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External Environmental Factors and the Development of Oil Palm in Edo State Nigeria

BY OGUH Festus A. & ADJENE Friday

ABSTRACT

The study examined the influence of external environmental factors on oil palm development in Edo state, located in South-South region of Nigeria. The growth of oil palm sub sector of crop farming in Agricultural industry has been greatly influenced by some environmental factors over the years. Therefore, this study has investigated the role played in either undermining the growth and development of oil palm or improving its performance. A literature review of related works along with the use of structured questionnaire was used to source primary data which were analysed to analysed the data in other to test the formulated hypothesis. A population of 184 oil palm farms across Edo State was used and the Taro Yamane method was used to determine the sample size. The questionnaire and responses were designed using the five Likert scales The hypothesis was tested using the chi-square method. The result of the analysis revealed that external environmental factors had negatively influenced the oil palm development in Edo state. Prevalent challenges identified by the study included funding, government intervention and insecurity. It was recommended that government should do a lot more to improve on the method of oil palm production s many farms were operated on a subsistence method. This will go a long way in improving oil palm production in Edo state to make it commercially viable.

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INTRODUCTION

The oil palm is a notable food and cash crop around the world. Its wide use for various food, pharmaceuticals, chemicals and many more cannot be overemphasized. The growing world population accompanied with growing demands for goods and services, food consumption, changing diets, bio-energy exploration etc. has resulted in the high demand for the oil palm amongst other agricultural produce. However; in spite of the growing demand for the oil palm and its products, there are still contending issues which has led to stagnation in growth and development of the oil palm industry in Nigeria which happened to be a prime producer and exporter of palm oil in the world prior to 1960. The poor growth has resulted to numerous problems such as reduction of palm oil exports, importation to satisfy national demand and non-self-sufficiency of domestic palm oil supply.

According to Abdul Qadir et al, (2016), In an attempt to mitigate these problems, the Federal and some State governments used the following measures.

i. The Nigerian Institute for Oil Palm Research (NIFOR) in 1964;
ii. Privatization of government owned oil palm estates
iii. Directorate of Foods, Roads and Rural Infrastructures (DFRRI) sponsored oil palm seed/seedlings multiplication programme (1987-1990);
iv. The National Agricultural Land Development Authority (NALDA) oil palm development programme (1993-2002).
v. National Accelerated Industrial Crops Production Programme – NAICPP - (1994-2002).

However; the above programmes haven't yielded the much desired national policy on self-sufficiency in palm oil production, hence various researches have been on going on the production and processing of the oil palm with a central focus on achieving its high productivity, wider viability of use, environmental and social economic effects of the crop. In a more focussed scale, the present study intends to explore the external effects of oil palm production in Edo State, a Niger Delta entity in the south-south region of Nigeria. The Oil palm (Elaeis guineensis) is a species of palm commonly called African oil palm or macaw-fat. (Mohd, 2001) It is the principal source of palm oil. It is native to west and southwest Africa, specifically the area between Angola and the Gambia; the species name guineensis refers to the name for the area, Guinea, and not the modern country which now bears that name. The species is also now naturalized in Madagascar, Sri Lanka, Malaysia, Sumatra, Central America, the West Indies and several islands in the Indian and Pacific Oceans.

The closely related American oil palm Elaeis oleifera and a more distantly related palm, Attalea maripa, are also used to produce palm oil. (Wikipedia, 2022). The human use of oil palms date as far back as 5,000 years in West Africa; in the late 1800s, archaeologists discovered palm oil in a tomb at Abydos dating back to 3,000 BCE. (Carvalho, 2006) It is thought that Arab traders brought the oil palm to Egypt. (Wong et al, 1997). The oil palm is a perennial plant indigenous to the tropical rain forest region of West Africa. The main belt runs through the southern latitudes of Cameroon, Côte d'Ivoire, Ghana, Liberia, Nigeria, Sierra Leone, Togo and into the equatorial region of Angola and the Congo. However, because of its economic importance as a high yielding source of edible and technical oil, the oil palm is now grown as a plantation crop in most countries with high rainfall (minimum 1600mm/year) in tropical climates within 100 of the equator (FAO, 2004).

Nigeria used to be the world's largest producer of oil palm before the crude oil boom era. Malaysia has

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now taken the leading position. Oil palm plantation and allied industries is now the main stay of Malaysian economy. Malaysia came to Nigeria in the 1970s to obtain oil palm seeds and seedlings. Researchers have established that oil palm trees do better on plantation farms when planted on a deep, slightly acidic loamy soil with pH 5 – 6 under a climatic condition, humid tropics with 250 cm rainfall well distributed; and long hours of light. It is mainly propagated by seed through pre-nursery and field nursery practices (Ugochukwu et al., 1999). It is the most important source of vegetable oil of all oil-bearing plants and yields highly (Sivasothy, 2006). It is locally called Nkwu (Igbo), Ope (Yoruba) and in (Hausa) which are the three major ethnic languages of Nigeria.

Problem Statement

The economic and nutritious value of palm kernel has resulted to increased demand of the commodity and it constituent products. In this respect there are targeted attempts around the world to achieve its high yield, wider use for products and self-sufficiency in its production of which Nigeria which used to be a major producer falls short. Considering the regions like Edo state in Nigeria where the plant cultivation has experienced a boost in the past, it has become pertinent to explore the contending issues and challenges such as the external environmental factors which influence the plant development in the state and to recommend ways to mitigate the prevailing challenges.

Objectives of Study

The objectives of this project are as follows

i. To review oil palm production in Nigeria.

ii. Identify external environmental factors influencing oil palm development in Edo State

iii. Recommend possible ways of improving the plant production in the state.

Hypothesis Development

The Null hypothesis which the survey seeks to analyse states that there is no relationship between the variables; External Environmental factors has no significant influence on oil palm development in Edo state. The chi-square statistics was used to test the hypothesis. If the observed chi-square test statistic is greater than the critical value, the null hypothesis will be rejected.

Scope of Study

The present research is intended for execution in Edo State in the South-South geo-political zone of Nigeria particularly due to its popularity as a known oil palm producing state with favourable weather conditions for the plant cultivation. The research will be survey and analytical base by the use of collected data which will be mathematically evaluated and analysed. Secondary data will be collected from Journals, bulletins and catalogues of institutions such as Nigerian Institute for Oil Palm Research (NIFOR), Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Food and Agriculture Organization (FAO) of the United Nations, and other relevant materials. The primary data will be collected through structured survey questionnaire that will be administered oil palm producers and related entities.

Review of Related Literature

Conceptual frame work of the Study

The study was carried out to identify the external environmental factors which influence oil palm development and its solutions in Edo state. The research hinged on review of related literatures,

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identifying sample space, collecting data through questionnaire and media sourcing. The conceptual framework for this research is exemplified in the Figure below.

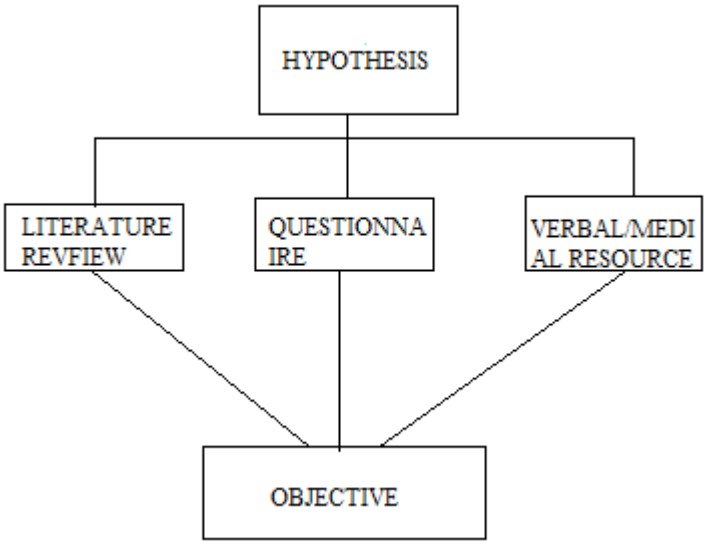

Figure 1 Conceptual framework of the study

G1obal Oil Palm Cultivation

The palms, botanically referred to as Arecaceae, are a family of stem-less, tree-like monocot plants. The African oil palm, Elaeis guineensis, is native to West Africa it is perhaps the world's most important palm species. Oil palm fruits are available year-round and have served as semi-wild food resources in traditional societies for more than 7000 years. Cultivation of the oil palm crop was originally an informal process mainly confined to the West and Central African coastal belt between Guinea, Liberia and Northern Angola (Corley and Tinker 2015). Globally, the best production levels are achieved in high rainfall areas in equatorial regions between 7° N and 7° S. During the 19th century, oil palm seedlings were transported to the Dutch East Indies now the modern Indonesia, and to the Malay States (now Malaysia), as part of colonial ventures to grow newly introduced cash crops in the region. Nigeria is contentiously the 5th largest palm oil in the world out of the estimated 42 countries who produce the oil globally. (IPPA, 2010). The world palm oil production increased from 11 million Metric Tonnes (MT) in 1990 to 23 million MT in year 2000, and amplified to 65 million MT in 2015 (USDA, 2015).

In present day, oil palm is crucial to the economies of many countries, especially Indonesia and Malaysia, from which large quantities of its products are exported in the form of oil, meal and other derivatives (Murphy 2019). More widely, oil palm is now cultivated in plantations across the humid tropics of Asia, Africa and the Americas, from where its products are exported to global markets. However, despite the increase in cultivation in these places around the world, the vast majority of oil palm is still grown in the two adjacent South East (SE) Asian countries of Indonesia and Malaysia as shown in the Table 2.1. these regions generate about 85% of the global palm oil production (Murphy 2019; Goggin and Murphy 2018). The major importing regions, collectively responsible for about 60% of total palm oil imports, are the Indian subcontinent (India, Pakistan, Bangladesh) with about 17 Mt, the EU-27 with 6.5 Mt, and China with 5 Mt (Statisa 2020).

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Table 2.1 Global Palm Oil Production. Source: Goggin and Murphy, (2018).

Rank	Country	Palm oil production	
		Mt	%
1	Indonesia	42.5	58.8
2	Malaysia	18.5	25.6
3	Thailand	2.8	3.9
4	Colombia	1.5	2.1
5	Nigeria	1.0	1.4
	Others	5.9	8.2
	Total	72.3	

The demand for palm oil has increased rapidly in recent years due to a combination of factors which include the followings;

1. Increasing demand sparked off by higher consumption of edible oils, particularly in growing population in emerging countries such as China and India.
2. Improving living standards and changing diets in people around the world
3. Development of the bio-fuels industry around the world, particularly in the European Union (EU), United States of America (USA), Brazil, Argentina, China and India
4. Changing weather patterns, which can have major geographical impacts and can be potentially quite large (Rosillo-Calle et al, 2009).
5. Developed economies are shifting away from the use of trans-fats to healthier alternatives. Palm oil is often used as a substitute for trans-fat as it is one of the few highly unsaturated vegetable fats that are semi-solid at room temperature and its relatively low cost.

With a population of over 190 million people and an estimated national population growth rate of 5.7% per annum, an average economic growth rate of 3.5% per annum Nigeria remains a huge market base for oil palm and its products. In 2005, in order to stimulate local production and attain self-sufficiency in edible oil production, the government introduced the presidential initiative on the development of edible oil over a period not exceeding three {3} years. Under this initiative, attention was focused on the promotion of eleven scheduled oil seed crops which are oil palm seed, groundnut seed, Soya beans seed, cotton seed etc. After seven {7} years of the initiative, the domestic edible oil demand far exceeds the national production. The short fall in supply is estimated at about 50,000 tons per year [Foraminifera, 2005]. From the above figures, it is clear that there is a large and sustainable market for palm products in Nigeria, however; contending challenges remains a bane to the development of the food and cash crop

Physiology and uses of Oil Palm

Oil palm can be used in various forms; the leaves are used in making brooms and as roofing materials (in the rural areas). The bark of the frond can be peeled and woven into baskets. The main trunk can be split like sawn timbers and used as part of building materials. Palm wine can be obtained from oil palm; red palm oil is readily obtainable from the fresh fruit bunches. When the fruit is processed the residue obtained can be used as fuel (for cooking and fertilizer to improve soil nutrient). Red palm oil is used in cooking, making soap, candle and margarine. Palm kernel oil can be extracted from the nut of the fruit

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(Sivasothy, 2006). The oil palm fruit is a sessile drupe and consists essentially of an exocarp (skin), a fleshy mesocarp which contains palm oil and a hard stony endocarp (shell) enclosing a seed called kernel in which the oil is contained (Poku, 2002). There are three main varieties of oil palm distinguished by their fruit characteristics as Dura, Tenera and Pisifera. In terms of kernel, Dura have large kernel, Tenera have medium kernel while Pisifera have smaller or no kernel (The Tropical Agriculturalist, 1998).

The residue obtainable in the process of palm kernel oil extraction otherwise called palm kernel cake is used as livestock feed. Palm kernel oil is used in vegetable oil and soap making. Palm kernel shells are also useful as energy source and industrial raw materials such as mosquito coils (Soyebo et al., 2005). A graphic of an oil palm and its fruit is shown in the Figure 2.1.

Figure 2: Oil Palm and its fruits. Source: Osaghae, 2014; Ajani et al 2012

Oil palm development in Edo State

Edo State is located in the South-South geopolitical zone of Nigeria and was created in 1991. It is bounded in the North and East by Kogi State, in the South by Delta State, and in the West by Ondo State. It lies approximately between Latitude 05o44.N and 07o34.N of the Equator and between Longitude 06o04.E and 06o43.E of the Greenwich Meridian. The annual rainfall averages are 250 cm near the coastal areas and 150 cm in the extreme northern part of the state. The temperature ranges from 22oC to 36°C. The soil type in the state is generally the reddish-yellow kind of ferrasols. This varies from area to area in the state. The vegetation also varies from the rain forest type in the Benin low lands to Savanna in the AkokoEdo uplands. Agriculture is the predominant occupation of the people in this state. The major cash crops cultivated are rubber, cocoa, and oil palm. In addition, the state produces crops such as yams, cassava, rice, plantain, guinea-corn, and various types of fruits and vegetables. (Bankole et al, 2019).

Agriculture provides employment and income for about 75% of the population of Edo State through traders, artisans, professionals in various fields. There is a supply gap of about 650,000mt of oil palm in Nigeria which can be closed by cultivating about 350,000 hectares of oil palm plantation. With respect to this, the Edo State Government had earlier disclosed plans to bridge, at least, 20 percent of the supply gap in Nigeria's oil palm market. The state government had said that with the inflow of investment into the state through the Edo State Oil Palm Programme (ESOPP), it will massively increase oil palm

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cultivation. The state through ESOPP, has commenced cultivation of 70,000 hectares of land for oil palm and intends to add another 20,000 hectares in the near future. (VON, 2022)

External Environmental Factors influencing Oil Palm production

External environment factors are elements that exist outside of an entity's internal environment that can affect its operations, productivity, development or its general existence. These outside forces can help the entity or present challenges to its current processes. There are the direct and indirect external environmental factors. The direct external environmental factors relate to those elements of the external environment which have a direct impact on the entity. The direct environment includes the competition, buyers, suppliers and interest groups like employee unions and pressure groups, the company's finances, personnel or equipment etc. The second type of external environment is the indirectly interactive forces. These forces include the followings;

1. Technological factors.
2. Economic factors.
3. Political and legal factors.
4. Demographic factors.
5. Social factors.
6. Competitive factors.
7. Global factors.
8. Ethical factors.
9. Legal factors

Considering the various factors which make up the external environmental factors, the present work will be exploring the prevailing external environmental factors which affects oil pam development in Edo state. This will be achieved through a structured conceptual framework which incorporates empirical and theoretical reviews.

Agricultural Policy framework in Nigeria and Edo state

Agriculture is one of the most difficult business to operate in Nigeria because of the harsh economic environment created by the government's inability to provide basic infrastructure like power, road network, funding of critical sectors. Gambold (2009) pointed out that the investment climate in Nigeria is harsh. In a survey conducted by IBRD/World Bank in 2004, Agricultural produce under unfriendly conditions which agriculture constitute the bulk of it. The hostile environment can be traced to improper funding, changes in reserve ratios set by Central bank of Nigeria which make it difficult for conventional banks to have sufficient liquidity to meet the demand of borrowers generally and agricultural operators in particular

Policies prescribe how people in an organization should act or behave (Asiabaka, 2002). Policy guides actions toward those that are most likely to achieve a desired outcome. Agricultural policy is a statement of action and a fundamental tool employed in achieving agricultural development (FBN, 1997). A programme, on the other hand is a comprehensive plan that includes objectives to be attained, specifications of resources required and stages of work to be performed (Asiabaka, 2002). Clearly, the persisted failures of agricultural programs in Nigeria have revealed the basic weakness of agricultural

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policies in Nigeria and the inability of the various past administrations in Nigeria to solve the basic and fundamental problems of agricultural development (Amalu, 1998). A cream of authors (Amalu 1998, Ayoola 2001 and Madukwe 2008) have also laid the failure on the door-steps of governments for the absence of or weak agricultural policies.

In Nigeria agricultural policies and programs have undergone changes especially in the postcolonial era. These changes have been a mere reflection of changes in government or administration (Amalu, 1998). The reason for the setback is attributed to the reason that these policies and programs vary only in nomenclature and organizational network. The various policies emphasize virtually the same objectives which include food security and sufficiency, export excess agro-produce to other countries, provision of extension services to rural dwellers and farmers, agricultural support and rural development services etc. Despite all the policies and seemingly laudable programmers with challenging themes, Nigeria is yet to achieve food security. Agriculture also continues to suffer from inertia associated with these policies and program reformation that pervade the country. In Edo state, agricultural policies and reforms have also been put to existence and action respectively by various administrations at the local and state levels.

Theoretical Review

Fauzia et al, (2020) carried out a research on Identification of internal and external factors in re-cultivation of oil palm. The authors who used the Focus Group Discussion method for their research concluded that based on their conducted research, it was deduced that conducting replanting oil palm is influenced by factors consisting of internal and external factors. The Internal factors that influence replanted were qualified into strengths which consist of motivation, land ownership, experience of farmers and farmers as members of farmer groups/ Village Unit Cooperatives. According to the author's findings, weaknesses included capital, farmer's knowledge, and lack of sources of income. On external factors the authors reported that there are opportunities and threats to replanting oil palm which include accessibility to oil pal mills, government support, the availability of seeds and fertilizers as well the use of biodiesel. They also identified threat in the replanting oil palm which consists of price fluctuations, professionalism of village unit cooperatives management and negative campaigns.

Bankole et al (2019) carried out research on Profitability and Factor Influencing Palm Oil Production in Edo State, Nigeria. The authors research methodology focused on the use of well-structured questionnaire using a multi-stage sampling technique. Descriptive statistics, budgeting analysis, and ordinary least squares (OLS) were used in analyzing their data. Results revealed that the majority of the respondents were male (86.4 %), having a mean age of 49.7, and married (90%). Palm oil production was shown to be profitable in the study area, with net revenue of ₦100 860. The return to scale (RTS) of 0.188 indicated a positive decreasing return to scale, and that palm oil production in the study area was in stage II of the production function and factors which influenced the oil palm production included depreciation on capital equipment, quantity of water used, producers' age and acquisition of more academic qualifications.

Murphy et al (2021) carried out a research on Oil palm in the 2020s beyond its challenges and solutions. In their summation of critical literature review, they asserted that Oil palm crop production faces many future challenges, including emerging threats from climate change and pests and diseases while the prevailing influencing factors included new scientific advances, breeding patterns, changing patterns of global trade and consumer sentiment, and the related issues of labour and mechanization.

Abdul Qadri et al, (2016) carried out research on the Productivity of Oil Palm Production Systems in

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Edo and Kogi States, Nigeria: A Total Factor Productivity Approach. Using a survey method with the use of questionnaire, the authors asserted that there is dominance of smallholders, low yield and inadequate documentation on productivity of the Oil Palm Production systems in the country. Their study investigated Total Factor Productivity (TFP) of oil palm production systems in Edo and Kogi States, Nigeria using Tornqvist TFP index. Data were collected using multistage sampling procedures. The results showed that the oil palm production in the study area was structured into small (≤ 10 hectare (ha), medium (11 – 50 ha) and large (≥ 51 ha). The TFP of the large, medium and small scale OPPS were 1.04, 0.99 and 0.82, respectively, while the overall TFP was 0.92. Promotion of large and medium scale systems with upgrading of small scale system to either medium or large scale system was recommended by the authors to enhance the pace of growth and development of the oil palm industry. In order to archive this, planned growth such as provision of necessary incentives like land availability, land preparation, planting and supervision of maintenance of immature palms till fruiting, followed by careful allocation of the farms to small scale farmers should be carried out by government

Qaim et al, 2020, carried out research on Environmental, Economic, and Social Consequences of the Oil Palm Boom. The authors asserted that Rising global demand for vegetable oil during the last few decades has led to a drastic increase in the land area under oil palm. Especially in Southeast Asia, the oil palm boom has contributed to economic growth, but it has also spurred criticism about negative environmental and social effects. In their detailed literature review, the authors asserted that the oil palm expansion has contributed to tropical deforestation and associated losses in biodiversity and ecosystem functions. Simultaneously, it has increased incomes, generated employment, and reduced poverty among farm and nonfarm households. Around 50% of the worldwide oil palm land is managed by smallholders. The authors recommended that sustainability trade-offs between preserving global public environmental goods and private economic benefits need to be reduced. Policy implications related to productivity growth, rainforest protection, mosaic landscapes, land property rights, sustainability certification, and smallholder inclusion, among others were also factors cited by the authors.

Udosen and Ugboya (2013) carried out a research on future of Nigerian Agricultural Industries using the oil palm production in Edo sate as a case study. The study analysed oil palm production from 2001 - 2008 in Edo State, with a view to establishing the future of Nigerian Agricultural oil palm industries. The specific objectives were to identify and quantify the factors influencing the production of oil palm, reveal the constraints to the production of oil palm; analyze the viability of oil palm production as an investment and predict the future of oil palm enterprise in Edo State. Three Local Government Areas of high oil palm concentration in Edo State were covered. Ninety selected oil palm producers from nine villages in the study area were selected. Frequency distributions and multiple regression analysis were used to analyze the results. The results showed that for the period under review (2001 - 2008) on a per hectare basis, seedlings cost, and labour cost were significant inputs, positively influencing the production of oil palm in the Edo State. A growth rate of 6.2% and 23.5% were projected for oil palm with reference to palm oil and fresh fruit bunches (FFB), respectively, up to the year 2020, an indication that oil palm production in the State is viable and the future is bright. The study revealed that inadequate storage facilities, poor planting materials and lack of government assistance, among others, are major bottlenecks in oil palm production in Edo State. The authors concluded however that, since oil palm production in Edo State is viable, it is an indication that the future of Nigerian Agricultural Industries was bright.

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Research Gap

Following the review of various literature of various authors and their research findings with respect to the subject matter on external environmental factors and oil palm development in Edo state, some prevalent factors were deduced as shown in the Table 2.2

Author	Review findings	Research gap
Udosen and Ugboya (2013)	The study revealed that inadequate storage facilities, poor planting materials, seedlings cost, and labour cost, and lack of government assistance, among others, are major bottlenecks in oil palm production in Edo State.	The authors' research was focused on a given period in the past and may or may not represent present day factors in the state
Qaim et al, 2020	Oil palm expansion, smallholders' management, preserving global public environmental goods and private economic benefits, policy implications related to productivity growth, rainforest protection, mosaic landscapes, land property rights, sustainability certification among others influenced oil palm production	The authors research was on a global scale with significant review of factors prevalent in their research region of Malaysia. It may require further study to verify the influence of such factors in oil palm development in Edo state
Abdul Qadri et al, (2016)	Large and medium scale systems, provision and preparation of land, planting and supervision of maintenance of immature palms till fruiting, careful allocation of the farms to small scale farmers by government influence oil palm development	Considering the period which the research was carried out, there may be need to verify the prevalence of listed factors in present day Edo state as listed factors may or may not apply again
Murphy et al (2021)	Climate change, pests and diseases, scientific advances, breeding patterns, changing patterns of global trade, consumer sentiment, labour and mechanization influenced oil palm development.	The research was mostly based on deduction from previous works and were not empirically verified by the authors.
Fauzia et al, (2020)	Accessibility to oil pal mills, government support, availability of seeds and fertilizers, price fluctuations, professionalism of village unit cooperatives management and negative campaigns	Research findings were mostly based on dedicated group discussions which may not reflect the views of other groups in a different region like Edo state.
Bankole et al, (2019)	External environment factors which influence oil palm production include depreciation on capital equipment, quantity of water used, producers' age and academic qualifications	It was not clearly state in the research woks if the sample space included a mix of rural and urban respondents.

METHODS

The present study was carried out using reviews and the survey research design. The survey research was specifically used due to its extensive and varied inputs of opinions of respondents drawn from rural and urban areas of Edo state where oil palm farmers, Agriculture ministries and related outfits are prevalent. The procedure for execution of the survey research are;

i. Definition of the problem

ii. Statement of the hypothesis

iii. Determining sample size

iv. Formulating research instrument

v. Data collection

vi. Analysis of data using statistical methods

vii. Results and Discussion

viii. Conclusion and recommendation.

Empirical Analysis

The total number of respondents = 184. The respondents were selected at random but from a dedicated agriculture related group with vast and long term experience in oil palm cultivation, agriculture extension services and related field of engagements. .The Taro Yamane sample sizing which involved the use of formula to determine the adequate number of people whose responses to the hypothesis would reflect the answers to the hypothesis with high accuracy was utilized. Determining the appropriate sample size is hinged on certain factors (Miaoulis and Michener, 1976) which include;

i. Purpose of the study

ii. Population size

iii. Level of confidence or risk

iv. Level of precision

v. Degree of variability of the attributes being measured

3.31. Determining sample size; use of the Taro Yamane formula

Yamane (1967) provides a mathematical formula to calculate sample size as follows;

$$n = \frac{N}{1+(N)e^2} \quad (1)$$

Where;

n = sample size

N = population size

e = level of precision which is taken as 0.05 with a 95% confidence level

Given the population sample of 184 cutting across the three senatorial districts of Edo state,

$$n = n = \frac{184}{1+(184)0.05^2}$$

n = 126

in order to obtain reliable data, a minimum of 126 persons were marked for interview via printed questionnaires.

Research instrument

For the study, questionnaire was used as the research instrument. The 3 parts questionnaire consisted of open-ended question, check-list question and five point Likert scale shared in 3 parts as follows;

First part; comprised of the demographic information of the respondents such as gender, age, education, monthly income, occupation, marital status as check-list questions.

Second part; comprised of questions on agro officers' knowledge of the subject matter.

Third part; comprised of a direct query on the view of the respondent on the influence of specific

external environmental factors on oil palm production in Edo state.

Formulating the research instrument

The questionnaire was formulated using the following steps:

a. Understanding conceptual framework of the study.

b. Questionnaire research question design.

c. Classification of the research questions.

d. Selecting the relevant questions and sequencing the questions in order

e. Testing the reliability of the questionnaire.

Data Collection and Validation of instruments of methodology

The questionnaires were randomly distributed to the various respondents and the result of the reliability testing of the questions in the questionnaire that are associated with the different external environmental factors that influence oil palm development in Edo had reliability level of $\alpha = 0.886$. For the study using SPSS program to interpret the result, if the value of α is more than 0.886 then the questionnaire is acceptable.

Data analysis of the research questions

The data of this study was analysed by a computer analytical software known as Statistical Package for Social Sciences) (SPSS) as follows :

1. The demographic background information of the respondents was analysed using simple frequency and percentage.
2. The information of the various respondent's responses on significant survey questions were ranged and presented using simple Mean (m) and Standard Deviation (SD).
3. The information of the influence external environmental factors on oil palm development in Edo state was analysed and presented using compare means statistics in forms of t-test and F-test.
4. The scoring of questionnaire was analysed using the five point– Likert scales.

The five – point Likert scales are as follow:

Strongly Agree = 5 points

Agree = 4 points

Neutral = 3 points

Disagree = 2 points

Strongly Disagree = 1 point

Class interval C = $\frac{\max value - \min value}{class\ number}$ (2)

Weighting scale:

1. = 1.00 – 1.80 means Strongly Disagree (Not true at all)

2. = 1.81 – 2.60 means Disagree (True to a minimal degree)

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3. = 2.61 – 3.40 means Neutral (True to a moderate degree)

4. = 3.41 – 4.20 means Agree (True to a high degree)

5. = 4.21 – 5.00 means strongly agree (Absolutely True)

Relevant mathematical relations to the data analysis

A. Percentage = P = f / N * 100% (3)

Where:

P = Percentage

F= Frequency to be converted to percentage

N = Numbers of frequencies

B. Mean = m = $\frac{\sum Ex}{N}$ (4)

where;

$\sum$x = summation of the data

N = number of data elements

C. Standard Deviation = SD = $\sqrt{\frac{\sum(x-m)^2}{(n-1)}}$ (5)

Where;

SD = Standard Deviation

n-1 = Value of information

m = Mean

n = Numbers of data

3.41. Testing of the reliability of the questionnaire;

This is done by setting the rating scale using Cronbach's Alpha-Coefficient expressed mathematically as;

$\alpha = \frac{n}{n-1}(1 \frac{\sum Vi}{Vtest})$ (6)

Where;

α = Reliability

n = Number of questions in questionnaire

V i = Variability of each of question score

Vtest = Variability of each of overall questions' score (not %'s) on the entire test

Testing the difference in mean between demographic background and behaviour from 7 aspects of marketing mix factors by using t-test and F-test:

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$$t = \frac{\sum D}{\sqrt{\frac{n\sum D^2 - (\sum D)^2}{(n-1)}}} \quad (7)$$

df = n-1

Where :

D = Difference between each data

N = The total of data

10. Testing of hypothesis

The chi-square was used to test the formulated hypothesis. The chi-square is mathematically expressed as;

$$X^2 = \frac{\sum (O-e)^2}{e} \quad (8)$$

Where: O = observed frequency

e = expected frequency

Σ = summation

The degree of freedom DF is expressed as;

DF = (r-1)(c-1) (9)

Where;

r = number of rows

c = number of columns.

From the data collated in the administered questionnaire; the chi-square Table 1 is formulated as follows;

Table 1 Chi-square table

Responses	O	E	O-E	$(O-E)^2$	$\frac{(O-E)2}{E}$
Strongly agree	80	38.0	42	1764	46.4
Agree	50	38.0	12	144	3.8
Neutral	26	38.0	-12	144	3.8
Disagree	20	38.0	-18	324	8.5
Strongly disagree	14	38.0	-24	576	15.2
Total	190				77.7

The chi-square calculated = 77.7

Df = (r-1)(c – 1) = 5-1 = 4

From the chi-square tables (shown in appendix 1), looking up the Chi-square critical value at 5%(4df) = 7.78.

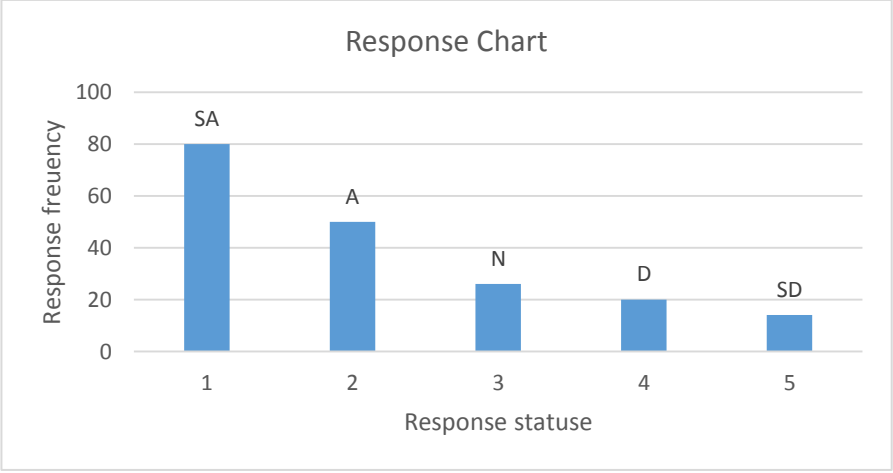
Decision: Since the chi-square calculated of 77.7 is greater than the critical table value of 7.78, the null hypothesis is rejected and by implication, it can be inferred that the listed external environmental factors have significant influence on oil palm development in Edo state.

Results and Discussion

Following survey data collection analysis, it was deduced that that there is a significant influence of external environmental factors on the development of oil palm in Edo state. The respondents to the survey questionnaire clearly agreed that external environmental factors which influenced oil palm development in Edo state include but not limited to the followings;

1. Funding
2. Government policies/ intervention
3. Insecurity
4. Storage
5. Land and property rights
6. Mosaic landscapes
7. Academic/professional qualification
8. Climate change
9. Pests and diseases
10. Scientific advancement
11. Breeding patterns
12. Changing patterns of global trade
13. Consumer sentiment
14. Agricultural mechanization
15. Depreciation on capital equipment,
16. Age

There was a majority strong agreement by respondents that external environmental factors affect oil palm production in Edo state as exemplified in the Figure 4.1 and with a sub majority of the respondents also agreeing to significant influence of funding, insecurity and government intervention on oil palm development in Edo state.



LEGEND; SA= Strongly Agree, A= Agree, N = Neutral, D = Disagree, SD = Strongly Disagree
Figure 4.1 Bar chart showing respondents response to external environmental factors

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A detailed corollary to issue of funding, insecurity and government intervention entails start-up capital, labour and maintenance costs, recent attacks by human invaders, government subventions such as provision of fertilizers, farm mechanization, loans, provision of infrastructures such as good roads, irrigation systems amongst others.

Conclusion

Responses from respondents of the survey questionnaire points to need for government to do more in encouraging oil palm development in the state through proper funding and favorable economic and agro-related policies. On a general note, deductions made from the present research include the followings;

i. Oil palm development in Edo state is still below expectations and only still contributes a small share of the total oil palm production of Nigeria.

ii. Major oil palm production in the state are owned by big companies who have the financial powers to sustain the crop production

iii. The rural peasant farmers lack modern cultivation practices hence; experiences low yields which further complicates their ability to raise funds.

iv. There issue of insecurity has become a significant factor in the development of oil palm amongst farmers or would be investors since the menace of human invaders in recent years across Nigeria.

Recommendations

The following recommendations were made following the outcome of the present research;

i. Government should prioritize funding and security agro investors in Edo state as much as it does in every other sectors of the state.

ii. Further research should be carried out in this subject area to ascertain specific challenges which are common to rural and urban regions with a view to streamlining the solutions necessary to mitigate such challenges in the respective regions.

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Appendix 1

Right tail areas for the *Chi-square* Distribution

df\area	.995	.990	.975	.950	.900	.750	.500	.250	.100	.050
1	0.00004	0.00016	0.00098	0.00393	0.01579	0.10153	0.45494	1.32330	2.70554	3.84146
2	0.01003	0.02010	0.05064	0.10259	0.21072	0.57536	1.38629	2.77259	4.60517	5.99146
3	0.07172	0.11483	0.21580	0.35185	0.58437	1.21253	2.36597	4.10834	6.25139	7.81473
4	0.20699	0.29711	0.48442	0.71072	1.06362	1.92256	3.35669	5.38527	7.77944	9.48773
5	0.41174	0.55430	0.83121	1.14548	1.61031	2.67460	4.35146	6.62568	9.23636	11.07050

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