OIL PALM PESTS' MANAGEMENT STRATEGIES AND NATIONAL AGRICULTURAL DEVELOPMENT IN NIGERIA

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ABSTRACT

The burning issues of Nigeria's national development have attracted much concern of management experts and practitioners alike. The present study's strategic interest in oil palm pests' management, oil palm development, and national agricultural development, are premised on the fact that Nigeria in the 1950s and early 1960s, derived greater part of the national economic development earnings from oil palm produce. Nigeria was then a celebrated world leader on oil palm produce, with strong national economy. The study fundamentally and empirically examined oil palm pests' management strategies, in relation to oil palm development and national agricultural development that will enhance national development in Nigeria. The study adopted documentary and cross-sectional research, and copies of Likert 5-type coded questionnaire were administered to 120 statistically selected managers/entomologists, drawn from selected oil palm development and related establishments in South–South and South–East areas of major oil palm belt of Nigeria. One hundred six copies of the questionnaire were found fit for use after data cleaning. Data generated were analyzed using Pearson's Correlation and Multiple regression techniques, with the aid of Statistical Package for Social Science. Findings of our study revealed positive correlation and strong statistical significant relationship between dimensions of oil palm pests' management strategies and national agricultural development. Based on our findings, we arrived at the proven fact that, effective oil palm pests' management will enhance oil palm productivity and national agricultural development in Nigeria. The study recommends amongst others, committed private and public sectors investments on oil palm development and productivity, for enhancement of effective national agricultural development, as applicable today in Malaysia.

KEYWORDS: *Oil Palm Pests, Management Control Strategies, Oil Palm Development, National Agricultural Development, Nigeria*

INTRODUCTION

Shortage of food and related agricultural produce, federal character maintenance, ethnic sentiments, transparent and effective leadership, security, proper accountability, effective oil palm development, mismanagement of resources, large scale corruption, and so on, are strategic in national economic development, and these are still among the most pressing national development challenges of the hour in Nigeria. Among the factors which limit national development via agricultural production are pests that destroy crops and stored products. These pests' challenges have created the gap

between food and industrial raw materials production, and human population increases continue to widen the gap, thereby worsening oil palm and agricultural developments and overall national development in Nigeria. When pests are left unmanaged, they are liable to cause such serious losses that will discourage further interests and attempts to grow certain crops that are strategic in national agricultural development, for instance, oil palm (Hartley, 1977; Taylor, 1977; Turner and Gillbanks, 1982; Chikwe, 1992; Kalidas, 2012).

The applicability of rational managerial control measures of oil palm pests requires thorough managerial knowledge of the biology and behaviour of the pests. The oil palm (*Elaeisguineensis*) is very strategic and of vital importance in Nigeria's national agricultural development. Oil palm crop is noted to be the richest source for vegetable oil production with a capacity of 4–6 metric tons of oil per hectare (ha) annually (Kalidas, 2012). Oil palm also has the similar record of the most sustainable crop to feed the hungry mouths of the world and national development enhancement, since it has the universal recognition as the most efficient, effective and highest yielding form of edible oil production (Basiron, 2011). Oil palm crop is evergreen and can produce all-year-round, and as such, the management of its pests' challenges to ensure optimum productivity is vital for national agricultural development. Oil palm provides the Nigerian nation's main cooking oil, serves as a viable strategy for employment generation, as well as a strategic raw materials provision for the Oleo-chemical industries and national development pursuit. Nigeria is an agrarian nation and has huge agricultural potentials for employment of labour, production of food and industrial raw materials, as well as enhancing the per capita growth and development of the economy and national development. With an arable land potential of 98.3 million hectare (ha), it is reported that only 34.2 million ha (48%) is cultivated, while 52% is at present unexploited (Nwankpa, 2017). To contribute and enhance Nigeria's national agricultural development, the present study is advocating the management of oil palm pests, and use of oil palm crop in specific to enhance the achievement of such laudable national agricultural development objective. This study becomes necessary because, it is on record that, about the beginning of the 20th century (about 1911), Nigeria controlled about 75% of the world oil palm production, and about 18% came from Sierra Leone (Hartley, 1977). It is also noted that, at this time, Nigeria controlled 45% share of the world market in oil palm produce, and this rose to 58% in 1953. Export figure declined from a peak of 225,000 tons in 1953 to barely three tons in 1968, and vanished completely by 1974 (Ejemba and Chikwendu, 1986). Nigeria lost her foremost place in palm oil exports to Zaire in 1962 and regained temporarily in 1964–1965. Total production from the grooves was estimated by FAO as about 500,000 tons of oil in 1971. With increased demand of palm oil, due to the increase in population and petroleum revenue, and decrease in groundnut oil production, Nigeria became a net importer of palm oil from 1976 till present date (Ejemba and Chikwendu, 1986). The urgent need for Nigeria to sit up and strive for extensive and intensive exploitation of all facets of oil palm development and production for national development comes to fore, hence the present study of oil palm pests management, since pests limit oil palm crop optimum production potentials (Hartley, 1977; Taylor, 1977; Turner and Gillbanks, 1982; Chikwe, 1992).

As argued by Kalidas (2012), the eco-friendliness of oil palm is revealed and manifested as it is a perennial plantation crop, the sustainability of its green canopy throughout 30 years of its average economic life, and as it does not cause soil erosion. Oil palm cultivation is noted to be beneficial to farmers, as they can get more in returns, since the Benefit-Cost-Ratio record for oil palm is more than 1.8 (Kalidas, 2012). Oil palm is a labour saving crop. This implies and suggests that, it is less labour intensive when compared with other crops. In addition to oil palm crop's high productivity, it is noted to be as a good sink for carbon dioxide absorption and very good source for oxygen production. Basiron (2006) argued that, a hectare of oil palm plantation produces an amount of 21.96 tons of oxygen annually, while 30.28 tons of

carbon dioxide absorbed accordingly. Basiron (2006) further posits that oil palm crop is far superior over other oil seeds crops whose production and productivity of vegetable oil is less than 1 ton, as well as oxygen (2.54 tons) is far below to oil palm crop. In view of these, the management of oil palm pests and oil palm development is strategic to national agricultural development and economic viability sustainability in Nigeria.

As noted by Anon (2011, in Kalidas, 2012), the cost benefit ratio of oil palm in Malaysia is 3.0, and this could be the reason for Malaysia's fast growth economy and national development. Nigeria's economic growth and national development should have been far better than that of Malaysia that was initially behind her in oil palm production in 1950s and 1960s. Nigeria's backwardness and such related national development challenges were as a result of emergence of oil and gas boom that engendered less interest in agriculture and in specific, oil palm development and production neglect, proper accountability and leadership transparency challenges, large scale corruption and resources mismanagement. However, to awaken Nigeria in its slumber as per oil palm development, Belgium trained oil palm experts (SIAT GROUP), who under their private ownership and management have at present, established about 35,000 ha of oil palm plantation at Edo and Delta states of Nigeria. The SOCFINCO of Belgium after successful feasibility report in 1974, under contractual arrangement with Rivers State Government, started in 1977, acquired land and established Risonpalm (Rivers State of Nigeria Palm), a 10,000 ha Oil Palm Estate with operational office at Ubima, involving five communities each in Ikwerre and Etche Local Government Areas of Rivers State, and handed over the plantation and 40 tons per hour oil palm mill to Rivers State Government (their principal) on December 31, 1985. This huge oil palm establishment was mismanaged by indigenous leadership, and some-what abandoned. The group (now named SIAT) are currently replanting the near abandoned 16,000ha of the oil palm plantation at Ubima and Elele Estates of former Risonpalm Nigeria Limited (now, SIAT Nigeria Limited), Rivers State, under contractual relationship of 35years with Rivers State Government. Other moves both in large plantations and small holders'oil palm enterprises are on in South–South and South–East geo-political zones of Nigeria, and such will enhance national agricultural development and national development.

Research Problems and Specific Objectives of the Study

At oil palm crop's various stages of development, the palm is subjected to various pests' infestations, which often times, result to serious economic damages and strategic loss in production. The roots, trunks and foliage of the palms can be attacked by pests. Reports abound that up to 40–60% reduction in the potential yield of adult field palms during severe pests outbreak of *Coelaenomenodera elaeidis (*leafminer*)* at Ubima Estate of Risonplam Limited in Rivers State in 1991, and up to 20–30% seedlings destruction in a nursery attacks at their (Risonpalm) Highland Oil Palm Project, Yenagoa (Chikwe, 1992). To revitalize Nigeria's agriculture and national development, the national development strategy of using oil palm as enhancing strategic crop is paramount and comes to fore. This is to enhance Nigeria's attainment of its former glory and status as world oil palm leading producer in the 1950s (Ejemba and Chikwendu, 1986). Oil palm pests have been noted as posing strategic set-back in oil palm development and production (Wood, 1968; Wood, Corley and Goh, 1973 in Kalidas, 2012; Dhileepan, 1988; Chikwe, 1992; and Kalidas, 2012). In specific, the objective of the study is to critically and empirically examine the strategic influence of oil palm pests' management strategies on oil palm development and national agricultural development in Nigeria.
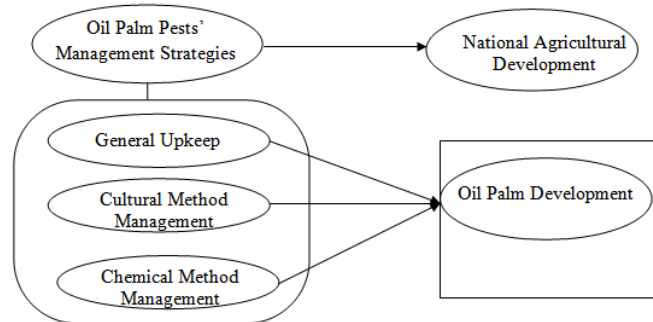
Study Variables and Conceptual Framework

**Figure 1: Conceptual and Operational Relationship Model
of Oil Palm Pests' Management Strategies and National
Agricultural Development in Nigeria.**

Research Questions

The following specific research questions guided the research effort, and these fundamentally are:

- To what extent do oil palm pests' management strategies impact on national agricultural development in Nigeria?

- To what extent does general upkeep as a dimension of oil palm pests' management strategies influence oil palm development as a measure of National Agricultural development in Nigeria?

- To what extent does cultural method measurement as a component of oil palm pests' management strategies, correlate with oil palm development as a measure of National Agricultural development in Nigeria?

- To what extent does chemical method management as a dimension of oil palm pests' management strategies impact on oil palm development as a measure of National Agricultural development in Nigeria?

Hypotheses

Ho_1: The general upkeep as oil palm pests' management strategy has no significant relationship with oil palm development in Nigeria.

Ho_2: The adoption of cultural method management as oil palm pests' management strategy has no significant relationship with oil palm development in Nigeria.

Ho_3: Chemical methods management as oil palm pests' management strategy has no significant relationship with oil palm development in Nigeria.

Fundamental Nexus and Literature Review

Concept of Pests and Diseases

The term pest is a widely used, but grossly abused term (Taylor, 1977). It has been described as an organism whose existence conflicts with man's profit, convenience or welfare. Plant pests are usually defined in terms of the degree and importance of crop damage or loss (Chikwe, 1992). Although, Chikwe noted that all organisms causing any damage or nuisance, or loss to crops can be regarded as potential pests. However, in our present study context, it is usual that we use the term strictly for organisms whose depredations cause significant economic damage or loss. As argued by Taylor (1977), the criterion for determining the status of any organism as a pest in crop production is, therefore, purely economic

and may be related not only to the number of organisms, the nature or severity of damage, but also the effect of damage or infestation on the yield, market value and acceptability of the crop. On the whole, it is important to know the numbers of organisms or level of infestation that is considered great economic importance before determining which organisms are pests. Virtually, all the pests of crop plants are animals, with exception of weeds and parasitic plants which sometimes are referred to as pests. In relation to these, plant diseases according to Taylor (1977) and Chikwe (1992) can briefly be defined as disorders or physiological disturbances of the normal functions of plants caused by physical, chemical or biological factors (i.e. the disease-inciting agents that are themselves living organisms, and these are those referred to mainly as PATHOGENS). In the same vein, symptoms are the visible morphological expressions of disease conditions. Nevertheless, it is even more difficult to determine what amounts to economic loss in diseases and the needs for management control are also usually based on economic considerations (Taylor, 1977). From the above brief descriptions, organisms which cause economic loss in quantity and quality of crops and products are, therefore, widely recognized as pests and diseases organisms.

However, in view of the nature of our present study, we shall examine the concept of pests to only limited major oil palm pests that cause economic damage and their management control strategies for oil palm development and effective national agricultural development enhancement.

Major Pests of the Oil Palm Nursery Palms

Termites (*Isoptera)*

These insect pests live in subterranean nests. They live in caste on individual bases and each soldier in the caste is characterized by an enormous gland that opens by a pore at the front of the head, where a sticky fluid is secreted. Nursery seedlings of oil palm are principally attacked by termites particularly during the dry season; specifically, the common one is *Armitermes evuncifer* species. This species attack and destroy the root systems of seedlings in the soil, and this causes the seedling to become pale, stunted or dead in event of heavy infestations.

Management Control Strategies

The management control methods of termites' eradication can be by cultural methods through frequency and volume of watering during the dry season up to the onset of the next rainy season. Relevant and appropriate chemical control recommendation by an expert or entomologist is advised. A careful observation for the pests' occurrence and early recognition and control will minimize damages done (Duckett, 1989).

Grasshoppers and Crickets (*Orhoptera*)

The grasshoppers use their mandibulate mouth parts to defoliate seedlings causing damages through bitting and chewing. The nymph stage is the most destructive phase, specifically when they swan. Detrimental effects of defoliation have been recorded in Sumatra (10–25%) and Honduras (22–30%) as expressed by Sipayung, Chenon and Sudharto (1989). Related observation was also recorded in Risonpalm Highland Oil Palm Project, Yenagoa in 1991 (Chikwe, 1992).

Management Control Strategies

This is mainly by cultural method by handpicking and destroying the nymph or the adults when they are at low infestation densities. The application of appropriate insecticide or other relevant chemicals is recommended.

Sucking Insects (*Hemipterans*)

Hemipterans are the groups of insect pests that are characterized by the possession of or the presence of the stylet or beak attached to the front part of the head or the underside, which projects backwards. The stylets are used for the piercing and sucking of the leaves sap. This causes malformations and twisting of the leaves as the bugs feed on them. For instance, Aphids (*Cerataphis variabilis*) are sometimes encountered. These aphids feed on the leaves and cause marked twisting and distortions of the central spears of the palm. It has also been reported that a wide spread of attack of this insect pests can defoliate and cause losses in yield as much as 50%, at 4–6 months after the attack (Wood, Corley and Goh, 1973).

Management Control Strategies

Application of contact insecticides or relevant organo-phosphate insecticides with systemic action can give high degree of remission. A much more efficient and sustainable control action for aphids and soft scale pests, according to Turner and Gillbanks (1982) is the use of natural enemies such as predacious ladybird beetles (*Coccinellidae*), Nutidulid beetles and Chalcidoidea (wasps). In severe attack as remarked, these ladybird predators may be imported. The general upkeep of the plantation environment is also very important to ensure total eradication.

Moths and Buterflies (*Lepidoptera*)

The adult insect pests have mouth parts adapted for feeding and are mostly harmless, but the larval stages called caterpillars are plant feeders and often are major crop pests. The larva aggregate and scrap the lower and upper surfaces of the leaves. Some of them are *Pimelephila ghesguirei* and *Zophorestes cerymica (*skipper).

Management Control Strategies

The cultural method of hand picking is recommended to be done when at low populations with hand gloves. Usage or application of relevant chemical or insecticide is also recommended. In all, early detection and control of the infestation is very important.

Coleopteran (Beetles)

These are also insect pests that attack oil palm seedlings. Examples of this include *Sesamiapoephaga*. The larva has been found to drill a hole at the base of the seedling, gnawing at the base. This action results to the wilting and subsequent withering of the central whorl of leaves, which comes off easily if pulled. The Dynastid beetles (*Oryctes monoceros*) attack field palms that are less than one year old, killing them. They also attack and kill mature palms.

Management Control Strategies

Avoidance of the frequent establishment of shaded nurseries. When infestation occurs, apply systemic insecticides.

Some Major Pests of Field Oil Palms
Chrysomelidae: Hispidae (*Coelaenomenodera Elaeidis*)

These are leafminers and the most destructive pests of oil palm in the field. Serious attacks of this have been reported some time in Imo, Edo and Cross River States of Nigeria (Ejemba and Chikwendu, 1986). The level of attack and destruction caused by leafminer in Risonpalm Limited, Ubima Estate in 1991 attracted the attention of entomologists from Nigerian Institute for Oil Palm Research (NIFOR), Benin. The research institute acted swiftly in response, control and eradication. The attack resulted to significant losses in fresh fruit bunches (FFB) yield (Chikwe, 1992). The attack results to the adults

eating up the longitudinal grooves in the leaves, while the larva develops and pupates between the upper and lower epidermis of the leaf blades, destroying the photosynthetic tissue to form a 'mine". In the event of serious attack, necrosis results.

Management Control Strategies

The cultural method of introducing several chalcid wasps to parasitize on the insect pests in their immature stages, for instance, eggs, larvae and pupae. Many Hamenopterans (ants) can also be introduced as natural regulatory agents to feed on the pests, keeping them in check. Other cultural control is by pruning and keeping the affected leaves within the period of larval abundance when the atmospheric humidity is high. This control measure strategy helps and ensures the fast decomposition of leaves, as well as the death of the insect pests. At high infestation level (threshold), appropriate insecticide (chemical), for instance, ultracide 40EC at 1.5 L/ha can be applied, using the canon sprayer e.g. tecnoma. General Field upkeep and maintenance is vital to the control of the pests.

Oryctesmonoceros and *Rhyncophorus* Species

These are other major coleopteran pests that attack oil palms in Nigeria (NIFOR). Similar observation has been made in India (Dhileepan, 1988). *Oryctes* species are often found attacking mainly adult palms by biting through the tightly packed and unopened leaves in the central buds. As a result, when the leaves are open, cut-edges are observed. In addition, they also destroy the midribs of the leaves, the spathes and inflorescence stalk bases.

Rhinoceros (Beetle)

Rhinoceros beetle, *Oryctes* rhinoceros has been observed to be a serious damaging pest of oil palm in Malaysia (Bedford, 1980). When severe damage occur, about 15% of the leaf area can be lost (Samsudin, Chew, and Mohd, 1993), and such has been observed in result to a decline in yield of upto 25% (Liau and Ahmad, 1991). It is also important to stress that damage by the beetles provides entry points of the beetles to the palm, leading to emergence of *Rhynchophorus ferrugineus* and other associated fungal pathogens that lead to bud rot disease (Mariau, 1999).

Rhyncophorus ferrugineus (Coleoptera curculionidae) larvae and adults feed on the crown of the palm or the spot where leaves have been pruned. The weevils are attracted by the primary wounds inflicted by *Oryctes,* leading to a secondary infestation and damage. This eventually results to the death of the palm. It is to be noted that most of the damages done by Rhyncophorus species tend to be secondary to that of *Oryctes* species. However, the control of *Oryctes* species is vital and such helps to achieve the control of Rhyncophorus species.

Management Control Strategies

The major management control strategy of eliminating Rhyncophorus species is by cultural method. This includes the strategic elimination of breeding sites, such as compost, refuse dumps, bunch wastes, burning of old palm stumps, handpicking by phytosanitory team and destruction of the adults, opening up of oil palm trunk to expose the beetles breeding ground to harsh weather. The chemical control strategies include, the painting of coal tar on the site of pruning wounds made by leaf pruning.

General Field Upkeep Management and Survey of Insect Pests

Routine surveys of insect pests' population in the field are very important. However, the frequency of routine survey depends on the cost benefit ratio of such operation. In addition, "systematic random sampling" technique could be adopted.

Experience from NIFOR recommendations indicate that field palms could be sampled by examining fronds 1, 9, 17 and 25 for insect pest populations (Chikwe, 1992). In the same vein, it is further observed through routine surveys on general upkeep and field maintenance that some *Oryctes* species have been found on leaf 17 and 25 of the oil palm fronds. In effect, the number of oil palms to be sampled in the survey will depend on the size of the plantation. Nevertheless, for the purposes of covering all the fields in a large oil palm estate, the management recommendations should be the sampling of 40 palms per field, and not less than 20 palms per field. The essence of this recommendation is to achieve effectiveness in the insect pests' population count and control.

Some Vertebrate Pests of Oil Palm

In the group of vertebrate pests of oil palm, a number of animals cause serious damages to oil palm, particularly the young oil palm plantings. Some of such common pests in most cases in plantations worldwide include: rats, porcupines, "cutting grass", *Thryonomusswinderianus* and birds (Turner and Gillbanks, 1982). The damages caused by these vertebrate pests differ and variability depends on the plantation location, pests' population and level of field upkeep and control.

Management Control Strategies

These include cultural methods by destroying their natural habitats, birds scaring, hunting, poison baits and regular field upkeeps and maintenance.

Oil Palm and National Agricultural Development

Nigeria is noted to be among the poverty-ridden nations in the world, and agriculture can serve as the leading growth and development sector in the globalized economy (Umo, 2012). Umo (2012) identified two basic solutions to substantiate his position on national agricultural development. (1) The presence of non-tradable staples such as root crops, tubers and local cereals can offer the much-needed food security and (2) agriculture can offer comparative advantage which is in primary activities as compared to manufacturing. It is on record that Nigeria spends substantial amount of its foreign reserves on importation of staple foods, which resulted to spend over 1.3 trillion naira in 2010 on rice, sugar, wheat, and fish imports (Adesina, 2012). Spending scarce foreign exchange on food means that less is available to import the much needed capital, technology, skilled labour, and management. These being the factors of production that tend to be in short supply in developing countries. To come out of this ugly situation, agriculture is the panacea, using oil palm development and effective oil palm pests' management as one of the major strategic solutions in such national development pursuit.

The perceived role of oil palm development in Nigeria's agricultural development cannot be overemphasized. It is for Nigerian nation to go back to the drawing board and see oil palm development as a stimulant and strategic paradigm shift, for her agricultural development that will enhance national development. This move will effectively complement the oil and gas sector of the economy for the achievement of wholistic national economic growth and national development. It is observed from World Bank (2008, in Nwankpa, 2017) record that, the Gross Domestic Product (GDP) originating from agriculture is to say the least, twice as effective in poverty reduction, as compared to the GDP originating from non-agricultural sectors. Nwankpa (2017) expressed that this observation has been the historical experience of China, India, Latin America, and of recent Ghana. It is further remarked that, Nigeria with huge agricultural potential should borrow a positive leaf from these noted economies and develop her agricultural sector, rather than much dependence on monolithic oil and gas sector associated with environmental and resource depletion, as well as the noted oil and gas economic shock vulnerabilities.

It is the view of this paper that Nigeria should focus strategic attention on agriculture for her national development as it were, with specific interest on oil palm development and effective management of its pests in her oil palm belt of the nation. This strategic option will no doubt, significantly correlate with and enhance the needed wholistic national economic development. In as much as our presents study focus is on agricultural aspect of oil palm development and its pests management that will necessitate national development, our study is not in any way, disregarding the manufacturing and oil and gas sectors of Nigeria's economy. On the other hand, Wit and Crookes (2013) succinctly remarked that Nigerian manufacturing sector has remained underdeveloped, and has contributed only about 3 percent of GDP annually between 2002 and 2007 (World Bank, 2012).

Oil Palm Pests' Management Strategies and National Agricultural Development

As common and applicable to most management concepts, national development has been relatedly viewed in various angles by different scholars. National Agricultural development can be conceptualized as advancement in agricultural industry which makes life more meaningful in the various aspects, including the economic, administration, infrastructure, social, cultural, and religious as well as human capital (Ajagun, 2003; Chikwe and Biriowu, 2019). Ibude (2008) describes national development itself, as the manner and process in which individuals, groups and corporate bodies cooperatively cultivate the capacity to regulate both internal and external relationships, to bring about growth in the quantity and quality of goods and services that are readily available in a country for the enhancement of living standards of the citizenry.

To increase Nigeria's agricultural growth rate and much needed wholistic national agricultural development, via effective oil palm development and its pests' management strategies, such will require multifaceted attack on a number of national challenges including, security (herdsmen-farmers problems and kidnapping, etc), large scale corruption, resources allocation and utilization problems, ineffective leadership, proper accountability, leadership transparency, etc. In addition, strategic attention should also be focused on interrelated oil palm pests' management strategies involving cultural control methods, oil palm fields general upkeep maintenance and judicious application of relevant pesticide (chemical) control measures and management. A slowly growing agricultural sector can also result in inflationary pressures (Zuvekas, 1979). In other words, this implies that, poor agricultural performance hinders the growth and development of the rest of the economy, as well as limiting the resources available to promote national development. Zuvekas (1979) posits that, a country can experience economic growth with a stagnant agricultural sector, but such is likely to be growth without national development. These observations are akin to what Nigerian nation is currently suffering, hence the need for extensive and intensive oil palm development and its pests management for the enhancement of Nigerian national development, including food security sustainability.

METHODOLOGY

The major methods adopted in the study include, the documentary and cross-sectional survey. Likert 5-type coded measurement scale was used in the design of the research instrument items. Instrument validity was ascertained through peer reviews and professional authentication, while the reliability of .859 was achieved using Chronbach's alpha, with the aid of Statistical Package for Social Sciences (SPSS) software. Data were drawn from 120 statistically selected managers/entomologists or plantation officers who are heading strategic departments, and who also have indepth knowledge of the issues raised in the research instrument items. These respondents were drawn from statistically selected oil palm establishments in South–South and South–East geo-political zones of Nigeria. These in specific are: Nigerian Institute for Oil Palm Research (NIFOR) Benin, Presco Nigeria Limited in Edo and Delta States; Bayelsa Palms Ltd; Siat

Nigeria Limited (former Risonpalm Ltd) Port Harcourt; selected Smallholder oil palm enterprises in Imo, Abia and Rivers States, and Monitoring and Evaluation Unit of Federal Department of Agriculture in the study area.

One hundred six copies of the research questionnaire were found fit for use after data cleaning. Data generated were analyzed, posited hypotheses tested, using Pearson's Product Moment Correlation and Multiple regression techniques at .01 level of significance, with the aid of SPSS software. As asserted by Cohen, Manion, and Morrison, (2007), multiple regression technique model is used to calculate the effect of two or more explanatory variables (the predictor) and one explained variable (the criterion variable). Regression analysis enables the researcher to predict the specific value of one variable when he knows or the assumption of other variables. It is also a way of modeling the relationship between variables (Cohen and Holliday, 1996).

Data Analysis and Discussion of Findings

This section starts with stating and testing the posited hypotheses, resultant analysis and discussion of findings.

Ho$_1$: There is no significant relationship between general upkeep and national agricultural development in Nigeria.

Table 1: Pearson's Correlation Analysis Showing the Direction and Magnitude of the Relationship between General Upkeep and Oil Palm Development in Nigeria

Correlations			
Variable 1	**Statistics**	**General Upkeep**	**Oil Palm Development**
	Pearson's		
General upkeep	Correlation Coefficient (*r*) Sign. (2-tailed) N	1.000 106	.772** .000 106
Oil Palm Development	Correlation coefficient (*r*) Sig. (2-tailed) N	.772** .000 106	1.000 106

**Correlation is significant at .01 level (2-tailed); $p < .01$.
Source: Research Data and SPSS Output.

Table 1 shows the correlation analysis and relationship between Oil Palm General Upkeep and Oil Palm Development in Nigeria. The results showed that the Pearson's correlation coefficient (*r*) is. 772, indicating strong positive and significant relationship exists between oil palm pests' management strategy dimension of general upkeep and oil palm development in Nigeria. In this scenario, the *p*-value is .000, which is less than .01 significant level, and thus, revealing statistically significant association.

Ho$_2$: There is no significant relationship between cultural method management and oil palm development in Nigeria.

Table 2: Pearson's Correlation Analysis Showing the Direction and Magnitude of the Relationship between General Cultural Method Management and Oil Palm Development in Nigeria

Correlations			
Variable 1	**Statistics**	**Cultural Method Management**	**Oil Palm Development**
	Pearson's		
Cultural method management	Correlation Coefficient (*r*) Sign. (2-tailed) N	1.000 106	.743** .002 106
Oil Palm Development	Correlation coefficient (*r*) Sig. (2-tailed) N	.743** .007 106	1.000 1.000 106

**Correlation is significant at .01 level (2-tailed); $p < .01$.
Source: Research Data and SPSS Output.

The relationship between cultural method management and oil palm development as in Table 2, showed that the correlation coefficient (r) is .743. This indicates that a strong positive statistical significant relationship exists between usage of cultural method (as oil palm pests' management strategy) and oil palm development in Nigeria. The p-value of .002, which is less than .01 significant level assert that, cultural method management has a significant and strong influence on oil palm development, using oil palm as a strategic crop in the quest for national agricultural development in Nigeria.

Ho₃: There is no significant relationship between chemical method management and oil palm development in Nigeria.

Table 3: Pearson's Correlation Analysis Showing the Direction and Magnitude of the Relationship between Chemical Method Management and Oil Palm Development in Nigeria

Correlations			
Variable 1	**Statistics**	**Chemical Method Management**	**Oil Palm Development**
	Pearson's		
Chemical method management	Correlation Coefficient (r) Sign. (2-tailed) N	1.000 106	.761** .000 106
Oil Palm Development	Correlation coefficient (r) Sig. (2-tailed) N	.761** .000 106	1.000 106

**Correlation is significant at the .01 level (2-tailed); $p < .01$
Source: Research Data and SPSS Output.

The relationship between oil palm pests' chemical method management and national agricultural development in Nigeria, as depicted in Table 3, revealed that the correlation coefficient is .761. This indicates that a strong positive and statistical significant relationship exists between chemical method of managing oil palm pests and the enhancement of national agricultural development in Nigeria. The p-value of .000 which is less than .01 significant level, statistically assert significant relationship. The results revealed that the usage of chemical method as a strategy of managing oil palm pests will enhance oil palm development effectiveness and national agricultural development, leading to ultimate national development in Nigeria.

Table 4: Multiple Regression of General Upkeep, Cultural Method Management and Chemical Method Management on Oil Palm Development in Nigeria

Coefficients[a]						
		Unstandardized Coefficients	**Standardized Coefficient**			
Model		**B**	**Std Error**	**Beta**	**T**	**Sign**
1	(constant)	.432	.107		4.034	.000
	General upkeep	.648	.069	.750	9.446	.000
	Cultural methodmanagement	.620	.115	.560	5.391	.002
	Chemical method management	.277	.134	.235	2.060	.000

a. Dependent variable: Oil Palm Development

The data in Table 4 show the regression results of the respective tests of the posited hypotheses 1–3, using the predictor dimensions of oil palm pests' management strategies and national agricultural development as the criterion and oil palm development as the measure. The results of our regression analysis show that the general upkeep of oil palm plantation has a calculated t-value of 9.446 and a corresponding significant value/probability value of .000. Conventionally, the statistical decision criterion is to reject the null hypothesis since the critical t-value (i.e. t-tab) is less than t-calculated. This implies, t_{cal}(9.446, .01,

105) $> t$-$_{tab}$ (1.96, .01, 105), and we statistically assert that there is a strong, positive and statistical significant relationship between general upkeep of oil palm plantation and oil palm development in Nigeria.

Table 4 similarly shows the regression results of cultural methods management dimension of the predictor and oil palm development. Our results indicate that the cultural method management has a t-cal value of 5.391 and a corresponding significant/p-value of .002. Using the statistical decision criterion, t-$_{cal}$ = 5.391.t-$_{tab}$ (.01, 105) = 1.96. As a result, the null hypothesis is rejected, revealing that there is a statistical significant relationship between cultural methods management as the predictor dimension and oil palm development as a measure of national agricultural development in Nigeria. The results indicate that, the management of cultural method of pest control will enhance oil palm pests' management and overall productivity of oil palm enterprise that will ensure national agricultural development and national development in Nigeria.

In the same vein, Table 4 indicates that chemical method management has a t-calculated value of 2.060, with a corresponding significant value/probability value of .000. Based on the statistical decision rule, t-calculated = 2.060 > t-tabulated (.01, 105) = 1.96; and the null hypothesis is conventionally rejected, and the alternative is accepted. This implies that, there is a significant relationship between chemical method management of controlling oil palm pests that will ensure oil palm enterprise development and national agricultural development, leading to Nigerian nation wholistic development.

Table 5: Summary of Pearson's Correlation and Multiple Regression Findings and Statistical Values of the Relationship between the Dimensions of Oil Palm Pests' Management Strategies and National Agricultural Development in Nigeria (N = 106)

Dimensions	R-Value	T-Value	P-Value	Remarks
General Upkeep	.772	9.446	.000	Statistical significant relationship
Cultural Method Management	.743	5.391	.002	Statistical significant relationship
Chemical method management	.761	2.060	.000	Statistical significant relationship

CONCLUSIONS

With increased oil and gas production and price vulnerability in the global market arena, and Nigeria in specific, the role and use of oil palm pests' management and oil palm enterprises development to enhance Nigeria's national development is a welcome development. Our study has revealed that, the continuous general upkeep of oil palm plantation, appropriate cultural methods management and effective chemical (pesticide) method management adoption will help to control oil palm pests. Such strategic approach and adoption in oil palm enterprises development will increase oil palm productivity and enhancement of national agricultural development, leading to eventual economic and national development sustainability.

RECOMMENDATIONS

- Since oil palm played a vital role in national economic development in Nigeria in 1950s and early 1960s before the emergence of oil and gas boom, committed Nigerian government and private businessmen should embrace agriculture which is a primary industry, and oil palm development in specific to complement the oil and gas sector for effective national economic development.

- Committed Nigerian businessmen and politicians should borrow a positive leaf from Malaysia, and the Presco Nigeria Limited and Siat Nigeria Limited (Group of Brussels' oil palm development scheme) in South–South, Nigeria, to enhance national development, instead of laundering monies and turnkey project establishments outside Nigeria.

- Smallholder oil palm enterprises development should be encouraged by committed government and private businessmen.

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