Boosa	6.45	87.10	6.45	0.0	0.0	0.0	0.0	100
Aba-Iya-Gani	7.50	52.50	17.50	22.50	0.0	0.0	0.0	100
OAU Senior Quarters	0.0	0.0	0.0	9.76	56.10	19.51	14.63	100

Source: Author's Fieldwork, 2019

Households' heads with the income range of ₦11, 000 - ₦20, 000 (i.e low income) had the highest percentage in this study across the selected communities while in Parakin had households' heads with a monthly income of between ₦41, 000 - ₦70, 000, ₦71, 000 - ₦100, 000 (i.e the middle income earners) and as expected, people earning above ₦100 000 (high income earners) were also from Parakin (Table 2). Hence, a household in which the household head has a low income might be faced with the problem of food insecurity arising from unavailability or limited resources as depicted by the analysis of this study. Since, one can only live within his/her income.

Table 3: Prices of Selected Food Items in Ile-Ife Over 10 Years (2009-2019)

Food Items	**Unit**	**2009**	**2011**	**2013**	**2015**	**2017**	**2019**
Maize	50kg	₦4,500	₦5,200	₦7,200	₦7,500	₦10,000	₦12,000
Rice	50 Kg	₦9,200	₦8,300	₦9,500	₦10,000	₦11,500	₦21,500
Yam	50kg	₦2,500	₦2,750	₦5,000	₦5,000	₦6,000	₦7,000
Cocoyam	50kg	₦2,000	₦2,500	₦2,750	₦3,000	₦3,500	₦5,500
G. Oil	25 litres	₦7,800	₦8,000	₦8,200	₦8,500	₦10,800	₦12,800
Beans	50kg	₦8,000	₦8,200	₦8,500	₦8,600	₦9,000	₦10,000
Palm Oil	25 litres	₦7,900	₦8,200	₦8,200	₦8,500	₦10,700	₦11,700
Garri	50kg	₦3,800	₦2,400	₦2,600	₦2,800	₦4,800	₦5,800
Beef	50 kg	₦12,000	₦15,000	₦12,000	₦15,000	₦18,000	₦20,000
Fish	50 kg	₦12,500	₦13,800	₦14,000	₦15,000	₦16,000	₦18,000
Sugar	50 Kg	₦6,650	₦8,150	₦8,250	₦7,500	₦8,000	₦9,000
Yamflour	50kg	₦10,700	₦12,000	₦12,300	₦18,000	₦25,000	₦28,000

Source: Osun State Ministry of Commerce and Industries and Authors' Market Survey between 7th to 14th of October, 2019

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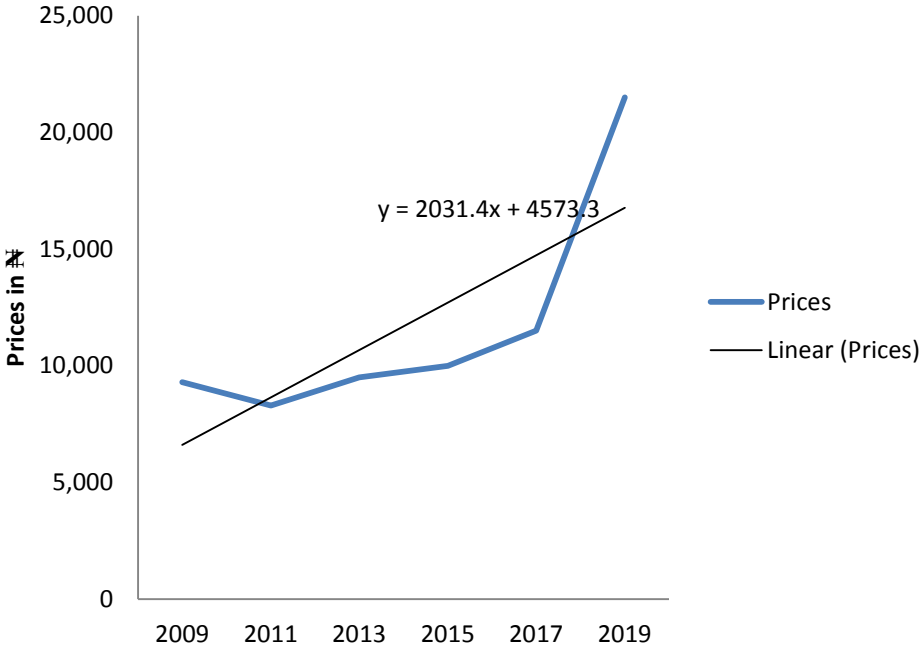


Figure 3: Rate of change in Prices of Rice in 2009-2019

The prices of food items had been on the increase over the years. For example, rice which is an everyday food has its price fluctuating around ₦20,000 per 50kg and the cheapest item is cocoyam which goes for ₦5500 per 50kg as at the time of this survey in month of October, 2019 (See the Appendix). The rate of change in food items was on the increase. For example, rice increased with ₦10000 in the last two years and which made unaffordable for households but yet it has to be purchased at the household level (Fig.2). However, beans are the only food item that has the lowest rate of change. Although food items such as cocoyam and yam and garri and maize, groundnut oil and palm oil are readily available in Ile-Ife and its environs while food items such as rice, beans, yam flour, fishes and beef were brought to Ile-Ife from other places within Nigeria could be part of the reasons for not answering the affordability of the food items. All of these could be an indication of price fluctuations which then affects the food security level.

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Table 4: Households' Food Security and Hunger Levels across the Selected Communities

Characteristics	Frequency	Percentage
Description of food situation at home in the last 12 months		
we do eat enough of what we want	193	42.9
we do eat enough but not always what we want	200	44.4
we sometimes do not eat enough	46	10.2
we frequently do not eat enough	11	2.5
Total	**450**	**100.0**
Duration of guaranteeing family food		
A day	32	7.1
A week	105	23.3
A month	268	59.6
Six month	31	6.9
A year or more	14	3.1
Total	**450**	**100.0**
Reason for not eating enough at home		
No enough money to purchase food	210	46.6
Price of food items is too much	129	28.6
It is difficult to access the market	102	22.7
Others	9	2
Total	**450**	**100**
Ever worried in the last 12 months because food at home could run out before more can be purchased		
Almost every month	140	31.1
Some months	83	18.5
Only one or two months	95	21.1
Did not happen	132	29.3
Total	**450**	**100.0**
Time in the last 12 months when bought food was inadequate and no money to buy more		
Almost every month	90	20.0
Some months	129	28.7
Only one or two months	91	20.2
Did not happen	140	31.1
Total	**450**	**100.0**

Fifty-nine percent of the respondents can guarantee food for their households for a month and this belongs to the class of the civil servants. Result showed that 2.9% of the households do eat enough of what they want frequently. All of these could be accounted for as a result lack of money; price instability of food items also the scarcity of food items at some season of the year. Most importantly, the income and the occupational status of the household heads do play a major role on budget and available food to the household.

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Table 5: Frequency and Percentages of the Distribution of Residents' Responses on Food Budget Based on Demography

Occupation	**Monthly Food Budget(₦)**				
	Below 10,000	10,000-20,000	20,001-40,000	Above 40,000	Total
Artisans	83(82.83)	13(13.13)	3(3.03)	1(1.01)	100(100.0)
Civil servant	46(26.67)	78(44.85)	31(17.58)	25(10.91)	180(100.0)
Trader	79(71.96)	26(22.43)	4(3.74)	3(1.87)	112(100.0)
Farmer	29(86.96)	1(4.35)	2(8.70)	0(0.0)	32(100.0)
Others	19(58.33)	2(16.67)	3(16.67)	2(8.33)	26(100.0)
$\chi^2(12) = 115.09$	p-value = < 0.05				
Household size					
4 and below	130(53.90)	71(29.46)	27(11.20)	13(5.39)	241(100.0)
Greater than 4	106(50.71)	80(38.27)	17(8.13)	6(2.87)	209(100.0
$\chi^2(3) = 1.8867$	p-value = < 0.05				
Educational status					
None	51(87.27)	9(12.73)	0(0.00)	0(0.00)	60(100.0)
Primary/Secondary	134(79.87)	30(16.98)	5(3.14)	0(0.00)	169(100.0)
ND/HND/B.Sc or Equivalent	65(36.69)	81(46.75)	23(12.43)	8(4.14)	177(100.0)
P.GD/M.Sc/M.Phil/Ph.D	1(2.27)	11(25.0)	17(38.64)	15(34.09)	44(100.0)
$\chi^2(9) = 224.0708$	p-value = < 0.05				
Monthly Income					
₦0-₦10 000	37(91.89)	5(8.11)	0(0.00)	0(0.00)	42(100.0)
₦11 000-₦20 000	122(90.08)	14(8.40)	1(0.76)	1(0.76)	138(100.0)
₦21 000-₦40 000	54(62.96)	32(34.57)	2(2.47)	0(0.00)	88(100.0)
₦41 000-₦70 000	27(29.63)	52(60.49)	7(8.64)	1(1.23)	87(100.0)
₦71 000-₦100 000	3(4.35)	31(44.93)	27(37.68)	9(13.04)	70(100.0)
₦201 000-₦400 000	0(0.00)	4(20.0)	8(46.67)	6(33.33)	17(100.0)
Others	0(0.00)	0(0.00)	0(0.00)	8(100.0)	8(100.0)
$\chi^2(18) = 391.0823$	p-value = < 0.05				

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Figure 4: Households Monthly Food Budgets across the Selected Communities

In assessing the differences in average monthly budget on food in relation to selected socio demographic and economic variables, tests of differences in average of such expenses were conducted to assess the impact of the demographic variable on the household food security level. For example, a Chi-Square test established a significant relationship between occupation and monthly food budget. Occupation which is a determinant of the monthly income and food budget among the following categories; for example the artisans whose budget were below ₦10,000 were predominant (83%), 45% of the civil servants who used to budget between ₦10,000-₦20,000 which was the highest proportion in the category with a Chi square value of 113.09 and p-value < 0.05.This showed the association between monthly income budget, households' head occupation, household size, educational status and monthly food budget. With respect to household size(in terms of family size) and monthly food budget, household size below 4 had (53%) budget below ₦10,000 on food monthly while households with the budget of ₦10,000-₦20,000 on a monthly basis had 29% (Table 5). Meanwhile about half (50%) of households with household size greater than 4 budgeted below ₦10,000, followed by those whose budget was between ₦10,000-₦20,000. With a Chi square value of 1.8867 and p-value of 0.001, the results showed that there was no significant relationship between household size and monthly food budget irrespective of the household sizes. Meanwhile, a significant relationship was established between the educational status of the household head and monthly food budget (at $\chi^2 =$ 224.0708 and p-value < 0.05), for example about 87% households' head with no educational background budgeted ₦4,085 with a standard deviation of ₦6,964 on food on a monthly basis and this was peculiar to the artisans. On the other hand 8 out of 10 of household heads with low educational background budgeted below ₦10,000 on food. As a departure from the foregoing, highest proportion of households budgeting between ₦10,000-₦20,000 existed among household heads with ND/HND/B.Sc. or equivalent, and the trend was followed by those with monthly food budget of below ₦10,000 with about 37%. While the household heads with higher educational background budgeted most on food monthly (Table 4), 38% of this category budgeted between ₦20,001- ₦40,000 on food, 34% budgeted above ₦40,000. A Chi square value of 224.0708 and p-value of 0.001 shows that there was a significant relationship between educational status and monthly food budget.

At $\chi^2$391.0823 and p-value = < 0.05 there was a significant relationship between monthly income and monthly food budget. For example about 92% respondents who earn less than ₦10,000 monthly earmarked less than ₦10,000 for food on a monthly basis while 90% were recorded among the households' heads earning between ₦11,000-₦20,000 monthly. It could be inferred that the higher the income, the higher the amount budgeted on food monthly. For instance, households' head earning between ₦201,000-₦400,000, about 47 percent budget between ₦20,001-₦40,000 on food monthly. The trend continued with the households earmarking above ₦40,000 for monthly food budget with 33% with a Chi square value of

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391.0823 and p-value = < 0.05, which implies that the monthly income of the households' head plays a vital role in the monthly budget on food which implies that no household food budget will exceed its income (Table 4.13). Furthermore, occupation and monthly income plays a major role on household food security, for instance where respondents earns between ₦11,000 - ₦20,000 budget an average of ₦7,542 with a standard deviation of ₦5,367 on food, respondents who earns between ₦201,000 -₦400,000 budget an average of ₦40,133 and standard deviation of ₦21,287. An F-value of 132.04 and p-value of 0.001 shows that the difference observed in average monthly budget across levels of monthly income on food is significant (Table 3).

There is no significant difference in monthly budget on food across household size at t-value = -1.5074 and a p-value of < 0.05. For instance, in household size of 4 and below, average monthly budget on food was ₦14,808 and a total of ₦13,284 will be needed on food to be food secured, while those with size greater than 4 spend average of ₦16,932 and a total of ₦17,153 will be needed to be food secured. Studies have shown that food available to larger families per head are usually lower than that available to smaller families that is per food capita. Food intake decreases with an increase in family size. This is in conformity with Adio (2000), Oluyole *et al*., 2016 whereas this could not be measured in this study since the outcome of this study shows that the household sizes do not affect the budget on food by the family.

Results of this study demonstrated that food insecurity is still high among the selected communities in Ile-Ife. 41% of the households cannot guarantee their household food for a month, while some have one or more household members skipped a meal in a day for lack of food whenever there is food shortage. In all, 20% of the households have their children benefitting from the food assistance by the State Government for the children of primary school ages (Government schools) during the school hours and this has been a succor to the households. In other to enhance household food security level, food wastage has to be curbed only 56% made use of fridge in preserving their food remain for later consumption although these were being used among households of these two communities Parakin and Ibadan Road. Through this one could say that a larger percentage of the sampled population knows the adverse effect of food wastage on food security level which is hunger and starvation. Nonetheless, 8% respondents had experienced food crisis in their community and this was recorded during of Ife-Modakeke crisis which lasted for years.

Focusing on households sizes and monthly food budget, at t-value = -1.5074 and a p-value of < 0.05, no relationship was found between household size and households' food security. This suggests that focusing on household size alone may not provide an accurate assessment of the varying demographic characteristics of different households and food security.

However, Seventeen percent of the respondents suggested the need for government intervention, while 14% suggested that farmers are to be supported through loans, people should be more involved in farming and that government should encourage large scale farming through mechanization while 10% and 11% hopes that improving storage facility and planting more crops would help in a way to ensuring food security. Other suggestions include subsidizing food items and preventing adverse climatic impacts. This is an indication that the government still has a frontline role to play in the area of agriculture which is the only key to food security.

IV. Conclusion and Recommendations

a) *Conclusion*

This study has shown that households sizes below or equals 4 had the highest representation in this study. There is a variation in the educational background of households' heads across the selected Communities. For instance communities such as Parakin and OAU Senior Staff Quarters had the highest number of households' heads with higher educational Status. In terms of occupation, artisans had the highest representation in this study but with an exemption of communities such as Parakin and OAU Senior Staff Quarters which were dominated with civil servants. Across the selected communities, household heads with the income range of ₦11,000- ₦20,000 had the highest percentage except Parakin and OAU Senior Staff Quarters with higher income. While a larger population in this study budgeted less than ₦10,000 on food on a monthly basis. From the results in chapter four, it can be inferred that the higher the income, the higher the monthly food budget. Also, the higher the educational status, the higher the monthly income which shows there is a significant relationship between the Educational Status and the monthly income. Forty-one percent of the households do not eat enough food due to the following reasons; the stagnating growth in food production, increasing population, poverty, climate change, high food prices, ongoing neglect in agricultural practices, absence of market within the communities and lack of sufficient income. Food security of many household was further deteriorated due to lack of awareness on food utilization and preservation.

Food insecure households have their households' head as mostly artisans and were more likely to have no educational background whose heads were with low income and low budget on household food. To overcome this problem of food insecurity, the empirical results suggest that it is necessary to put in

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place policies that will encourage qualitative education and job creation with good remuneration.

The household with the high income earning heads are more food secure compared to households with a low income head. Poverty, poor economic activity, low agricultural productivity, lack of access to basic services like health facilities and food markets all play significant role on food security. Thus, the varying demography (such as educational and economic variables) plays a significant role on households' food security level.

b) Recommendations

Economic growth is urgently required to combat poverty, which is a key underlying factor to the hunger problem among the communities. Economic growth, preferably through increased investments in a much neglected agricultural sector, is however not enough, and there is an urgent need for the Government to address the food insecurity situation, In the current situation, food security major thrust has to be given to production of food grains, fisheries and livestock products through sustainable use of resources. Investing in agriculture has several benefits and as a great contribution to the economic growth, agriculture has to be transformed from traditionally subsistent to a vibrant commercial and competitive one. Potentiality for agricultural development should be tapped with increasing concerns for irrigation, fertilizer, storage, marketing, improved seeds and breeds, quality control, improvement on road networks, research focus on niche areas, credit facility and capable human resources, Improved farming system and Improved market infrastructure are also of great importance in order to ensure access to food by all population groups. Price regulation will curb price fluctuation of food items, also a major avenue to improve food security. There is also the need for improved educational policy to be made so as to increase the number of literates. Lastly, employment with improved renumerations should be provided to the eligible ones.

References Références Referencias

1. Adio, M. A. (2000): Analysis of the food security of farm households in Oyo State. M.Sc. thesis submitted to the Department of Agric-Economics, University of Ibadan, Ibadan, Nigeria. 53-54. Ajala O.A and Olayiwola A.M (2013): An Assessment of the Growth of Ile-Ife, Osun State Nigeria,
2. Using Multi-Temporal Imageries. *Journal of Geography and Canada* 5(2):43-54. https://www.researchgate.net/publication/280736057, accessed on 12th of August, 2019.
3. Agboola, P. O. (2005): Analysis of Food Insecurity and Coping Strategies among Farming Households in Osun State, Ph.D Thesis Department of Agricultural Economics University of Ibadan, Ibadan.73-76.
4. Ayoade, J.O. (2003): Climate change: A synopsis of its nature, causes, effects and management. *Publication of Faculty of Science*, University of Ibadan, Ibadan 3(4):7- 9.www.scirp.org/ayoade/ climate change, accessed on 22nd of September, 2019.
5. Badiora, A.I. and Afon, A.O. (2013): The Origin of Scaling Cities: *Bettencourt Science* 340(1438): 9-13. www.uvm.edu/340/2013/bettencourtscience, accessed on 14th of January, 2019. Chen, R. and Kates, R.W. (1996): Towards a Food secure world: Prospects and Trends. Food Policy 19: 192-208. Household Security, revised. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service. *Benin Journal of Social Sciences, University of Benin, Benin city, Nigeria*: 259-269. https://www.rw.kates.org/queries_food.html, accessed on 14th of November, 2018.
6. EBS (2009): EBS (Edo Broadcasting Service) *Comprehensive News* 16th and 17th October. www.edostate.gov.ng/edo-broadcasting-service/, accessed on 27th of October, 2017.
7. Food and Agricultural Organization (2003): The special program for Food security; Responding to new challenges, FAO Rome.www.fao.org/5/c-f4631e.pdf, accessed on 7th of November, 2016.
8. Food and Agricultural Organization and World Bank (2003a): The State Of Food Insecurity in the World. Rome, Italy. www.fao.org/3/a-y5061e.pdf, accessed on 7th of January, 2016.
9. Food and Agricultural Organization and World Bank (2003b): Trade Reforms and Food Security: Conceptualizing the Linkages. Rome, Italy.www.fao.org/3/b5062e.pdf, accessed on 7th of January, 2017.
10. Food and Agricultural Organization and World Bank Food and Agricultural Organization (2005): Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World. Rome. www.fao.org/5/f3096e.pdf, accessed on 6th of January, 2017.
11. Ifabiyi I.P (2008): Effects of Grazing Exclusion on Vegetation and Soil: *Journal of Geography and Geology* 4(5): 7-9. www.foei.org/en/resources/publications/200812, accessed on 13th of January, 2018.
12. International Institute for Tropical Agriculture (2004): Summary Report on the Nigeria Food Consumption and Nutrition Survey (NFCNS)-IITA, Ibadan. https://www.iita.org/c/document-library/get-file%3Fuuid, accessed on 22nd of November, 2018
13. National Population Commission, (2006): Population data in Nigeria: The National Population Commission and the National Bureau of Statistics

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from October, 2006. https://www.population.gov.ng /&sa, accessed on 3rd of December, 2019.
14. Okunmadewa, F. Y., Yusuf, S. A. and Omonona, B. T. (2007): Effects of Social Capital on Rural Poverty in Nigeria. *Journal of Social Science* 4(3):331–339. http://agric.ui.edu.ng/Omonona publication & sa, accessed on 26th of March, 2019.
15. Oluyole, K.A., Taiwo, O.O. (2016): Socio-economic Variables and Food Security Status of Cocoa Farming Households in Ondo State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology* 9(1): 1-7. https://www.researchgate.net/ publication/290473991, accessed on 24th of November, 2019.
16. United Nations Development Program, (2009): Human Development Report, 2009. New York. http://hdr.undp.org/sites/default/files/report/269/hdr-2009-en-complete.pdf, accessed on 27th of November, 2019
17. Yusuf, S.A. (2008): Social capital and household welfare in Kwara State, Nigeria. *Journal on Human ecology,* 23(3): 256-257. http://krepublishers.com/ 02-Journals/JHE/JHE-23-0-000-000-2008-Web, assessed on 7th of January, 2019.

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Fellows/Associates of Science Frontier Research Council

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20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

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22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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