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Traditional Occupational Practices And Survival Of Maize Farming In Rural Area In Ogun State

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Abstract

This study assessed traditional occupational practices and survival of maize farming in rural area in Ogun state. The specific objectives of this study were to: determining the influence of leadership structure in rural areas on climate change on the survival of maize farming in the study area, determine the influence of land management on pesticides usage on the survival of maize farming in the rural areas of Ogun State, determine the effect of indigenous knowledge on pest and disease on the survival of maize farming in the rural areas of Ogun State and determine the influence of Land management on fertilizer usage on the survival of maize farming in the rural areas of Ogun State. This study adopts survey research method; the population of the study was rural farmers within Abeokuta south local government area, who are involved in maize farming, the total population for this study is ninety six (96), the sampling technique that was used for this study is the simple random sampling technique, the instrument that was used for this study is a structured self-designed questionnaire, descriptive statistics was used to analyze the data collected for this study, hypothesis was tested using chi- square method; The result of the study shows that leadership structure significantly influenced climate change on the survival of maize farming in rural areas, *land management has significant influence on climate change on the survival of maize farming in rural areas, indigenous knowledge can help in pest and disease control on the survival of maize farming in rural areas and land management has significant influence on fertilizer usage on the survival of maize farming in rural areas. In conclusion, the study revealed that traditional occupational practices have an impact on on survival of maize farming. The study therefore recommended that, f or easy access to information and effective utilization, there is need for establishment of information centers by Nigerian Meteorological Agency (NiMet) in all rural communities in Nigeria. Such information centers could provide the rural maize farmers information on Fertilizer usage, Pest and disease, Pesticides usage, Climate change, Leadership structure and Land management and its impact on productivity and survival of maize farming and the government, private investors or Non-Governmental Organizations should endeavor to provide rural areas farmers with inputs support like fertilizers, land, credit facility and improved education e.t.c*

Keywords: *Occupational practice, Maize farming, Traditional, Rural area, Rural farmers*

Introduction

Farming constitutes an important component of the agricultural economy in developing countries and it is an instrument to socio-economic change, improved income and quality of rural life in Nigeria (Lawal, Torimiro, & Makanjuola, 2009).According to (Gadédjisso-Tossou, Avellán, & Schütze, (2020) Maize (Zea mays, L.) is one of the main cereal crops of West Africa. It is the fourth most consumed cereal during the past two decades, after sorghum, millet and rice in Nigeria. Maize is the world's highest supplier of calorie with caloric supply of about 19.5%. It provides more calorie than rice (16.5%) and wheat (15.0%). It is one of the most important staple foods in the world today. Maize is also the most important staple food in Nigeria and it has grown to be local 'cash crop' most especially in the south-western part of Nigeria where at least 30% of the crop land has been devoted to small-scale maize production under various cropping systems. Nigeria is the 11th largest producer of maize in the world, and the 2nd largest maize producer in Africa after South Africa. As a versatile crop that is not just consumed domestically, maize is used industrially by flour millers, brewers, bakers of bread and confectionery and animal feed manufacturers. Despite its high production volumes, maize farming in Nigeria yields an average of 1.8 MT/Ha which is one of the lowest among the top 10 maize producers in Africa. It lags behind countries such as Egypt and South Africa where the yields are 7.7MT/Ha and 5.3MT/Ha respectively making it difficult to totally meet the domestic and industrial maize demand.

Maize is the most important staple in terms of calorie intake in rural Africa. Maize becomes a more low-priced crop relative to other staples such as wheat and teff to rural and urban consumers through increased production forcing market prices down. It is now gradually more used both separately as well as in mixed flour with other more expensive cereals in traditional African diets (Tsedeke et al., 2015). The 2004/2005 national survey of consumption expenditure indicated that maize accounted for 16.7% of the national calorie intake followed by sorghum (14.1 %) and wheat (12.6%) among the major cereals (Berhane et al., 2011). The familiarity of maize in Africa is to some extent because of its high value as a food crop as well as the growing demand for the Stover as animal fodder and source of fuel for rural families. Approximately 88 % of maize produced in Africa is consumed as food, both as green and dry grain. Maize for industrialuse has also supported growing demand. Very little maize is currently used as feed but this too is changing in order to support a rapidly growing urbanization and poultry industry (Zerihun et al., 2017).

Maize is one of the most important cereal crops in the world, in agricultural economy both as food for human beings, feed for animals and other industrial raw materials. It is one of the world's leading crops cultivated over an area of about 142 million hectares with a production of 637 million tons of grain. In Africa, the current area planted under maize was 849,892 ha with an average yield of 2.02 t ha (ATA, 2011). It is estimated that for the next two decades the overall demand of maize will be increased by 4% ~8% per annum resulting from the increased demand for food. Such increase in demand must be met by increasing the productivity of maize per unit of land (Smith, Haberl, Popp, Erb, Lauk, Harper, & Rose, 2013). However, over the decades, the agricultural production including maize has either remained stagnant or increased at a very slow rate (Ray , Ramankutty, Mueller, West, & Foley, 2012)).

Importance of maize cannot be over-emphasized in the developing world, including the potential to mitigate the present food insecurity and alleviate poverty. Maize is a preferred staple food for over 900 million poor consumers, 120-140 million poor farm families and about one third of malnourished children (CIMMYT & IITA, 2010).In sub-Saharan Africa, absence or shortage of maize in variably leads to famine and starvation. It is estimated that by2025, maize would have become the crop with the greatest production in developing countries and the world, and by 2050, the demand for maize in developing countries will double (CIMMYT & IITA,2010).Due to the fact that maize is highly responsive to production inputs; its food and industrial uses are many, and its production potential can hardly be matched by any of the other major cereals. It is therefore, definitely a solution to hunger, which can salvage the famine population. As the popular Yoruba saying in Nigeria goes: Igba gbogbo ni agbado ngba ni(maize saves at all times).

In fact, Nigeria is one of the major importers of food items in the Sub-Saharan Africa. Report by FAO (2013) indicated that Nigeria was the highest importer of rice in the Sub-African region. To worsen the situation, most of the young and able-bodied men who are supposed to adopt farm mechanization easily are continuously leaving the rural areas for urban cities in search of jobs with better remuneration. This ugly scenario calls for a serious concern because the inability of Nigeria to feed her teeming population that has been estimated to be growing at the rate of 3.2 percent per annum (Julius, 2014) is a pointer to national calamity. This should be addressed because the index for measuring the independence of any nation is her ability to feed her population.

A working definition of traditional forms of occupation is based on customs. However, it should be noted that, even with occupations that are based upon old customs and usages, innovations are a necessary part of occupational practices, whether in the field of agriculture, hunting or fishing. In some areas traditional occupations and practices contain many modern innovations or modified practices. We shall attempt to distinguish between these various occupations and practices, which vary from community to community and from region to region. We shall now attempt to provide a precise and formal definition of the term "traditional occupation". (Calleros-Rodríguez,.2013) defined traditional occupation as those occupations that have been followed by successive generations of indigenous people and their communities, and are rooted in customs and practices that were established prior to the colonization of the region in the nineteenth century. These include traditional occupational practices, which were largely subsistence oriented before, but now are wholly or partly market oriented. Traditional occupations have been described as occupations practised by successive generations, rooted in customs and practices and focused on subsistence economies, pre-dating colonisation and the industrial revolution. Often these refer to occupations within agriculture and crafts, with crafts encompassing a range from weaving to the construction of buildings.

Over the years, traditional forms of agriculture—on small farms, using dry-land techniques and intercropping, with a dependence on organic inputs, indigenous knowledge and local seed banks—have been portrayed as primitive and inefficient and have therefore been marginalised. Small-scale traditional farming has been replaced by larger farms through land alienation caused by distress sales by small peasants. Traditionally, Nigerians were predominantly subsistence farmers of sorghum, maize, millet, cassava, yams and plantains, however due to a lack of investment in technology, infrastructure, roads and marketing, agriculture has failed to keep up with the growth in the population. Agriculture in Nigeria as in most other developing countries is dominated by small scale farm (rural farmers) producers (Ibitola, Fasakin, Popoola, & Olajide, (2019). Education of farmers, farm size, extension agent contact, farm income, ability to predict rainfall and climate change, modern communication facilities, output of maize and mixed cropping combination with maize have positive or Negative influence on the survival of maize and maize production. Olawande et al., (2009) in Kenya also confirm that age, education, availability of fertilize, distance to fertilizer market and agro ecological potential significantly influenced the survival and production of maize by rural farmers. Wanyama et al., (2009) in Kenya showed that change agent (extension) visit to farmers, proportion of land under maize production, sex of household head, and agricultural training significantly affected likelihood of farmers adopting new technologies in maize production.

One of the major uncertainties with the future trajectory of maize survival and productivity in Africa is the likely impact of a changing climate (Shackleton, & Luckert, 2015). Several studies (Amjath-Babu, Krupnik, Aravindakshan, Arshad, & Kaechele, 2016);;Nelson et al. 2010 ; Seo et al.2009 ; Ramirez-

Cabral, Kumar, & Shabani, (2017) provide strong evidence that predicted changes in temperature and rainfall caused by global warming may impose additional serious constraints on maize production in Africa (Benin et al.2016). Climate change will have a direct impact on the availability of water for irrigated crops. In addition to changes with precipitation, climate-change-induced higher temperatures increase the water requirements of crops (Capitani, Garedew, Mitiku, Berecha, Hailu, Heiskanen, & Marchant, 2019). Climate change is likely to make matters worse with further increases in rainfall variability being predicted (Schlenker & Lobell, 2010). Climate change is also expected to alter pest and disease outbreaks, increase the frequency and severity of droughts and floods, and increase the likelihood of poor yields and crop failure (Harvey et al. 2014). The ability of agricultural communities and other agricultural stakeholders in Africa to cope with the constraints and opportunities of current climate variability must first be enhanced in order to be able to adapt to climate change and the predicted future increase in climatic variability. Tools and approaches are now available that allow for a better understanding, characterization and mapping of the agricultural implications of climate variability and the development of climate risk management strategies specifically tailored to the needs of stakeholders (Pulwarty, & Sivakumar, 2014).

Specific concerns about climate variability on survival of maize include variability in the onset and cessation of rainfall, rainfall amount, and frequency and duration of periods of soil water deficits. This variability greatly affects maize survival and production in rain fed systems, and is a major disincentive to the adoption of yield-improving practices, these study therefor aim to access traditional occupational practices and survival of maize farming in rural area in ogun state

Statement of Research Problem

Maize in Nigeria is attacked by an array of diseases that can cause significant damages. These include the downeymildew, rust, leaf blight, stalk and ear rots, leaf spots and maize streak virus (IITA, 2010). However, Striga is one of the most dangerous weeds in maize production especially in savanna area of Nigeria. Yield losses from Striga range from 10 to 100% depending on time of parasite infection (Olaniyan, 2015). In a study, Striga infestation reduced grain yield of two susceptible hybrids by 49% and of two tolerant hybrids by 24%.

The two tolerant hybrids produced on average 87% higher grain yield than the two susceptible hybrids under low N rates (0-60 kg/ha) and 51% higher yields under high N (90-150 kg/ha) (Milošević-Đerić, Ristanović, Aćimović, Šošic, & Novaković, 2014). Efforts are continuously made to reduce or control these diseases; however, the efforts were complicated by several factors that are making it difficult to achieve an impact in a relatively short time, due to the following reasons, Important diseases change with time, Some diseases are specific to particular ecologies, whereas others are present in all ecologies, Difficulty in infecting maize with some of the diseases for effective screening of the germplasm for resistance for example downey mildew, Difficulty of artificially inoculating maize plants to screen for resistance, therefore, plant breeders could not study the genetics of resistance of some of the diseases (Badu-Apraku, & Fakorede, 2017).

Also, low soil fertility also ranks among the most serious constraints of maize survival and productions which are brought mainly by reduction in the fallow period because of ever increasing population pressures. Nigeria as in many other tropical climates is characterized by high rainfall and insolation, the attendant problem of nutrient leaching and low level of soil organic matter which has made nitrogen the most nutrient limiting maize production in Nigeria (Olaniyan, 2015).

Regarding maize production another major problem that effect the survival of maize farming is lack of fertilizer usage, fertilizer usage in Nigeria is the costly because the government has reduced drastically the subsidy on fertilizer. In view of this a bag of nitrogenous fertilizer costing only N3.00a bag (50kg) to the farmer in 1980s, N1,500 in 1990s is now N6,000. Fertilizer is relatively expensive in Nigeria than countries in Asia or South America, probably because fertilizer imports have to be financed with foreign exchange which is often in short supply. Another obstacle to fertilizer use in Nigeria is the unavailability at the time when the farmer need sit or in the formulations they desire. Many factors contribute to fertilizer supply problem. Planning and administering a national fertilizer program require skills that are not always available in the government agency that oversee input supply, and the private sector also may experience problems in distribution of fertilizer (Wanzala-Mlobela, Fuentes, & Mkumbwa, (2013)

Most maize farmers in Nigeria especially rural areas practice subsistence farming with low productivity. This may be attributed to high inefficiencies (technical and allocative) because farmers lack access to available resources or less information on efficiency, and low literacy levels limiting interpretation of such information to guide them in commercial production and efficient utilization of resources which lead to improve production in the study area.

Research Questions

The study came up with research questions so as to ascertain the above objective of the study. The research questions for the study are:

a) What is the influence of leadership structure in rural areas on climate change on the survival of maize farming in the study area?
b) What is the influence of Land management on pesticides usage on the survival of maize farming in the rural areas of Ogun State?
c) What is the effect of Indigenous knowledge on pest and disease on the survival of maize farming in the rural areas of Ogun State?
d) What is the influence of Land management on fertilizer usage on the survival of maize farming in the rural areas of Ogun State?

Literature Review

The meaning of traditional occupations

Traditional occupations have been described as occupations practised by successive generations, rooted in customs and practices and focused on subsistence economies, pre-dating colonisation and the industrial revolution Bagilhole, (2014). Often these refer to occupations within agriculture and crafts, with crafts encompassing a range from weaving to the construction of buildings. Does that mean that all old occupations are to be considered traditional? Although occupations like medicine, teaching, wine-making, politics, and the making of music, have been practised for centuries, they are considered modern because of the newness of the institutional frameworks and technologies that are being deployed today McDowell, (2015). Super-speciality medicine and computer-aided textile design evoke and suggest a modernity of the occupation itself, though these are old occupations with modern support structures and scaffoldings. Traditional occupations are often conflated with traditional modes of practising occupations Hughes, (2016). While ‘‘old’’ and ‘‘new’’ refer to a chronological timeline, modernity and tradition are more complex concepts that refer to embedded values and ideologies, production technologies, knowledge systems, levels of mechanisation, and integration with capitalist modes of production and marketing.

This research work focuses on agriculture and crafts for three reasons. First, the wide spectrum of occupations and livelihood systems within agriculture and crafts caused by changes in knowledge, trade systems and markets, social structures and institutional frameworks, international agreements, national policies, and the emergence of transnational corporations, offer many insights relevant to career guidance practice. Second, the dynamism and willingness to adapt to contemporary realities demonstrated by those who practise traditional modes of agriculture and crafts calls for a coherent examination of their role and significance today as they co-exist alongside the modern Bagilhole, (2014). Third, the increasing demand for organic foods and for traditionally produced goods and services suggests that they could belong to the future as well as the past. Their scope for constant innovations, the potential for entrepreneurship, and the unique dilemmas of the artisan/peasant, demand an enquiry into the place of traditional agriculture and crafts in the world of modern careers and career guidance. While these issues provide a rationale for the focus on agriculture and crafts, they are also a sombre reminder that the task ahead is both complex and layered.

Watts, (2013) defines career as ‘‘the individual’s lifelong progression in learning and in work’’. The scope for crafts and agriculture to be part of a long-term progression in a person’s life is a key theme in this article. The sustainable livelihoods framework developed by Rakodi, (2014) refers to livelihoods as a system comprising people’s capabilities, natural resources, material land social assets people draw upon, the strategies they adopt for subsistence, social and cultural contexts in which they make a living, and risk factors that determine vulnerability. Career guidance involves helping people make choices and plans and within this framework, planning as a component of guidance refers to planning for livelihoods.

Traditional Agriculture in Today’s World

Over the years, traditional forms of agriculture—on small farms, using dry-land techniques and intercropping, with a dependence on organic inputs, indigenous knowledge and local seed banks—have been portrayed as primitive and inefficient and have therefore been marginalised. Small-scale traditional farming has been replaced by larger farms through land alienation caused by distress sales by small peasants Mngumi, (2016). Plough and irrigation techniques, the use of chemical fertilizers and pesticides, the privileging and acceptance of corporate-sponsored research as the knowledge that counts, and dependence on corporations for hybrid or genetically modified seeds are developments collectively referred to as the ‘‘modernisation’’ of agriculture—a process often driven by national governments in a quest for food security and increases in production.

While large-scale modern agriculture increased food production, the human and ecological costs of such modernisation have slowly become evident. In India, for example, 182,936 farmers, unable to pay back crop loans, committed suicide between 1997 and 2007 (Sainath,2009). In addition, the plight of more than 30million people displaced by irrigation dams, soil and water pollution, and pesticide-related deaths, deformities and disease, has raised serious questions about the violence of this paradigm of agricultural modernisation. There are now reports across both developed and developing countries of peasants shifting away from inter-cropping and production of coarse grains (the staple source of food and protein for the poor), towards mono-cropping of cash crops and non-food crops, leading to nutrition deficiency, food insecurity, and indebtedness. Yet, sustainable and organic agriculture is practised today in various cultural, ecological, and socio-economic eco-systems across the developing world, as farmers have either maintained their faith in traditional knowledge or were unable to afford and access chemicals and commercial seeds Crews, Carton, & Olsson, (2018).

Origin, Classification and Botany of Maize

The term ‘maize’ seems to be derived from the word ‘mahiz’ of Taino language of the Caribbean islands, which became ‘maiz’ in Spanish (IITA 2010). Based on this common name, Linnaeus included the name as species in the botanical classification of Zea . Maize is also popularly known as ‘corn’ in English-speaking countries. In some countries, ‘corn’ means the ‘local staple’, while in some others it is used for any ‘cereal’. The ear of maize is unique among cereals, and morphologically similar wild pro-genitor of maize could not be found. Therefore, its evolution has been a great scientific challenge and of great interest for both biologists and archaeologists.

It is generally agreed that teosinte (Z. mexicana) is an ancestor of maize, although opinions vary as to whether maize is a domesticated version of teosinte, (Bonavia, 2013). Zeais a genus of the family Graminae (Poaceae), commonly known as the grass family. Maize (Z. mays L.) is a tall, monoecious annual grass with overlapping sheaths and broad conspicuously distichous blades. Plants have staminatespikelets in long spike-like racemes that form large spreading terminal panicles (tassels) and pistillate inflorescences in the leaf axils, in which the spikelets occur in 8 to 16 rows, approximately 30cmlong, on a thickened, almost woody axis (cob).The whole structure (ear) is enclosed in numerous large foliaceous bracts and a mass of long styles (silks) protrude from the tip as a mass of silky threads (Kostrakiewicz-Gierałt, 2020).Pollen is produced entirely in the staminate inflorescence and ear, entirely in the pistillate inflorescence. Maize is wind pollinated and both self and cross pollination is usually possible. Maize is cultivated worldwide and represents a staple food for a significant proportion of the world's population. No significant native toxins are reported to be associated with the genus Zea (Shears, & Ross, (2009).

Importance and Uses of Maize

Maize is the world's most widely grown cereal, as it is grown in a range of agro-ecological environments, and more maize is produced annually than any other grain. It is the most important cereal crop in the economy of African countries, and is one of the most important commodities used for food aid. Owing to the fact that it is cheaper than other cereals (such as rice and wheat), it is more affordable to the vast majority of the population, and therefore, occupies a prominent position in the agricultural development agencies of several countries in Africa. It is an important staple food for more than 1.2 billion people in Sub-Saharan Africa (SSA) and Latin America. All parts of the crop can be used as food and non-food products (IITA, 2010) and as a versatile crop; maize has been put to a wider range of uses than any other cereal. Maize is widely consumed as food in many parts of the world, and it is a staple food in developing countries, particularly in continents of Latin America, Asia and Africa. It is also a basic ingredient for some indigenous drinks and food products. In the developed world, maize is largely used as livestock feed and raw material for industrial products, while in developing countries it is mainly used as food.

In sub-Saharan Africa, maize is a staple food for an estimated 50% of the population and provides 50% of the basic calories. It is an important source of carbohydrate, protein, iron, vitamin B, and minerals. Africans consume maize

as a 5starchy base in a wide variety of porridges, pastes, grits, and beer. Green maize (fresh on the cob) is eaten parched, baked, roasted or boiled and plays an important role in filling the hunger gap after the dry season (Okoli, 2020).
Maize grains have great nutritional value as they contain72% starch, 10% protein, 4.8% oil, 8.5% fibre, 3.0% sugar and 1.7 % ash (Huma, Hussain, Ning, & Yuesuo, (2019).Zea maysis the most important cereal fodder and grain crop under both irrigated and rainfed agricultural systems in the semi-arid and arid tropics (Benin et al., 2016). The per capital consumption of maize in Ghana in 2000 was estimated at 42.5kg (MoFA, 2000) and an estimated national consumption of 943000 Mt in 2006 (Okoli, 2020).

Maize as Livestock Feed

The bulk of the concentrated feed to farm animals consist of grains, and maize is the most important and preferred one due to its low cost (compared to other cereals), low fiber content and high starch content which consist of concentrated energy food that gives highest conversion of dry substance to meat, milk and eggs. Maize stover, which is the plant residue after the ear has been removed (contains 30 to 40% of the plants total nitrogen, 75% of the potassium, sulphur and magnesium and almost all the calcium) is used by many farmers in developing countries as roughage feed for livestock (Olaniyan, 2015). Silage maize is important feed in temperate areas (United States, Canada and Europe), and consists of entire plant, which is cut, chopped and placed in a structure for anaerobic fermentation so as to allow for storage. In 2005, of the 42% of the world maize produced in United States,58% served as feed; while 17% went into industrial uses and ethanol production (Agbo, 2021).
Maize can be processed into different products for various end users at the traditional level and on industrial scale. A large proportions of products utilized in developing countries are obtained from traditional processing, while industrial processing meets the bulk of the demand in developed countries. Traditional com-mercial products obtained from maize are based on certain endosperm and some quality parameters, which influenced the choice and suitability of maize varieties for various uses. The properties include chemical, physical, biochemical, physico-chemical, organoleptic and rheological properties that can be influenced or altered favourably through breeding and other agronomic practices (Juuna, 2017)

Global Maize Production Trends

Globally, maize ranked third after wheat and rice in terms of area harvested but in terms of annual production maize ranked first(AGBO, 2021).There is continuous increase in maize production all over the world and this is attributed to both increase in area of production and increase in yield per hectares. Maize grain production in the world in 1970 was about 266 million metric tons (MMT), while in year 2000, it was over 592MMTand exceeded 844MMT in 2010.Of the total global production, United States is far the biggest producer, contributing between 37-43% of the total world production. In 2010 world ranking, United States was followed by China (177MMT),Brazil (56MMT),Mexico (23MMT) and Argentina (21MMT) (FAOSTAT, 2012).Maize production in United States and other developed countries of the world is highly mechanized on large scale production, where hybrids maize varieties are commonly grown with high inputs in terms of agrochemicals.

Africa is a minor producer of maize by world standard (FARA, 2009), accounting for only 7% of global production, while the average annual productions were estimated at 32MMTduring 1985 -1987, which increased to49MMTduring 2005-2007. Area planted with maize in West and Central Africa increased from 3.2 million in 1961 to 8.9 million in 2005,leading to increased production from 2.4MMTin 1961 to 10.6MMTin 2005(IITA, 2010).Until the middle of the 20th century, maize production in the Sub-Sahara Africa grew mainly through expansion in the area planted. However, shortage of the land mass has eliminated area expansion as a potential source of production growth and there is an increased attention on increasing productivity. Basic facts about maize production and trade in Africa as highlighted by FARA (2009) stated that:

A. Africa accounts for 7% (49MMT) of global maize production.
B. Maize yield in Africa (1.7 tons/ha) account for 36% of global maize yield (4.9 tons/ha)(FARA, 2009.).
C. Maize production in Africa is increasing faster (2.8% per annum) than global production (2.5% per annum); however; global yields are increasing faster (1.6% per annum) than yields in Africa (1.3% per annum).
D. Africa is a net importer of maize. Average annual net imports have more than doubled from 4.57 million tons in 1995-1997 to 10.64 million tons in 2005-2007.

E. Maize imports have risen by 76% between 1995-1997 (6.82 million tons) and 2005-2007 (12 million tons), while exports have declined by 40% from 2.25 million tons to 1.35 million tons during the same period.
F. Africa accounts for 12% of the global maize imports.
G. Africa spends more than US$2.0billion on net imports of maize in 2005-2007.

Maize in Nigeria

Increase in maize production in Nigeria has been achieved greatly by expansion in area harvested rather than increase in yield. The area harvested increased from 2.8 million hectares in 1986 to over 3 million hectares in 2000 and over 6 million hectares in 2011. Of the total world production (844M tons) in 2010, Nigeria, the largest producer in Sub-Sahara Africa produced 7.7 million tons representing 0.9% of the world production. Based on production potentials, Nigeria has been divided into four groups namely low, medium, medium to high and high maize production potential (ATA, 2011).The average yield of maize in Nigeria as in other Sub-Sahara Africa countries is generally low 1.68 tons/hectare, which is very low compared to average yield in United States9.3 tons/hectare over the same period

Maize Production in Nigeria

Maize improvement work started in the forest zones but yield trials were soon conducted in both forest and savanna locations (Adjei-Nsiah, Kuyper, Leeuwis, Abekoe, & Giller, 2007). The evaluation zones were:

1. Wet rainforest, covering most of Eastern States of Nigeria and the South-Western part.
2. Derived Savanna, fringing the forests and forming the transition to the southern Guinea Savanna.
3. Southern Guinea Savanna.

Because of the differences in yield potential of the ecological zones, testing of new maize varieties across the country became an established practice in maize breeding. These trials were called cooperative maize yield trials (Abiala, 2013). With time, the name has gone through several changes, including zonal Trials, Uniform maize, variety trials and now, Nationally Coordinated Maize Variety Trials (NCMVT).

Yields in Ibadan (7o22'N) representing the Forest zone and Mokwa (9o19'N) in the Southern Guinea Savanna were much lower than in Savanna (11o 11'N) of the Northern Guinea Savanna. A comparison by Osang, Richard, & Iheadindueme, (2014) of Forest and Savanna location since yield trials conducted for four years showed that the yield advantage of the savanna was due primarily to ear number. Whereas number of plants harvested was about the same in the two agro-ecologies, the savanna zone consistently produced more ears per unit land area. Therefore barrenness was much more pronounced in Forest zone than in Savanna ecologies. Maize plants in the savanna were taller with higher ear placement, suggesting greater vigor of growth. Number of days to silking was about the same in the two ecologies although the late Ops and the yellow hybrids tended to silk later in the Savanna than in the forest zone. However, percentage moisture content at harvest was consistently lower at savanna than at forest locations (Abiala, 2013). This implies a shorter grain – filling duration and/or a faster dry-down rate in the savanna than in forest ecologies. Indeed, the "stay green" character secures frequently in the forest zone, whereas it is almost non-existent in the savanna zones. The hybrid maize project has made an impact in Nigeria. The yield advantages of hybrids appear to be sufficiently large to attract the attention of farmers. Improved high yielding maize variety can express its full genetic potential only when offered optimum management resources. This starts with the right choice of site through timely and appropriate establishment, nutrition; disease and pest control to proper harvesting procedure and produce disposal and/or storage. Details of these operations with regards to maize production (Abiala, 2013)

Land clearing and yield preparation: Land clearing must be carried out with minimal displacement of the topsoil. It requires judicious use of heavy machinery coupled with sound soil conservation measures that will preserve the soil fertility status, which varies under long-term fallow vegetation Botta, Vázquez, Becerra, Balbuena, & Stadler, (2012). Minimum tillage is a feasible way of sustaining high soil fertility under intensive maize farming.

Planting time: Sowing date is an essential component of crop management. Yields decline with lateness of planting after an optimum time, usually the start of the rains. Response of varieties to other inputs is dependent upon planting time. Optimum planting in each of the major agro-ecological zones of Nigeria falls with these following ranges:

1. Forest zone – Mid April – 2nd week in May

2. Forest – Savanna transition – 3rd week in April – 3rdweek in May
3. South Guinea Savanna Last week in April – 3rd week in May.
4. Northern Guinea Savanna – last week in May – 1stweek in June
5. Sudan Savanna – First 2 weeks in June

Plant population: An optimum plant population is essential for maximum yield in maize. Farmers grow maize at very irregular and wide spacing, due to the fact that most farmers inter-crop maize with other crops. A direct relationship between plant population and final yield to some extent, is obvious because total grain yield is positively and significantly correlated with the number of ears and hence with the number of harvestable plants. A plant population of 53,333 plants/ha is recommended Kowarik, & von der Lippe, (2018). This is obtainable with a 75 cm x 50 cm spacing at 2 plants per hill or a 75 cm x 25 cm spacing at 1 plant per hill Farmers are known to prefer wide spacing so as to afford easy movement for weeding and other operations.

Plant nutrients and Fertilizer applications: For good growth and high yield, the maize plant must be supplied with adequate nutrients particularly nitrogen, phosphorus and potassium. The quantity required of these nutrients particularly nitrogen depends on the pre clearing vegetation, organic matter content, tillage method and light intensity (Onasanya, Aiyelari, Onasanya, Oikeh, Nwilene, & Oyelakin, 2009). The most important of these micronutrients for maize growth are sulphur, zinc and magnesium particularly in the savanna and under continuous cropping of maize in the Forest ecology. The nutrient requirement is satisfied by the application of the right form of fertilizer containing the requisite combination of the elements.

Weed Control: Weeds cause severe yield reduction in maize in Nigeria because they compete with the crop for nutrients; water and light. Weed control is the most expensive operation in traditional maize farming since it is procured manually. Often, the labour is too expensive causing many farmers to abandon weed control thereby resulting in very low yields.

Disease Control: Although several diseases have been identified on maize in Nigeria (Kaine, (2016), only few of them significantly reduce maize yields. They are maize rust, leaf blight, maize streak, downy mildew, maize mottle/chlorotic stunt, Curvularia leaf spot, stalk and ear rots. In order to make maize farming economically feasible, resistant lines were bred (Asuku, 2016) and made available to farmers. With these efforts, maize streak, smut and rust have been kept under control.

Downy mildew disease of maize was first reported in Nigeria in 1969 in Samara near Zaira Kaduna State. However, in 1995, over 75000 square kilometers was affected within the forest and transitional forest zones of Nigeria (Munji, Bele, Idinoba, & Sonwa, 2014). From 1970 to 1995 only one species of Peronosclerospora was known in Nigeria, and two pathotypes of this pathogen. However, due to series of studies on the etiology, epidemiology of the pathogen, another Peronosclerospora has been observed in maize together with P. sorghi

Most of maize varieties grown in Nigeria are highly susceptible to downy mildew disease. Fortunately, genes for resistance have been identified from maize germplasms in Thailand and the Philippines, where downy mildew is the most serious disease of maize. Genes for downy mildew resistance has been incorporate into streak resistant varieties (Olaoye, 2009). Scientists in Nigeria have developed high-yielding disease resistant/tolerant maize varieties. The newly developed varieties of maize has between 90 and 95% resistance to the pathogen without extra fungicide protection. Recently, a maize parasitic weed called striga is causing economic loss in Northern Guinea Savanna and some parts of derived Southern Guinea (Kowarik, & von der Lippe, 2018). Striga hermonthica is a threat to increased maize production in Nigeria particularly in the high – yield potential savanna zone. Scientists have identified some inbreeds and hybrids that have consistently demonstrated tolerance to S.hermonthicaunder heavy infestation (Menkir, Chikoye, Solomon, Tofa, & Omoigui, 2020; Tippe, Bastiaans, van Ast, Dieng, Cissoko, Kayeke, & Rodenburg, (2020) also reported that the use of NPK and urea fertilizers as effective means of controlling Shermonthica in maize field.

Insect Pest Control: Stem borers, armyworms, silkworms, grasshoppers, termites and weevils are the economically important insect pests of maize in Nigeria (Kaine, 2016). These pests are grouped into three categories

(i) the field pests
(ii) the field to-to-store pest
(iii) Store pests.

Use of chemicals (insecticides) is presently the most popular control measure in Nigeria (Asogwa, & Dongo, 2009; Maharaj, 2011). But these chemicals are very expensive and are not easily available. However, synthetic insecticides possess the capacity to leave harmful residues in food commodities if used incorrectly, as well as the ability to give rise to a rapid emergence of resistant strains. There has been a renewed interest in the use of natural plant products in the protection of stored agricultural products against insect pests in storage (Dubey, 2011; Abd El-Aziz, 2011). The use of plant products in form of powders in the management of stored products Coleopteran is the most convenient, the powders are easy to apply, and the commodities remain clean after treatments. Moreover, the moisture contents of the commodities are not increased. Powders of some species of plants have been used successfully for the control of different species of stored product pests (Rumbos, & Athanassiou, 2017; Abd El-Aziz, 2011; Mohapatra, Kar, & Giri, 2015).Research is also continuing in the search for genetic resistance to stem borer and other insect pests of maize.

Trend in Maize Production

Until recent years, the bulk of maize grain produced in Nigeria was from the southwest zone. Atehnkeng, Ojiambo, Donner, Ikotun, Sikora, Cotty, & Bandyopadhyay, (2008) reported that western Nigeria generally produced about 50% of Nigeria green maize, the remaining 50% being split between the North and the east. Although large proportion of the green maize is still produce of the south- Western part, there has been a dramatic shift of dry grain production to the savanna, especially the Northern Guinea savanna. This can now be regarded as the maize belt of Nigeria. In this zone, farmers tend to prefer maize cultivation to sorghum. This trend may have been brought about for several seasons including availability of streak resistant varieties for all ecological zones in Nigeria, availability of high-yielding hybrid varieties, increase in maize demand coupled with the federal Government imposed ban on importation of rice, maize and wheat. Local production had to be geared up to meet the demand for direct human consumption, breweries, pharmaceutical companies, baby cereals, livestock feeds and other industries.

Seed production and certification have taken a new turn in Nigeria with the establishment of private seed companies. The National seed service that used to be the primary source of improved seed also expanded its facilities, widened its scope and hired better trained staff. Thus, improved seeds are readily available to farmers. Maize is most productive in the middle and Northern belts of Nigeria, where sunshine is adequate and rainfall is moderate (Atere, Olalusi, &

Olukunle, 2016). Under these conditions, storage of grains can be accomplished without much damage from insect pests. The recent achievements by breeders in the development and release of superior maize varieties with higher yield potentials and better resistance to insect pests and diseases has played a central role in increase maize production in the country (Atere, Olalusi, & Olukunle, 2016).

Demographic Characteristics of Small Scale Farmers and Maize Production

Socio-economic conditions of farmers are the most cited factors influencing technology adoption. The variables most commonly included in this category are age, education, household size, landholding size, livestock ownership and other factors that indicate the wealth status of farmers. Farmers with bigger land holding size are assumed to have the ability to purchase improved technologies and the capacity to bear risk if the technology fails (Olawande, Sikei, & Mathenge, 2009). This was confirmed in the case of fertilizer by Martey, Wiredu, Etwire, Fosu, Buah, Bidzakin, & Kusi, (2014) Studies undertaken have shown that access to resources and services (information, credit) vary by gender of household head who makes key decisions. It was hypothesized that the variable could positively or negatively influence the adoption of fertilizer and soil erosion information technologies in Tanzania, Kassie, Jaleta, Shiferaw, Mmbando, & Mekuria, (2013) in Kenya and Odendo, Obare, & Salasya, (2009) in Ethiopia whereas; farm size did not matter in, Deressa, Hassan, Ringler, Alemu, & Yesuf, (2009).

The role of education in technology adoption has been extensively discussed in the literature. Education enhances the allocative ability of decision makers by enabling them to think critically and use information sources efficiently. Producers with more education should be aware of more sources of information, and more efficient in evaluating and interpreting information about innovations than those with less education (Ellis, & Goodyear, 2013). Education was found to positively affect adoption of improved maize varieties in West shoa, Ethiopia Deressa, Hassan, Ringler, Alemu, & Yesuf, (2009), Tanzania (Kassie, Jaleta, Shiferaw, Mmbando, & Mekuria, (2013). (Agrekon, Fufa & Hassan, 2006.

For widespread adoption of improved varieties and chemical fertilizer by farmers, extension educators need to understand the factors affecting technology adoption (Suvedi, Ghimire, & Kaplowitz, 2017). Adoption of technology is influenced by physical, socio-economic, and mental factors including agro-ecological conditions, age of farmer, family size, education of farmer, how-to-knowledge, source of information, and farmer's attitudes towards the technology (Odhiambo, 2020). Young farmers are more likely to adopt a new technology because they have had more schooling and are more open to attitude change than older farmers (Liu, 2013;Tey, & Brindal, 2012). Education is expected to enhance decision making and the adoption of agricultural technologies. Knowledge influences adoption. Farmers who have adequate knowledge of technology use are more likely to adopt it Odhiambo, (2020)).

On the other hand, farm size, level of formal education of the head of the farm family, number of instructional contacts the farmer had with extension agents, ratio of credit to total cost of production, degree of farm enterprise commercialization, membership of farmers' associations, knowledge of fertilizer use and application as well as ratio of non- farm to total annual income of farmers had positive signs, implying direct effect on the probability of adoption and intensity of use of fertilizer by the farmers, Suvedi, Ghimire, & Kaplowitz, (2017). Specifically, these imply that a unit increase in the farm size, level of formal education of the head of the farm family, number of instructional contacts the farmer had with extension agents, ratio of credit to total cost of production, decree of farm enterprise commercialization and ratio of non-farm to total annual income of farmers would bring about increased adoption and intensity of use of fertilizer among the farmers.

Also, membership of farmers association brings about increased awareness on the part of the farmers regarding existing and new farming technologies. With increased awareness of the availability of improved farm inputs coupled with information on their applicability, the level of adoption and intensity of use of fertilizer would increase. These views have also been expressed by Morris, Henley, & Dowell, (2017).

Cultivation of large farm sizes makes it more economical for farmers to apply fertilizers. Also, the larger the size of farm cultivated and therefore output produced, the more commercialized the farm would be. Increased level of education of farmers and contacts with extension agents lead to increased knowledge of input uses and their application because ignorant of the uses and abuses of inputs in crop production could discourage farmers from using them. These findings are in line with the reports of Oluwasusi, (2014) who noted that contacts with extension agents as well as acquisition of formal education exposes the farmers to the availability and technical-know-how of innovations and increases their desirability for acquiring them. The high and positive effect of off farm incomes on the adoption indices of the farmers is an indication that they need improved financial bases in order to adopt better farming technologies. Also gender issues in agricultural production and technology adoption have been investigated for a long time. Most of such studies show mixed evidence regarding the different roles men and women play in technology adoption. Danso-Abbeam, Bosiako, Ehiakpor, & Mabe, (2017) in their study on factors influencing improved maize technology adoption in Ghana, and Luzinda, (2018) studying coffee production in Papua New Guinea show insignificant effects of gender on adoption.

Maize Production Constraints in Nigeria

In view of the importance of maize in Nigeria, efforts are continuously made to increase maize yield per unit area of land and to extend areas where it can be grown, especially the cultivation of dry areas as improved through irrigation. Traditionally, maize has been mostly grown in forest ecology in Nigeria but large scale production has moved to the savanna zone, especially the Northern Guinea savanna, where yield potential is much higher than in the forest. The environmental conditions required for maize cultivation are therefore, superior in the savanna zone with high solar radiation, less incidence of biotic stresses and natural dryness at time of harvest (Olaniyan, 2015). However, in spite of all efforts, maize yields in Nigeria, like in many other Sub-Sahara countries, is still very low compared to developed countries due to many constraints, which may be biotic, abiotic agronomic or others like low soil fertility, pests and diseases, drought, unavailability of improved germplasm, weeds, unremunerative prices, uncertain access to markets etc.

Soil Conditions Necessary For Maize Production

Maize has been grown under conventional agricultural practices in Northern Ghana for years. The basis of conventional tillage is annual ploughing or tilling of the soil, but this is usually supplemented with a number of other practices, including the removal or burning of cropresidues, land leveling, harrowing, fertilizer application and incorporation Miller, Owen, Ellert, Yang, Drury, & Chanasyk, (2019), etc. All of these practices cause soil disturbance, compaction, and deterioration. Ploughing causes the rapid breakdown of soil organic matter. The soil collapses and compacts, reducing aeration and the number of soil organisms. The topsoil becomes susceptible to erosion and water runoff, Podwojewski, Janeau, Grellier, Valentin, Lorentz, & Chaplot, (2011), so that after heavy rainfalls a great deal of soil is lost and little water is retained, leading to shallow and infertile soils which are no longer able to produce good yields.

The soils of the major maize growing areas in Ghana are low in organic carbon (<1.5%), total nitrogen (<0.2%), exchangeable potassium (<100 mg/kg) and available phosphorus (< 10 ppm) (Tellen, & Yerima, 2018). A large proportion of the soils are also shallow with iron and manganese concretions (Gargiulo, Mele, & Terribile, 2013). Despite these shortcomings, soil fertility management is low. Maize thrives in well drained sandy loam soil with a pH of 5.7-7.5 and 500-800 mm of rainfall evenly distributed throughout the growing season for good yield. Fertilizer nutrient application in Ghana is approximately 8 kg ha-1(Agbo, 2021) while depletion rates range from about 40 to 60kg of nitrogen, phosphorus, and potassium (NPK) ha-1yr-1(AGBO, 2021) and among the highest in Africa.

Pests and Diseases of Maize

Maize in Nigeria is attacked by an array of diseases that can cause significant damages. These include the downey mildew, rust, leaf blight, stalk and ear rots, leaf spots and maize streak virus (IITA, 2010). However, Striga is one of the most dangerous weeds in maize production especially in savanna area of Nigeria. Yield losses from Striga range from 10 to 100% depending on time of parasite infection (Rodenburg, Demont, Zwart, & Bastiaans, 2016). Studies on time and rate of application of nitrogen were carried out at Mokwa, Southern Guinea savanna zone of Nigeria using four hybrid cultivars (Onasanya, Aiyelari, OnasanyaOikeh, Nwilene, & Oyelakin, 2009). Timing and nitrogen application rates significantly affected Striga emergence, host plant damage scores, agronomic traits and grain yield. Nitrogen application at two weeks after planting (WAP) (compared with 0, 4 and 6 WAP) at 60kg/ha gave the best result in terms of maize performance and reduction of Striga emergence. The tolerant cultivar produced 188% higher grain yield than susceptible cultivars across all treatments. Grain yield of tolerant cultivar at 60kgN/ha was 88% higher than that of susceptible cultivar at 120kgN/ha. In a similar study, Striga infestation reduced grain yield of two susceptible hybrids by 49% and of two tolerant hybrids by 24%. The two tolerant hybrids produced on average 87% higher grain yield than the two susceptible hybrids under low N rates (0-60 kg/ha) and 51% higher yields under high N (90-150 kg/ha) (Onasanya, Aiyelari, Onasanya Oikeh, Nwilene, & Oyelakin, 2009). Efforts are continuously made to reduce or control these diseases; however, the efforts were complicated by several factors that are making it difficult to achieve an impact in a relatively short time, due to the following reasons

i. Important diseases change with time

ii. Some diseases are specific to particular ecologies, whereas others are present in all ecologies

iii. Difficulty in infecting maize with some of the diseases for effective screening of the germplasm for resistance for example downey mildew.

iv. Difficulty of artificially inoculating maize plants to screen for resistance; therefore, plant breeders could not study the genetics of resistance of some of the diseases Mesterhazy, Lemmens, & Reid, (2012)

The most debilitating pests in maize production include stem borers, termites, storage insects, beetle and host of others. Various species of stem borer rank as the most devastating, causing maize pest loss of 20 -40% during cultivation and 30 -90% post-harvest storage(IITA, 2010).As a result of significant yield loss due to pest and diseases, extensive research has been done along this area. Many national maize programs with the aim of developing maize resistant varieties to prevailing diseases in different agro ecological zones of the country had been organized. On account of these national programs, germ plasms both of pollinated and hybrids resistant to prevailing diseases have been developed. Several agronomic practices have also been investigated to minimize the effect of many of these pests and diseases.

Although many insects, pests and diseases can be controlled with chemicals, these chemicals, often times, are not available, are dangerous and often expensive for small-holders who lack access to credit facilities. Moreover, chemicals are increasingly viewed as environ-mentally hazardous, threat to human life and safety, such that their use are been discouraged by many policy makers. A variety of chemical and cultural practices can help control many of the diseases; however, using resistant germplasms, which is the least harmful to the environment, is the most effective method for controlling them.

Low Soil Fertility and Maize

Low soil fertility ranks among the most serious constraints of maize productions which are brought mainly by reduction in the fallow period because of ever increasing population pressures. Nigeria as in many other tropical climates is characterized by high rainfall and insolation, the attendant problem of nutrient leaching and low level of soil organic matter which has made nitrogen the most nutrient limiting maize production in Nigeria (Olaniyan, 2015). Increase of fertility level has played a key role in the increase of maize yields and the dominant plant nutrient causing this increase has been nitrogen.

One important characteristic of maize is its high nutrient requirement especially N,P and K. On the average, maize grain contains up to 2% N and 2.6% for all above ground parts.20kgof nitrogen is removed from the soil for every ton of maize grain harvested (Fakorede, 2017). Farmers understand the importance of nitrogen in maize production and employ different strategies to minimize the adverse effects of low soil fertility such as using low population density, applying mineral fertilizer or animal manure, leaving the land fallow and switching to less demanding crops (Chianu, Chianu, & Mairura, 2012). However, even with all these efforts farmers are not able to supply adequate quantity of fertilizer and most often do not apply fertilizer mostly due to high cost or unavailability. Therefore, maize yield is generally low.

Fertilizer Requirements of Maize

Increase in fertility level has played a key role in the increase of maize yields in Nigeria, and the dominant plant nutrient responsible for this increase has been nitrogen, which is a major nutrient needed in large quantity for high yields in maize production. Many field experiments have shown responses in grain yield of maize to application of nitrogen fertilizer. But the magnitude of response to applied nitrogen varies across experiments due to confounding influences of soil nitrogen supply from non-fertilizer sources, weather variation, variety and cropping practices. Consequently, recommendations of nitrogen management are site and season specific.

Nitrogen is a component of protein and nucleic acids but when it is sub-optimal, growth is reduced Kaur, Asthir, Bains, & Farooq, (2015)). Nitrogen is also a characteristic constituent element of protein and also integral components of many other compounds essential for plant growth processes including chlorophyll and many enzymatic processes. Nitrogen plays a significant role in protein synthesis and thus strongly influences grain production and grain protein content Kong, Xie, Hu, Feng, & Li, (2016).Its supply also affects both leaf area development and leaf senescence, and consequently crop radiation interception Xu, Fan, & Miller, (2012). Meanwhile, photosynthetic activity of the leaf canopy, and thus radiation use efficiency, varies with leaf nitrogen (expressed as the amount of nitrogen per unit leaf area (Garbulsky, Peñuelas, Gamon, Inoue, & Filella, 2011).

During reproductive development, nitrogen is mobilized from the leaves and stem to the grain Yoneyama, Tanno, Tatsumi, & Mae, (2016) with consequent reduction on leaf photosynthetic capacity and the consequences for grain yield depend on the relative contribution of crop nitrogen uptake and mobilization of leaf nitrogen to grains as moderated by the grain concentration. Common nitrogen recommendation for old NS series in Nigeria is 75kgN/ha (Lukwesa, 2014). Peng, Li, & Fritschi, (2013) recommended 150kgN/ha for FARZ series based on profitability, although the yield of maize at 75kgN/ha was not significantly different from the yield at 150kgN/ha, while Yang, Guo, Chen, ChenYuan, & Mi, (2016) reported responses up to 70,140 and 210 kg N/hafor maize grown using different maize genotypes.

With regard to dry matter distribution in maize as influenced by nitrogen, studies on nitrogen levels at Ilora, Southwestern Nigeria using three genotypes of maize (open pollinated, single cross and double cross hybrids) indicated that at final harvest, among all genotypes and fertilizer levels, the least dry matter was partitioned to tassels while the highest was found in stem and grains. The proportion of dry matter partitioned to grains are 27% for single and double cross and 25% for open pollinated while the proportion partitioned to grain was similar (30%) for 75,100, 150 and 200kgN/ha (Olowe, Olawuyi, & Odebode, (2015).

The biggest problem to fertilizer use in Nigeria is the cost because the government has reduced drastically the subsidy on fertilizer. In view of this a bag of nitrogenous fertilizer costing only N3.00a bag (50kg) to the farmer in 1980s,N1,500 in 1990s is now N6,000. Fertilizer is relatively expensive in Nigeria than countries in Asia or South America, probably because fertilizer imports have to be financed with foreign exchange which is often in short supply, another obstacle to fertilizer use in Nigeria is the unavailability at the time when the farmer needs it or in the formulations they desire. Many factors contribute to fertilizer supply problem. Planning and administering a national fertilizer program require skills that are not always available in the government agency that over see input supply, and the private sector also may experience problems in distribution of fertilizer (Rashid, Tefera, Minot, & Ayele, 2013).

Furthermore, deep-seated corruption in Nigeria is a major obstacle to fertilizer supply. For instance, medical practitioners, engineers, politicians and others who have no business in farming are the major players in fertilizer and other inputs distribution of fertilizer; thereby, benefiting from government support towards fertilizer supply, while the farmers who are supposed to be major beneficiaries are relegated to the background (Lukwesa, 2014).

Data from sites throughout Africa suggested that modest doses of fertilizer, especially nitrogen in maize often generate significant yield increases. Whether or not crop responses are sufficient to justify the increased cost of purchasing and applying fertilizer depends on a number of factors, including the price of fertilizer, the price of maize grain and cost of additional inputs required Burke, Jayne, & Black, (2017). Applying chemical fertilizer is a major strategy for maintaining soil fertility, Other technology such as crop rotation, crop residue management, use of live mulches, use of organic fertilizer (compost, animal manure, organo-mineral fertilizer)and other techniques have been researched into. Moreover, nitrogen use efficient geno-types have been researched and developed. Research into many of these soil fertility technologies has shown that they could be viable, and trials on various farmers need to test whether they are economically viable and sustainable from the farmers ‘point of view.

Weed Infestation and Maize

Maize require minimum weed invasion to exhibit its yield potential. Heavy weed interference results in competition for essential resources and, consequently, yields loss. Weeds seriously limit maize productivity in farms in Nigeria. Indeed, it is estimated that weed control takes 50 to60% of the total cost of maize production (Fakorede, 2017). Weeding takes between 21 to 32% of the total time devoted to maize production in Nigeria. Maize is susceptible to competitions from many annual weeds in the first six to eight weeks after planting and the extent of weed infestation varies from one ecology to the other, it has been reported that weeding during a critical period of 10to30 days after crop emergence greatly enhances grain production, while uncontrolled weed growth during this period could reduce maize yield by 40 to60% (Olaniyan, 2015).

One of the most dangerous weeds in maize production is Striga, which is also known as witch weed. It is indigenous parasitic weeds that attack maize crop, especially in the savanna areas of Nigeria. Striga is becoming a detrimental pest of maize as a result of the intensification and expansion of maize in the savanna, where Striga is endemic. Apart from savanna region, the weed has been reported in other parts of Nigeria, including the derived savanna of southern Nigeria. The species observed in the southern part of Nigeria are Striga asiatica, Striga aspera, Striga gesnerioides and Striga forbes ii. However, Striga hermonthica which is prevalent in the Northern part of Nigeria is the most damaging and widespread among Striga species. Yield losses from Striga range from 10 – 100% depending on time of parasite infection (Menkir, Makumbi, & Franco, (2012).Although major technologies exist to control Striga weeds but since most of the effective control practices require expensive inputs or special equipment, they are not suitable for small scale farmers who constitute the large family population in Nigeria (Nambafu, Onwonga, Karuku, Ariga, Vanlauwe, & da Nowina, 2014). However, it has been recommended that the most practical approach of controlling Striga species is the use of cultivars that are resistant to or tolerant to the weed infestation.

Weeding Requirements of Maize

Weed control in most agricultural system in Nigeria involves the use of hoes and cutlasses which are quite tedious, time consuming and often in effective. Recommendation is usually hand weeding 14 to21days, and 57 days after planting, while third weeding may be necessary, depending on the varieties and severity of weeds. Weed may also be controlled by various other methods, including tillage practices, planting of weed –free seeds, cultivation using animalor mechanical power, cultural methods such as the use of cover crops, planting immediately after land clearing and use of herbicides. Maize is affected by many weed species but weeds such as Cyperus rotundus, Rottboellia Cochinchinensis and Imperata cylindrical are quite problematic because they are very competitive and difficult to control when routine crop husbandry practices are employed. Others such as Euphorbia heterophylla occur in large number (high density) and grow as rapidly relative to crop that the young maize are shaded out. Other weeds common in maize plots included Talinum triangulare, Amaranthus spinosus, Chromolaena odorata, Agerantum conyzoides (Da Silva, Galon, Aspiazú, Ferreira, Concenço, Júnior, & Rocha, (2013)

Weeding takes between 21 to32% of the total time devoted to maize production in Nigeria (Sharah, 2020).Moreover, different herbicides are recommended and for maize and maize based crop mixtures, however,

Research Methodology

This study adopted survey research method. Survey research method was used for the study There is the need to clearly define the population of the study before conducting the research proper. The population of the study includes rural farmers within Abeokuta south local government area, who are involved in maize farming. A total number of ninety six (96) copies of questionnaires were administered of which all the ninety six (96) copies of questionnaires were accurately filled and returned by the respondents. This implies that there was a high response rate on the part of the respondents. Hypothesis was tested using chi- square method; Data was coded and analyzed using Statistical Packages for Social Sciences (SPSS) version 220.

Table 1: Response Rate of the Respondents

Options		Frequency	Percent	Valid Percent	Cumulative Percent
	Retrieved	96	100.00	100.0	100.0
	Non-retrieved	0	0.0	0.0	100.0
	Total	96	100.0	100.0	

Source: Field survey, 2021

Table 1 above shows the response rate of the respondents. The table reveals that a total of 96 questionnaires were administered and all the 96 copies were duly filled and returned by the respondents which represent 100.0% response rate. The implication is that there was high response rate and it was on the basis the overall data analysis was computed.

Table 2: Demographic Information of Respondents

Variables	Frequency	Percentage (%)
Age		
18-21	11	11.5
22-25	27	28.1
Above 25	58	60.4
Total	**96**	**100.0**
Gender		
Male	63	65.6
Female	33	34.4
Total	**96**	**100.0**
Marital Status		
Single	11	11.5
Married	61	63.5
Divorced	10	10.4
Separated	14	14.6
Total	**96**	**100.0**
Household Size		
1-3	64	66.7
4-6	32	33.3
Total	**96**	**100.0**
Level of Education		
Primary	9	9.4
Secondary	44	45.8
Tertiary	43	44.8
Total	**96**	**100.0**

Source: Field Survey (2021)

The table 2 above shows the demographic profile of the respondents. The table indicates that 58 (60.4%) of the respondents are above 25 years, followed by 27 (28.1%) with 22-25 years. This implies that majority of the rural farmers are above 25 years. Also, the table shows that larger percentage 63 (65.6%) of the rural farmers are male. This is followed by female with 33 (34.4%). This implies that rural farmers in Abeokuta South LGA are male dominated.

Similarly, majority of the respondents 61 (63.5%) are married. This is followed by separated with 14 (14.6%) and single farmers with 11 (11.5%). The implication of this to the study is that most of the rural farmers are married. The majority of the rural farmers are educated with 44 (45.8%) and 43 (44.8%) of them having secondary and tertiary education respectively.

Testing of Hypotheses

In this section, the data were analyzed and presented to test the stated hypotheses. As stated earlier, Chi-Square would be used to test the hypotheses.

H$_{O1}$: *There is no significant relationship between influence of leadership structure and climate change on the survival of maize farming in the rural areas of Ogun State*

Table 3: Chi-Square of relationship between Leadership Structure and Climate Change on Survival of Maize Farming in Rural Areas

	Value	Df	Asymp. Sig. (2-sided)	Decision
Pearson Chi-Square	151.185[a]	12	.000	Reject
Likelihood Ratio	175.556	12	.000	
Linear-by-Linear Association	7.000	1	.008	
N of Valid Cases	809			

****Significant at the 0.05 level (2-tailed) P<0.05**

Source: SPSS Output 2021

The result of Chi-Square test in Table 3 reveals Chi-Square statistic of 151.185 Df(12,1) of Asymp. Sig. of 0.000 is less than 0.05. Hence, the null hypothesis is rejected. Thus, there is a significant relationship between the influence of leadership structure and climate change on the survival of maize farming in rural areas of Ogun State. This implies that leadership structure significantly influenced climate change on the survival of maize farming in rural areas.

H$_{O2}$: *There is no significant relationship between land management and pesticides usage on the survival of maize farming in the rural areas of Ogun State*

Table 4: Chi-Square of relationship between Land Management and Pesticide Usage on the Survival of Maize Farming in Rural Areas

	Value	Df	Asymp. Sig. (2-sided)	Decision
Pearson Chi-Square	59.915[a]	9	.002	Reject
Likelihood Ratio	76.225	9	.000	
Linear-by-Linear Association	.143	1	.706	
N of Valid Cases	768			

****Significant at the 0.05 level (2-tailed) P<0.05**
Source: SPSS Output 2021

The finding of Chi-Square test in Table 4 reveals Chi-Square statistic of 59.915 Df (9, 1) of Asymp. Sig. of 0.002 is less than 0.05. Hence, the null hypothesis is rejected. Thus, there is a significant relationship between land management and pesticide usage on the survival of maize farming in rural areas of Ogun State. This implies that land management has significant influence on climate change on the survival of maize farming in rural areas.

H_{O3}: *Indigenous knowledge dose not significantly influence pest and disease on the survival of maize farming in the rural areas of Ogun State*

Table 5: Chi-Square of the Influence of Indigenous Knowledge on Pest and Disease on the Survival of Maize Farming in Rural Areas

	Value	Df	Asymp. Sig. (2-sided)	Decision
Pearson Chi-Square	57.715[a]	9	.000	Reject
Likelihood Ratio	66.225	9	.000	
Linear-by-Linear Association	.143	1	.706	
N of Valid Cases	768			

****Significant at the 0.05 level (2-tailed) P<0.05**
Source: SPSS Output 2021

The outcome of Chi-Square test in Table 5 reveals Chi-Square statistic of 57.715 Df (9, 1) of Asymp. Sig. of 0.000 is less than 0.05. Hence, the null hypothesis is rejected. Thus, indigenous knowledge significantly influenced pest and disease on the survival of maize farming in rural areas of Ogun State. The implication of this is that indigenous knowledge can help in pest and disease control on the survival of maize farming in rural areas.

H_{O4} : *Land management does not significantly influence fertilizer usage on the survival of maize farming in the rural areas of Ogun State*

Table 6: Chi-Square of the Influence of Land Management on Fertilizer Usage on the Survival of Maize Farming in Rural Areas

	Value	df	Asymp. Sig. (2-sided)	Decision
Pearson Chi-Square	153.189[a]	12	.000	Reject
Likelihood Ratio	177.556	12	.000	
Linear-by-Linear Association	7.000	1	.008	
N of Valid Cases	809			

****Significant at the 0.05 level (2-tailed) P<0.05**

Source: SPSS Output 2021

The outcome of Chi-Square test in Table 6 shows Chi-Square statistic of 177.189 Df (12, 1) of Asymp. Sig. of 0.000 is less than 0.05. Hence, the null hypothesis is rejected. Thus, land management influenced fertilizer usage on the survival of maize farming in rural areas of Ogun State. The implication of this is that land management has significant influence on fertilizer usage on the survival of maize farming in rural areas.

Discussion of Research Findings

The result of research question one revealed that leadership structure in rural areas influenced climate change on the survival of maize farming through training programs, production and farming decision making, and by improving farmers knowledge on maize farming. This is in line with the report of Wanyama et al., (2009) in Kenya which showed that change agent (extension) visit to farmers and agricultural training significantly affected likelihood of farmers adopting new technologies in maize production. This may be due to the fact leadership structure really matters in farming decision making especially in rural areas where leaders are seen as visionary personnel. The outcome research question two showed that land management enables farmers to develop interest in maize production, increase crop production for maize farming, improve farming activities and to reduce pest and diseases incidence. This means that land management on pesticides usage has influence on survival of maize farming in rural areas. This outcome is against the view of IITA (2010) who opined that high rainfall and insolation, the attendant problem of nutrient leaching and low level of soil organic matter which has made nitrogen the most nutrient limiting maize production in Nigeria. Land must be well managed because it determines the usage of pesticides especially for the survival of maize farming in rural areas.

The result of research question three showed that indigenous knowledge on pest and disease helps maize farmers in rural areas on survival of maize farming by providing maize farmers with basis for problem solving strategies, helping maize farmers in production and farming decision making and improving farms practice. This result disagrees with Onasanya, Aiyelari, Onasanya, Oikeh, Nwilene and Oyelakin (2009) who averred that efforts to control pest and disease are being affected by several factors such as ecological factor. The use of indigenous knowledge is still vital in fighting pest and disease for the survival of maize farming in rural areas where farmers may have access to modern techniques of fighting pest and diseases.

The finding of research question four indicated that proper land management on fertilizer usage influences the survival maize farming in rural areas. The respondents affirmed that it increases maize production, land management improves farming practice for maize farmers, land management reduces pest and diseases incidence and land management reduces soil pollution. This finding is consistent with the assertion of Botta, Vázquez, Becerra, Balbuena & Stadler, (2012) who opined that land clearing must be carried out with minimal displacement of the topsoil. The extent of land of land management to some extent determines the usage of fertilizer, hence the need to educate farmers on effective land management. The result of hypothesis one revealed that there was a significant relationship between the influence of leadership structure and climate change on the survival of maize farming in rural areas of Ogun State.

This implies that leadership structure significantly influenced climate change on the survival of maize farming in rural areas. This is not in consonance with Agunbiade & Afolabi (2017) who examined the influence of some environmental factors on maize productivity in Osun State, Nigeria. Factors that affect maize production is not limited to environmental factors alone but also leadership structure in ensuring best yield for rural farmers. They need to be mentored, monitored, counseled and supervised for effectiveness in maize farming.

The result of hypothesis two showed that there was a significant relationship between land management and pesticide usage on the survival of maize farming in rural areas of Ogun State. This implies that land management has significant influence on climate change on the survival of maize farming in rural areas. This results agrees with Julius (2014) who observed that land used in hectares, labour in man-days, quantity of fertilizer and level of education were positive and significant factors affecting output of maize.

The outcome of hypothesis three indicated that indigenous knowledge significantly influenced pest and disease on the survival of maize farming in rural areas of Ogun State. The implication of this is that indigenous knowledge can help in pest and disease control on the survival of maize farming in rural areas. This outcome supports the findings of Deressa, Hassan, Ringler, Alemu, & Yesuf, (2009); Kassie, Jaleta, Shiferaw, Mmbando & Mekuria (2013) who discovered that education was found to positively affect adoption of improved maize varieties in West shoa, Ethiopia and Tanzania respectively. Indigenous knowledge is also form of education being handed down from generations to generations by rural farmers.

The finding of hypothesis four showed that land management influenced fertilizer usage on the survival of maize farming in rural areas of Ogun State. The implication of this is that land management has significant influence on fertilizer usage on the survival of maize farming in rural areas. This finding lends credence to Olawande et al., (2009) in Kenya who observed that age, education, availability of fertilize, distance to fertilizer market and agro ecological potential significantly influenced the survival and production of maize by rural farmers. This may be as a result of the fact that effective land management and use of fertilizer help to increase maize yield and the survival of maize farming in rural areas.

Conclusion

From the analysis of data obtained. It is concluded that traditional occupational practices has an impact on on survival of maize farming. Also from the facts available, leadership structure significantly influenced climate change on the survival of maize farming in rural areas, land management has significant influence on climate change on the survival of maize farming in rural areas, indigenous knowledge can help in pest and disease control on the survival of maize farming in rural areas and land management has significant influence on fertilizer usage on the survival of maize farming in rural areas

Recommendation

Following the findings and conclusion, the study made the following recommendations:

1. Extension agents and other stakeholders in the field of agriculture should intensify efforts to inform maize farmers on the use of various traditional occupational practices so as to improve and increase productivity. This can be done effectively by the use of group teachings, Training, seminars and other teaching aids.
2. For easy access to information and effective utilization, there is need for establishment of information center's by Nigerian Meteorological Agency (NiMet) in all rural communities in Nigeria. Such information centers could provide the rural maize farmers information on Fertilizer usage, Pest and disease, Pesticides usage, Climate change, Leadership structure and Land management and its impact on productivity and survival of maize farming
3. National maize Research Institute and other institutes should take into consideration some Constraints maize production and survival. Such constrain include, Disease outbreak and inadequate knowledge on maize farming, low soil fertility, pests and diseases, drought and unavailability of improved germplasm, weeds in other for farmers to improve their knowledge on maize farming productivity and increase the income
4. The government, private investors or Non-Governmental Organizations should endeavor to provide rural areas farmers with inputs support like fertilizers, land, credit facility and improved education e.t.c

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