Abstract
The study examined capital investment and sustainability of agricultural value chain of the poultry industry. The study focused on some selected poultry farmers in Anambra and Imo States respectively. The objectives of the study were to examine the relationship between infrastructure, skill acquisition, research and development and poultry waste management and the sustainability of the poultry value chain. The study adopted a descriptive survey design. Four research questions and hypotheses were formulated for the study. The research population was 3240 and a sample size of 356 was chosen using Taro Yamani’s formula. The questionnaire was the main instrument for data collection and it was subjected to simple validity and reliability tests. The simple linear regression analysis was used to analyze the data and test of hypotheses. The findings of the study revealed that: There is a weak but positive and significant relationship between infrastructure and sustainability of agricultural value chain of the poultry industry. There is also a weak but positive and significant relationship between skill acquisition and sustainability of agricultural value chain of the poultry industry. There is still a weak but positive and significant effect between Research and Development (R&D) and sustainability of agricultural value chain of the poultry industry. There is a strong positive and significant relationship between waste disposal management and sustainability of agricultural value chain of the poultry industry. These findings challenge agricultural value chain boosted by entrepreneurship to continue the struggle of elevating and alleviating the economy from the hands of poverty.

Key words: Capital investment, sustainability, agricultural value chain, poultry industry, waste management.

Introduction
The poultry sector has been widely acknowledged as the greatest agro business within the livestock sector (Adebayo and Adeola, 2005). The income from poultry contributes significantly to cash elevation of producers. This is why Sonaiya (2001) estimates that poultry product sales contribute 15% of the annual financial income for rural households. The rural communities account for more than 70% of the world’s extreme poor in search of opportunities to earn a living. As such, the poultry industry has an enormous responsibility on all levels: social, economic and environmental.

Planning and implementing a poultry project is not as easy as it seems because, it takes several diversified forms and its productivity depends upon land, human resources, infrastructure and capital. The capital used to operate a poultry business is invested in machinery and equipment, poultry feed and supplies, land and buildings. Therefore, investing is the basic requirement for
financing and doing business of any establishment, during its startup phases or at a later stage for expansion and efficiency in operation and continuous research (Horton, 2019). Capital investment enhances the proprietor’s (business owner’s) power to perform useful economic activities.

Because, capital investment is a component of asset strategy development within the context of a corporate planning environment, it is targeted towards acquisition and improvement of an existing asset to produce increase in service capacity, quality and usefulness of the value chain. It also entails the improved creativity or innovation and improved job performance and satisfaction of workers in the value chain. Consequently, sound investments encourage economic growth through its uses either in the fixed income or variable income. As money, capital investment serves to purchase necessary infrastructure to develop its market products and enhance the product’s value chains (Chen, 2018). This return is determined by the rate of progress within the business.

Investing in agriculture, especially in the poultry industry is essential because, it caters for the immediate food and financial needs of the present generation and prepares for the future, while at the same time creating employment and long term wealth. This is why agriculture and poverty reduction have become household words in Nigeria to engineer sustainable development, create employment and entrepreneurial opportunities to aid economic diversification and cushion the crushing effect of the economic recession and ensure food security and sufficiency. Though agriculture has suffered gross neglect in Nigeria, yet the nation understands the place of agriculture for sustainable development (Channels T.V 2017: Africa 54).

Morton (2013) agrees with Adam Smith that; “agriculture is the base of all economies in the world.” Agriculture ranked as the second most important earner of Nigeria’s foreign exchange. It served as the major occupation and source of revenue in Nigeria, unfortunately, it became unattractive because, no new innovations to boost the sector (Osuala, 2017). In line with the United Nation’s Sustainable Developmental Goals (UNSDG 2016), poultry farming/industry (entrepreneurship) is well positioned to help accomplish the UN’s sustainable development goals, promising to transform societies and environments for the better.

Vaarst, Steenfeldt and Horsted (2016), believe that, poultry can be integrated into many different types of urban and rural farming systems, where they benefit from and contribute to such systems, and to livelihood of households around the globe. Hence, the Food and Agricultural Organization (FAO) Report (2010), shows that poultry comes fourth among sources of animal proteins for human consumption in Nigeria and contributes about 27% of the national meat production. Poultry has the best conversion rate of feed to human food and smallest environmental footprint in terms of energy and water use per kg meat or egg produced.

Despite this wonderful stride, the poultry industry has been adversely affected by problems associated with the birds’ susceptibility to diseases, sensitivity to feeding and environmental factors making sustainability a difficulty. Infections are among the most important food safety hazards (FAO, 2013). This means that, without proper waste management, the poultry business constitutes risk for the consumers and the producing systems. Waste management is important towards growth and sustainability of the industry. Investing in effective poultry waste
management is an indication of a preparation for a long term productivity, growth and environmental sustainability of the industry.

**Statement of the problem**
Poultry farming has been seen as a lucrative business, contributing 27% of the national meat production, creating employment with good opportunities to earn a living, and it is well positioned to accomplish the UN’s sustainable developmental goals of poverty eradication (UNSDG, 2016; FAO, 2010). In some cases, poultry farms can be highly specialized and sophisticated needing continuous and proper management to grow its value chains. However, starting a venture such as a poultry farm requires capital. The startup cost may vary depending on the location, size and facilities or equipment required for it to run. This makes the poultry a capital intensive venture.

The present high costs of commodities have caused a lot of uncertainty for the farmer – investors to the extent that, the sustenance of the poultry industry is threatened. This vicious trend is heightened by the fact that farmers and intending farmers are encountering great difficulties in raising capital. This is caused by the lack of access to government funding/grants, inability to secure loans, lack of credit facility, high cost of equipments and feeding ingredients, increasing cost of medications, improper marketing links and lack of storage facilities.

A quick assessment of some poultry farms reveals a situation of very poor and decaying infrastructural facilities, which raises the question on owner’s interest in continuity. This telling situation have led to the closure of some farms and downsizing on the quality and capacity of production. Be that as it may, one wonders at how sustainable a poultry farm can be if the physical and administrative structures are poor, the quality and skill of personnel are low and the farm’s ability to manage its waste is questionable. It means that, there is little or no feasibility studies to develop and maintain the health situation of the birds, workers and the environment.

This shows that farmers are not investing enough to ensure sustainable growth. Because good infrastructures foster economic growth by increasing productivity of capital and labour, reducing costs of production and raises profitability, employment and income levels, the complexities surrounding its strategic capital investment remains a challenge. Therefore, the study, capital investment and sustainability of agricultural value chain of the poultry industry seeks to address the problem and reposition the industry to its competitive competencies. Because, value chain analysis is advanced as a useful tool to help identify strategically important value creating activities to invest in, and develop appropriate competitive advantage for the industry.

**Objectives of the study**
The main objective of the study is to examine capital investment and the sustainability of agricultural value chain of the poultry industry. The specific objectives are to:

1) Examine the extent of relationship between infrastructure and sustainable poultry value chain.
2) Examine the relationship between skill acquisition and sustainable agricultural value chain of the poultry industry.
Two research questions and hypotheses were formulated to aid the study arrive at a dependable solution. The study is relevant to poultry farmers, agricultural policy makers, entrepreneurs, investors and students. The scope is limited to the examination and evaluations of commercialized poultry farms in Anambra and Imo States respectively. It was limited particularly from the lack of information on the size of the poultry sectors in the states, and the difficulties of identifying farmer participants accruing from bad roads and types of operations hidden in subsistent form or backyard businesses.

The methodology employed to execute the research showed that the design was a descriptive survey design. The area of the study focused on Anambra and Imo States in the South – East geopolitical zone of Nigeria. The population for the study was 3240 poultry farmers. The sample size of 356 was determined using the Taro Yamane formula. To ensure that the entire population was represented without bias, the simple random sampling technique was used to select the respondents for the study while at the same time employing convenience random sampling for ease.

The primary instrument for data collection was the questionnaire, structured following the Likert scale format. The questionnaire design was structured in a three tier form consisting of sections a, b, and c. The instrument was tested for face, content and constructs validity. In the reliability test, the test and retest method was employed. The responses were analyzed using the Cronbach’s Alpha through the SPSS (Statistical Package for the Social Sciences). The coefficient showed a 0.815 approximately 82% reliability. Regression analysis was used to analyze the data.

**Theoretical Framework**

The study is anchored on Peter Drucker’s theory of the business, postulated in 1994 and supported with the capital market theory. The business theory assumes that, firms exist and make decisions to maximize profits. It holds that the overall nature of companies is to maximize profits meaning to create much gap between revenue and costs (Chen and Murphy, 2019). This assumption means that, many businesses decline and fail because the assumptions they make form the basis for their fundamental decisions. The theory also takes care of the uncertainties about the future, bringing to the fore the constant need for self evaluation.

Moreover, Drucker is also of the view that, firms exist and make decisions to satisfy other objectives like marketing, innovation, human organization, productivity and social responsibility etc (Cohen, 2017). This is the core elements this study is out to examine in the search for capital investment and the sustainability of agricultural value chain of the poultry industry. The theory is essential to the study because, carrying out a capital investment for sustainability of any part of a firm or its value chain is a component of strategic planning.

Capital market theory on the other hand, is an assumption that all market participants have a homogenous expectation on return on the risk of their investment. It shows the relationship that should exist between security returns and risk if investors constructed portfolio as indicated by modern portfolio theory. Therefore, over and above discovering best ways and mission in the theory of the business, the capital market theory ensures effectiveness and efficiency in investments (Fabozzi and Grant, 2001).
Review of Related Literature
Conceptual Framework
Concept of Capital Investment

The concept “capital investment” is a combination of two financial or economic terms; ‘capital’ and ‘investment’. Hargrave (2019) stipulates that, capital is a term for financial assets such as, funds held in deposit accounts, as well as for the physical factors of production, that is, manufacturing equipment. Capital includes facilities and buildings used to produce and store manufactured goods. Capital must provide an ongoing service to the business, combined with labour to create wealth. Seth (2019) defines capital as that part of a person’s wealth, other than land, which yields income or, which aids in the production of further wealth. Capital enhances one’s power to perform economically useful work.

Hall (2018) shows that, when economists refer to capital, they usually mean the physical tools, plants and equipment that allow for increased work productivity. All the facets of infrastructural acquisition; land, buildings, or furniture used in the production processes, pass as capital. Capital comprises one of the four major factors of production; land, labour and entrepreneurship. On this level, it can be termed economic capital. In the ordinary sense, capital is used in the sense of money as Seth showed in his definition. Capital is an input in the production function for further production of goods and services. This can be tangible or intangible. In other words, any money spent to start up or further the running of a project (poultry farm) is capital.

The word “investment” has become muddled up with overuse (Beatie, 2019). The Cambridge Dictionary defines investment as the action, or process of investing money for profit or to achieve a result. Thus, the act of putting money, effort, time etc into something to make a profit or get advantage or the money, effort, time etc. used to do this is investment. To Chen (2019), an investment is an asset or item acquired with the goal of generating income or appreciation. In economics, investment means creation of capital or goods capable of producing other goods or services.

Therefore, capital investment is a sum of money provided to a company to further its business objectives. The term also can refer to a company's acquisition of long-term assets such as real estate, manufacturing plants, and machinery. But for Ward (2018), the term capital investment has two usages in business. First, capital investment refers to money used by a business to purchase fixed assets, such as land, machinery, or buildings. Secondly, capital investment refers to money invested in a business with the understanding that the money will be used to purchase fixed assets, instead of day to day operating expenses (Kenton, 2019).

Concept of sustainability
Sustainability is the process of maintaining change in a balanced environment, in which, the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (Wikipedia, 2019). Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Grant and Kenton, 2019). It can also be a socio-ecological process characterized by the pursuit of a common ideal.
The term 'sustainability' should be viewed as humanity's target goal of human-ecosystem equilibrium (homeostasis), while 'sustainable development' refers to the holistic approach and temporal processes that lead us to the end point of sustainability. Sustainable development consists of balancing local and global efforts to meet basic human needs without destroying or degrading the natural environment. The 2005 World Summit on Social Development identified sustainable development goals, such as economic development, social development and environmental protection. Sustainability encourages businesses to frame decisions in terms of years and decades rather than on the immediate earnings. It considers more factors than simply the profit or loss involved.

**Agricultural sustainability**

Sustainable agriculture, is farming in sustainable ways. It is a long-term methodological structure that incorporates profit, environmental stewardship, fairness, health, business and familial aspects on a farm setting. It is defined by three integral aspects which are: economic profit, environmental stewardship and social responsibility. Sustainability focuses on the business process and practice of a farm in general, rather than a specific agricultural product. According to the Western SARE (2012), Sustainable agriculture can be defined in many ways, but ultimately it seeks to sustain farmers, resources and communities by promoting farming practices and methods that are profitable, environmentally sound and good for communities.

As defined by the US Congress (1990), sustainable agriculture is: "an integrated system of plant and animal production practices having a site-specific application that will, over the long term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole." In other words, sustainable agriculture is profitable, it supports and enhances the quality of life of farmers, farm families and farm communities.

Morton (2013), sustainable agriculture integrates three main goals; environmental health, social and economic equity, and economic profitability. Measuring sustainability is based on the life cycle assessment (LCA) Varst, Stenfeld and Horsted (2015) but there is no generally accepted standard for life cycle inventory (Morton, 2013). Measuring sustainable metrics is important in the treatment of agricultural sustainability because, sustainable management equates to risk management. Threats to sustainable supply chains come from safety, security and stability.

However, the metric framework in the sustainability metric calculator as prescribed by the U.S.A National resource Conservation Service (NRCS) supports sustainability by;

1) Defining critical efficiency metrics, such as feed conversion rate (FCR) in poultry.
2) Define critical impact metrics.
3) Benchmark performance for each metric.
4) Develop and adopt goals for improvement across each metric.
5) Implement improvement strategies.
6) Measure each metric using best scientific methods at prescribed frequencies.
7) Report results and
8) Adjust and adapt practices as necessary.
Hence, for the purpose of this research, the work focuses on the non financial measurement of profitability within the sustainability matrix of the poultry value chain. As such, the study shall focus on the ingenuity of the farmers/entrepreneurs towards creativity and innovation in service capacity and quality in usefulness of the value chain. This means that, measuring sustainability is based on the performance provided by the investments on infrastructure, skill acquisition, research and development (R&D) and waste management. This will contain specialization, diversification and integration of the value chains. This will help to determine the effectiveness in the use of resources and work efficiency in the farm.

**Concept of value chain/agricultural value chain**

The concept “value chain” was first used by Michael Porter (1985) in his book *Competitive Advantage: Creating and Sustaining Superior Performance* (Tardi, 2019). A value chain is a business model that describes the full range of activities needed to create a product or a service. That is, it involves the steps taken to bring a product from conception to distribution in the process of procuring raw materials, manufacturing functions and marketing activities (Tardi, 2019). Value chain is how a firm adds value to its products beginning from its production to marketing and even after sales services (Web Dictionary, 2019; Wilkinson, 2013).

Value chain can help a company discern areas of its business that are inefficient, and then implement strategies that will optimize its procedures for efficiency and profitability (Tardi, 2019). This is why Porter holds that, “competitive advantage cannot be understood by looking at a firm as a whole, but it stems from the many discrete activities a firm performs in designing, producing, marketing, delivering and supporting its product.” (Tardi, 2019). In this sense, Porter treats the firm from its input and output processes which involves acquisition and consumption of resources. The above processes occur within the business unit, one leads to another, and Porter calls it the value system.

The components of the value system are divided into the primary activities and the support activities. The importance of value chain is to deliver the most value for the least cost in order to create a competitive cost advantage either by reducing the cost of the value or by redesigning the value. To achieve this motif, Porter engages what he calls the generic competitive strategies, which simply involves strategy target either on cost leadership, product differentiation or focus (Ngige, 2015). On it, there has to be a strong and balanced research and development.

Therefore, in the case of the poultry industry, a strategic farmer/entrepreneur targets either production for a lower cost compared to others or, he/she carries out product differentiation through the lines of the value chain. To succeed, the strategic farmer has to take cognizance of Porter’s five forces viz: threat of new entrants into the business, substitute providers, bargaining power of the customers, bargaining power of the suppliers and the real competitive rivalries.

Agricultural value chain therefore incorporates the whole range of goods and services necessary for an agricultural product to move from the farm to the final customer or consumer (Wikipedia, 2019). The poultry industry is targeted from the point of view of Porter’s primary and secondary activities. These strategic management activities determine if the small and medium scale poultry farms are able to compete and gain strategic advantage over both the competitive small farms and the bigger farms.
The Montpellier Panel holds that, agricultural value chains encompass the flow of products, knowledge and information between small holder farmers and consumers. Small holder farmers need to better engage with value chains in order to gain added value for improving their livelihoods, while reducing their risks and increasing their resilience. Government can support the development and coordination of value chains. Investment and incentives motivate for greater production. Okoroafor (2014), value chains reside at the core of high-impact and sustainable initiatives focused on improving productivity, competitiveness, entrepreneurship, and Small-Medium Enterprises (SME) growth.

**Agricultural Entrepreneurship**

Lans, Seuneke and Klerkx (2013), note that, farmers and growers increasingly require entrepreneurship to be sustainable in the future, so as to impact on business growth and survival. Agricultural entrepreneurship is not limited to specific situations such as, new venture creation, but it includes learning and development and recognizing the working environment of the entrepreneur. Thus, agricultural entrepreneurship emphasizes the creative, alert, proactive and networking aspects of entrepreneurial activity.

Kahan (2012), entrepreneurship is a key factor for the survival of small scale farming in an ever changing and increasingly complex global economy. Putari (2006) entrepreneurship is a function which involves the exploitation of opportunities which exist within a market. Sardeshmukh et al., (2011) entrepreneurship is a career option becoming increasingly desirable. Uchehara (2009) an entrepreneur is an instrument of change.

### 2.2.5 Poultry industry

Iwena (2012), poultry refers to group of birds reared for food and other purposes. While poultry farming is the process of raising domesticated birds such as chickens, ducks, quail, turkeys, guinea fowl and geese for the purpose of farming meat or eggs for food. Poultry are farmed in great numbers with chickens being the most numerous. More than 50 billion chickens are raised annually as a source of food, for both their meat and eggs. Birds raised for eggs are usually called layers, while birds raised for meat are often called broilers (Iwena 2012). Following the FAO Report (2010), poultry comes fourth among sources of animal proteins for human consumption in Nigeria and contributes about 27% of the national meat production.

**Systems of management in poultry management**

The system of management defines the extent to which, birds are exposed to sunshine, pasture and also housing pattern. There are three systems of poultry management; these are the extensive, semi-intensive and intensive systems (Erebor 2003; Iwena 2012). The systems are the options open for entrepreneurial opportunities.

**Incubation and Hatching**

This is the process of providing fertilized eggs with optimum conditions of temperature, relative humidity and ventilation necessary for the development of chicks and their successful hatching (Iwena 2012). There are two types of incubation namely, natural and artificial incubation. The natural incubation is done by the hen itself, after having laid a number of eggs, the hen gets broody. The artificial incubation is designed to provide the ideal conditions naturally provided by hen. It uses man made devices called incubators to provide optimum conditions necessary for the
development of the embryo into chick. The incubator is the most important equipment in hatchery.

According to Iwena (2012), the 21 days incubation period of domestic fowl can be seen as consisting of first 18-19 days incubation in the setter and last two to three days hatching in the hatchery. Infertile eggs and dead embryo can be detected about six days after incubation by the process called candling. The machine used to detect living or dead and developing embryos is called the egg candler. Candling consists of the passage of concentrated source of light through the egg in a dark room in order to see through the egg. At least two candling are done usually in six to seven days of incubation.

**Feeding**

All categories of poultry birds require balanced diet for proper growth and development. Their ration is enriched with proteins, carbohydrates, vitamins and minerals. Cold and clean water is kept in the drinkers while the feeds are kept in the feeders for the birds. On all levels of feeding, good sanitation concerns are observed to prevent diseases. Administration of drugs and vaccination must be carried out. The vaccination program include: drugs to prevent Newcastle disease, gumboro disease and fowl pox diseases. These management practices are the avenues through which a poultry farmer can invest for an entrepreneurial venture or business as the value chain for sustainability.

**Theoretical Exposition**

**Influence of infrastructure on sustainability of poultry value chain**

Kasper (2015) assumes that there is no accepted definition for the term “infrastructure”. Its etymology comes from the Latin prefix “infra” meaning below and the word “structura” meaning structure. This alludes to the idea that infrastructure concerns constructions that emanates from below. Infrastructure is a heterogeneous term, including physical structures of various types used by many industries as inputs to the production of goods and services (Chan et al., 2009). This description encompasses “social infrastructure” (such as schools and hospitals) and “economic infrastructure” (such as network utilities). The latter includes energy, water, transport, and digital communications. They are the essential ingredients for the success of a modern economy (Stewart, 2010).

Infrastructure is often assumed as economic infrastructure, including economically relevant sectors such as transport, energy, electricity, telecommunication but other definitions refer as well to, social infrastructure with facilities and services like hospitals, schools and governmental institutions (Kasper, 2015).

Torrance (2009) splits infrastructure into three different categories: (1) transport infrastructure, such as roads, rail tracks, and airports with user’s fees; (2) regulated infrastructure, such as water, electricity and gas distribution networks with regulated service contracts with availability fees; and (3) social infrastructure, such as schools and hospitals, for which governments pay an availability fee. Infrastructure is one driver of economic development, enabling globalization (Straub, 2008). Infrastructure investments are usually assumed to be capital intensive and tied to
the region of investment where it is made and to have stable long term cash flow with low market and total risk.

Three different ways to calculate the value of infrastructure focuses on the overall value created by the existence of it. (That is, productivity or economic growth); the value the network creates for the single consumer. The value created for the individual consumer is described as the individual utility increasing with the participation of an additional individual as prevalent in telecommunication networks. The third type of utility is based on the group forming effect of networks as one can imagine in informal insurance networks (Kasper, 2015).

**Infrastructure as physical structures in the poultry value chain**

A physical structure can refer to any building, equipment, or materials that can be seen and touched. It can also refer to services put in place to assist in human activities. Poultry production is highly dynamic in terms of structure and management changes. Different farm enterprises will require different types of infrastructure (structure), equipment and resources. The poultry enterprise involves infrastructures that are capital intensive, yet are growth and profitability drivers in both variable and fixed costs (Kasper, 2015). The system of poultry housing depends on category, type of birds, climatic conditions and capacity to invest and strength of birds (Sheikh, 2015). In the housing system all forms of technological equipment are employed for the successful production of poultry as follows: feeding and watering equipment, egg hatching equipment like incubators, candling and egg carriage, slaughtering equipment, waste equipment etc.

**Infrastructure as organizational structures**

Every organization relies heavily on organizational structures to be efficient, productive and sustainable. An organizational structure is a system that outlines how certain activities are directed in order to achieve the goals of an organization. These activities can include rules, roles, and responsibilities. Structuring provides a company with a visual representation of how it is shaped and how it can best move forward in achieving its goals (Kenton, 2019). Structure can either be tall or flat, hierarchical, divisional or departmental. This is why Chandler (1977) maintains that structure follows strategy. That is, all aspects of an organization’s structure, from the creation of divisions and departments to the designation of reporting relationships, should be made while keeping the organization’s strategic intent in mind.

Strategy lines up the arenas and markets in which a company will compete. This makes for organizational differentiation either in cost or focus (Rhodes, 2011). Value chain breaks up the structure into its strategically relevant activities so as to understand the behavior of costs and the possible existence of areas for excelling. The poultry industry is divided into three main segments: breeding, production and processing. Depending on the size, each of the segments carries its organizational structure.

**Infrastructure as links**

Kasper (2015) described economic infrastructure as having nodes and links. This presupposes access and integration to lines of value chains. Production systems have properties of network. Network/links often include vertical and horizontal integration. A vertically integrated firm is a firm which can be replicated by a “buyer-seller relationship”. It is the basic decision “whether to make or buy an input” (Kasper, 2015). FAO, (2010) observes that, today’s poultry industry is
characterized by vertical integration whereby a single company owns the facilities and controls the breeding, hatching and/or processing of broilers but contracts with private poultry farmers for the raising of chicks. In the simplest terms, farmers need to link up with both the vertical and horizontal integration to sustain their businesses and customers.

**Links as market structures**
Infrastructure investment raises productivity, and this has so far shown that the interactions of infrastructure’s links create markets and their values. The market structure is some characteristics of a market organization which strategy affects the nature of competition and price formation in the market (Ahmad, Arifin and Chew, 2016). It is important to note that all components of the Nigerian poultry market chain have a well defined role in the overall objective of supplying consumers with poultry products, notwithstanding differences in quantity of demand and products in different periods of the year (FAO, 2008). This gives room for market chains.

Market chain means the linked entities that bring a specific product from production to the final consumer. Market chain follows the pattern of producer to middle men, to traders, to processors, to wholesalers, to retailers and to consumers. It is a structure and interrelationship in a system. Johnston (2019) maintains that, products move from the producer to the customer through the market value chain. This chain includes anyone who handles or enhances the product on its way to the market. All actors in this chain can also play the role of a supply chain.

According to FAO (2008), the Nigerian poultry market chain constitutes the traditional and the industrial sectors. The traditional sector produces indigenous poultry and brings them either to the weekly markets or the daily markets, through the channels in which the consumers have access. The industrial sector breeds the exotic parent stocks that give rise to the commercial sector. The commercial sector begins with the distribution of day old chicks (DOC) to commercial farms and backyard farms. Hence, the market chain deals with the live bird markets (LBM). Live bird market opens the room for slaughtering, processing and packaging.

Sustainability of infrastructure is about the ability of the infrastructure to function in a way that will not compromise the ability of the system to function in the future (Upadhyaya, 2012). Infrastructure cannot be sustainable unless they are functioning at their best, and can survive the impacts of various stressors both current and in the future. The functionality of infrastructure is affected by changes in population, land use, aging infrastructure, funding, service, water quality, conservation and capacity of the employee. Thus, the poultry industry’s infrastructure needs be sustainable and profitable.

**Skill acquisition and sustainable value chain of the poultry industry**
The Development Education Center (DEC), (2019) states that, skill is very important in the life of every human being. The challenge of unemployment has triggered the strong need for skill acquisition. Skill acquisition is the ability to be trained on a particular task or function and become expert in it. Entrepreneurial skills builds individual self esteem, engender growth process and changes that is never ending. For skill to be acquired, appropriate knowledge, attitudes, habits of thought and qualities of character are learnt to enable the acquirer develop intellectual, emotional and moral character which prepares one for the future (Idoko, 2014).
Many scholars like Douli; Magbagbeola (2004) believe that skill acquisition increases competition and cooperation among people. Skill acquisition involves the acquisition of performance ability, through repetitive performance of an operation (Osinem & Nwoji, 2005). Skills and education are the characteristics of human capital. This is why Pettinger (2017) defines human Capital as a measure of the skills, education, capacity and attributes of labour which influence their productive capacity and earning potential. Therefore the skills of farmer-entrepreneurs go a long way to sustain the sector.

Poultry skill acquisition through entrepreneurship education
Nwabuama (2004) sees entrepreneurship education as the identification of the general characteristics of entrepreneurs and how potential entrepreneurs can be trained in management techniques needed for effective performance of persons for long time service of an organization after the acquisition of occupational skills. For Ebele (2008), entrepreneurship education is the teaching of knowledge and skill that enables the students to plan, start and run their own business. Both ideas portray the fact that within any organization like the poultry venture, there is need for constant teaching and learning to sharpen or expand knowledge within the working environment.

Entrepreneurship education entails teaching students, learners and would be business men and women, equipping the trainees with skills needed for teaching responsibility and developing initiatives of prospective trainees (Ezeani, 2012). Entrepreneurship education is the type of education which has the ability to impact on the growth and development of an enterprise through technical and vocational training (Undiyaundeye and Otu, 2015). In the context of the poultry industry, skill would be the ability to take decisions and set goals, mobilize and utilize resources and technical skills in poultry production practices, while managing risks and marketing the poultry products.

The effect of research and development on sustainable value chain of the poultry industry
Research and development (R&D) refers to the activities companies undertake to study, innovate and introduce new products and services. It is often the first stage in the development process. The goal is typically to take new products and services to market and add to the company's bottom line. The term R&D is widely linked to innovation, and it allows a company to stay on top of its competition (Kenton, 2019). Development itself involves research at all levels; from the most sophisticated laboratory to the smallest farm. There is need for a very close working relationship between scientists and farmers in order to obtain local support within the farming communities for trying out new methods based on research (FAO, 2013).

Across the poultry industry in Canada, research has shifted away from production efficiencies, to issues surrounding food security. Food safety, animal welfare and environmental sustainability are pillars of food security. How farmers respond to reduce the conflicts between food security, production efficiencies and economics, will define the future strength of the industry. Research and development takes place on all the facets of the poultry industry. The Australian example shows that Commercial poultry production research and development (R&D) activities are undertaken across many Australian universities, private organizations and government agencies (Queensland Government, 2017).
Waste management and sustainable poultry value chain

Waste management is the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste together with monitoring and regulation of the waste management process. Waste can be solid, liquid or gaseous. Each type has different methods of disposal and management (Wikipedia, 2019). Recycling is a resource recovery practice that refers to the collection and reuse of waste materials such as empty containers.

Poultry waste includes a mixture of bird excrement and urinary excreta (manure), bedding material or litter (wood shavings, straw, saw dusts, peanut and rice hulls), waste feed, dead birds, broken eggs, packing material and feathers removed from poultry houses. It also includes waste from cage, conveyor belt and water flushing systems Thyagarajan, Barathi, and Sakthivadivu (2013). Is poultry waste a value in the poultry value system of the industry? Akinwumi et.al (2012) agree that poultry waste can give good money if it is made attractive to other lines of farmers in various livestock trade.

Poultry waste management is an important aspect towards growth and sustainability of the poultry industry. With waste, one raises issues related to the environment, human health and the quality of life of the people living around the poultry environments (FAO, 2010). Wastes play an important role in controlling and the eradication of diseases, because, waste constitutes risk for the consumers and the producing systems. This now affects the handling of live birds because from it, viruses may spread (FAO, 2013). Ogundiran, Ademola and Adejumo (2015) show that poultry litter can be treated and reused or applied to the soil.

Byproducts come about from every subsector of the poultry industry; from the housing unit, the hatchery unit, and the processing unit. The treatment of these wastes should aim to produce value added sellable by products. Investment in poultry waste utilization will improve the sector and ensure sustainability of health practices. Hatchery wastes on the other hand, are high on protein. These can be recycled for poultry feed formulation.

Empirical Review

Some studies have been carried out around the areas of capital investment, sustainability and agricultural values chain independently. For instance, Maritan (2001), studied capital investment as investing in organizational capabilities. Alkaraan and Northcott (2006) studied strategic capital investment decision making to see the integration between strategic and financial analysis approaches. Relativo, et.al (2016), studied capital investment decisions of micro, small and medium enterprises in Digos city, Philippines, adopting the survey design. They agree on the profit generation of capital investment.

In 2008, the FAO, ran an assessment of the Nigerian poultry market chain to improve bio-
security.

Szollosi, Szucs, and Nabradi (2014) studied the economic issues of broiler production length in
Hungary as a profitability skill using the methodology of simulation model and ROSS 308 hybrid producers as the population of the study. The Food and Business Knowledge Platform (2016), undertook the role of agri-entrepreneurship and farming innovations for youth in agriculture engagement. Khan (2016), shows the importance of youth in the industry. To eliminate youth disinterestedness in the sector, he proposed ICT as a fertile opportunity to attract the young with entrepreneurial opportunities.


The Montpellier Panel (2014) believes that, investment in rural and food sector entrepreneurship in Africa can achieve sustainable food nutrition security for the continent and significantly contribute to Africa’s rural and urban economic growth. Lemma (2014), points out that livestock generally provide high quality food, cash income and employment. Gale and Armade (2015), examined effects of rising feed and labor costs on China’s chicken price employing the method of analysis of prices to show that China’s poultry production and consumption are growing rapidly

Bamiro (2008); Hamra (2010); Ike and Ugwumba (2011); Todsadee, et.al (2012); Mendes, et.al (2014); Emokaro and Eweka (2015); Yusuf et al. (2016); Olorunwa (2018) analyzed the economic importance of poultry production. Oladokun and Johnson (2012), undertook a study on feeding formulation problem in Nigeria. Showing that many Nigerian poultry farmers, employ inefficient methods like rule of thumb, experiences, and intuition to handle feed formulation problem. Butler (2016), studied the prospects and challenges of poultry farming in the Wa Municipality of the Upper West Region of Ghana.


**Data presentation**
The data presentation showed that, 320 copies of the questionnaire representing 90% were returned, giving the impetus to carry on with the analysis. Males were 215 (67%) while females were 105 (33%). 36 – 40 years age bracket were highest in the population representing 240 (75%). The 36 – 40 years bracket was the most active and populous in the poultry farmers
sampled. 294 representing 92% were married and only 26 (8%) were single. Academically, the B.Sc./BA/HND were highly represented having 132 (41%) followed by the WAEC/GCE who were 108 representing 34%.

On the descriptive statistics, the measure of central tendency (mean score) was employed. Hence, sustainability of poultry value chain had a mean score of 4.23, infrastructure had a mean score of 3.07, and skills acquisition was 3.73 while research and development produced a mean score of 3.77 and waste management was 3.69. After the regression analysis and test of hypotheses, the following findings were arrived at:

1.) There is a weak but positive and significant relationship between infrastructure and sustainability of agricultural value chain of the poultry industry.

2.) There is weak but positive and significant relationship between skill acquisition and sustainability of agricultural value chain of the poultry industry.

3.) There is a weak but positive and significant effect between Research and Development (R&D) and sustainability of agricultural value chain of the poultry industry.

4.) There is a strong positive and significant relationship between waste disposal management and sustainability of agricultural value chain of the poultry industry.

Conclusion
In conclusion therefore, the Nigerian poultry industry has been rapidly expanding in recent years, and now occupies a place of pride among livestock enterprises because of its rapid monetary turnover. It is one of the most commercialized and capitalized subsector of the Nigerian agricultural sector (Adere and Oguntade, 2006). The production costs per unit remain relatively low and return on investment is high. Yet the poultry industry is characterized by high demands on capital, labour, inputs and technology (Heise et.al. 2015).

Poultry production represents one of the few opportunities for investments and security against risk and food insufficiency. Poultry production has been shown to adapt to various environmental conditions. Hence, poultry birds can be raised in small towns, cities, farmed at backyard or commercial levels and villages. For this reasons, the market and demand for poultry products is very high and is a source of value oriented business geared towards the eradication of poverty (Diabua and Oyana, 2017).

Sustaining the poultry production and its challenges has kept farmers battling with problems ranging from the high cost of raw materials and the increased adulteration of raw materials, constant outbreak of diseases to inconsistent government policies. On the local scene, there has been strong competition with imported poultry markets. But this did not deter farmers from pushing ahead with the spirit of generating a sustainable future for a continued recovery and growth of the economy. This is seen from the research findings that, there is a positive and significant relationship between infrastructure and sustainability of the poultry value chain.

Infrastructure plays a major role in economic, social and environmental activities (Upadhyaya, 2012). Infrastructure is economically sustainable if it generates a positive net economic return, and generates an adequate risk adjusted rate of return for project investors. For the environment, sustainable infrastructure preserves, restores, and integrates the natural environment, including biodiversity and ecosystems. It supports the sustainable and efficient use of natural resources,
and withstands the tensions of climate. Socially, it contributes to enhance livelihood and the social well-being of investors over the life cycle of the project.

Sustainability of infrastructure is about the ability of the infrastructure to function in a way that will not compromise the ability of the system to function in the future. Infrastructure builds and adds value to production, transportation, processing, packaging, storage and retailing of the products. That is why poultry infrastructural development can boost social and economic infrastructural development. Though investing in poultry infrastructure remains a capital investment challenge.

If poultry has a good feed conversion rate (FCR), it presupposes that everything in the poultry subsector is a value chain including the waste products. From the findings, it is clear that most of the respondents and the farms have not optimally utilized this opportunity. The basic problem that accrues from it is that, it has not become popular for entrepreneurs to invest in improving the waste disposal section of the poultry value chain. Consequently, poultry waste remains a strong pollutant to both humans and the environment.

It follows that, the high outbreak of avian influenza and poultry diseases is because adequate care has not been given to recycling and utilization of the waste products. Concerning waste water, it is obvious that Nigeria does not have problems with drinking water scarcity as other countries such as South Africa or other European countries. This may be the explanation for a lot of the poultry processing water being left to waste, instead of treatment and reuse. Around the environs of Anambra and Imo States, there are lots of bore holes and water factories. These technology should be employed in the poultry sector at least, to capture the waste water, treatment be given, and the eventual reuse by the same processing factories.

Therefore, the study concludes that, the zone (Anambra and Imo States) have a lot of functional poultries that are operating profitably from just sale of birds, meat and eggs. But these poultries are not performing maximally because, a lot of the values and marketing opportunities are wasted and no investments in those areas. There are in some, good infrastructure though, many may not stand the test of time. Within the zone too, poultry has been taken as an entrepreneurial venture. Yes, it has created employment and looks good for food security and financial sustainability, but the level of the skill employed leaves one to wonder if the future is really in focus.

From the farmer’s perspective, skill and price determines the sustainability of production, nevertheless, it was discovered that the positive and significant relationship that exists between skill acquisition and the sustainability of agricultural value chain of the poultry industry was because, production prices were in alignment with market prices and farmers in most cases repatriated profit from their investments. This means that more people especially young graduates should be encouraged to engage themselves in agriculture as a gainful business and an employment opportunity.

For Khan (2016), ICT (Information and Communication Technology) is a fertile opportunity for improvement of agri-chains and to attract young people into the sector.
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