

**CHEMISTRY EDUCATION AND FOOD CHEMISTRY AS A TOOL FOR ADDRESSING
THE FOOD INSECURITY IN NIGERIA****BY****L. G. Hassan: Department of Pure and Applied Chemistry, Usmanu Danfodiyo
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Sokoto, Nigeria****Corresponding Email: mustaphasalihu6773@gmail.com****Abstract**

The scientific approach to food and nutrition arose with much emphasis given to agricultural chemistry to chemistry in general. Nigeria is a nation blessed with plenty of material resources such as landmass, seaports and irrigable swamps that can be cultivated to provide enough food products for consumption and export. But unfortunately, Nigeria is faced with chronic food shortages due to many factors of which climate change, rapid population growth/poor agricultural policy, conflict/political instability and poor storage facilities are the major causes. This paper discussed chemistry education and food chemistry as a tool for addressing the food insecurity in Nigeria. Meanwhile, the challenges of food insecurity demand an urgent and effective application of chemistry education and food chemistry to provide the basic knowledge via crop improvement and agrochemicals. The paper also outlines some strategies for improvement and suggested among others the full implementation of agricultural policy, climate change awareness and proper funding of agricultural sectors.

Keyword: Chemistry education, Food chemistry, Food fortification, Challenges of food insecurity, Strategies

Introduction

All living organisms need food for their survival and daily activities. Plants can manufacture their food through the process of photosynthesis, hence they are called autotrophs, and on the other hand, animals cannot manufacture their food as they depend on plants directly or indirectly for their food, hence they are called heterotrophs (Michael, 2012). The ability of plants to derive energy from sunlight, animals and humans to derive energy from food begins with chemistry and the principles of thermodynamic. The basics of food itself are made chemicals and biological structures such as amino acids, sugars, lipids, nucleotide, vitamins, minerals and hormones (Fanzo, Remans, and Snchenze, 2011). Food is one of the most important items in the world with clothing and shelter. These three items are usually classified as the man's basic needs (Fawole, Ilbasmic and Ozkan, 2015).

The first essential component of social and economic justice is adequate food production, even if a nation cannot send cosmonauts to the moon, it should be able to feed her population, only then it can occupy place of pride in the community of nations (Otaha, 2013). Meanwhile, the chemical elements are keys to understanding of the modern day food and nutritional needs. In the late 18th century, many of the chemical elements had been defined, including nitrogen from ammonia, followed by the discovery of protein in the egg albumin, inorganic elements and amino acids (Fanzo *et al.*, 2011). In another related development, Fanzo, Idowu and Lawrence (2011) realized that, the characterization of energy and calorimetry was also critical for the food and nutrition science world which in turn could not have been understood without the use of physiological chemistry.

Carbohydrates make up the bulk of our diet; they are our chief sources of energy. About 70% of the energy requirements for all the functions are obtained from carbohydrates (Olaoye *et al.*, 2014). The main sources of carbohydrates in the diet are starch and sugar, and sources of starch are mainly cereal

grain (maize, rice etc) or root and tubers. Olaoye et al., (2014), Normile, (2010), however, observed that fats and oils are the most concentrated form of energy in the food. They furnished by carbohydrates or proteins. The sources of fats/oils include germs of grain, groundnut, butter etc (Olaoye *et al*, 2014). Furthermore, the change that starch undergoes during gelatinization and retrogradation are major determinant of its functional properties for food processing, during digestion and industrial applications (Gafuma, Mugampoza and Bazirake, 2018), and these properties determine the quality, acceptability, nutritional value and shelf-life of the finished food (Wang and Copeland, 2013).

Despite the rich agricultural resources and technical endowments as well as several interventions by successive administration, Nigerian agricultural sector has been operating below its potentials and the primary indices for food security at the national and household levels are still unsatisfactory (Ohikere and Felix, 2012). Meanwhile, the shortfalls in the national domestic foods demand is a regular phenomenon, as only 50% of the present cultivable land is under cultivation and about 70% present of this land mass is cultivated by small holder farmers who employ rudimentary production techniques cultivating less than two hectares per farmer with low attendant yield resulting, thus, the nation's food demand by far exceeds the supplies that are derived from these farmers (Adeagbo, 2012, Ohikere and Felix, 2012).

Nigeria is still characterized by high dependent on food imports. Malnutrition is widespread in the entire country and rural areas are especially vulnerable to chronic food shortages, malnutrition, unbalanced nutrition, erratic food supply, poor quality foods, high costs and even total lack of food (Isaac, 2016). However, Vanguard, (2017), Isaac, (2016) and Federal Ministry of Information and Culture FMIC, (2016) had earlier reported that, this phenomenon of human suffering (Food insecurity) cuts across all age groups and categories of individuals of malnutrition among children in rural Nigeria, but Isaac, (2016) observed that, the figures differ with geopolitical zones; with 56% reported in a rural areas of Southwest and 84.3% in three rural communities in the Northern part of Nigeria.

Food security in African countries has come under extremely threats due to some factors of which some are natural or artificial depending on the circumstances and the countries involved (Fawole *et al*, 2015). In a recent report by America's Population Connection Staff (PCS, 2019) which indicated that sub-Saharan African has the highest proportion of undernourished people in any region, there, one in four are chronically hungry. Hunger in African nations kills more people than AIDs, malaria and tuberculosis combined (PCS, 2019). Nigeria being the giant of Africa with its economy becoming the largest in 2014; but yet, the poverty rate in the country is alarming (Omorogiuwa, Zirkorie and Adewoh, 2014). Synonymously, not less than 70% of the Nigerian population is surviving on less than a dollar per day while food insecurity prevalence in the low income urban households and rural areas respectively stand at 79% and 71% (Akerle, Momon, Aromolaran, Oguatona, Shittu, 2013). Despite the amazing resources that the nation (Nigeria) sit upon and rapid economic progress, yet poverty have remained deeply rooted in the Nigeria as about 70% of it population still live below the poverty line as earlier stated (Metamilola and Elegbede, 2017). Recently, premium time reported that, 132 children die of severe acute malnutrition out of 12,858 hospitalized between January and October 2018 in Kaduna state (Premium Time, 2018).

Chemistry Education and Food Chemistry: Overview

Chemicals are used in every facet of life and are present in a bewildering range of products and applications. Growing knowledge of the wide distribution and impact of chemicals in the food production led chemists to strengthen the food-chemistry relationship (Emmanuel, 2013). The production, processing and use of chemicals in modern society in providing solutions to our immediate societal needs such as food security can be achieved through effective knowledge and application of chemistry education and food chemistry (Emmanuel, 2013). Chemistry is an important science subject

that is taught across senior secondary to tertiary levels of education in Nigeria. It's a core science subject that permeates other science disciplines thereby equipping individual students with scientific knowledge, skills attitudes and aptitudes for self reliance (Udofia and Ekong, 2017). This is however, demonstrated according to Emmanuel (2013), Udofia and Ekong (2017) by the various applications of chemistry in the areas of pharmaceutical, transportation, space science, engineering, industry and the military. In the area of agriculture, it provides fertilizers, herbicides, drugs, laboratory chemicals, fungicides, agricultural equipments among others.

Meanwhile, every concept in the syllabus of chemistry exposed students to an excellent opportunity for advancing scientific, technological and economic security (Okebukola, 2012). Chemistry education is vehicle through which chemical knowledge and skills reach the people who are in need of capacities and potential for development (Udofia and Ekong, 2017), while Food chemists help with processing, packaging, preserving, storing and distributing foods and drinks to make them safe, economical and appealing for consumers (ACS online resources: college to career 2018).

Chemistry education plays an important role in enhancing the quality of teaching, learning and research that helps to shape and revolutionize the thinking, practice and vision of 21st century especially in agriculture (Udofia and Ekong, 2017). Emendu (2014) however, advanced that, chemistry education equipped students with good knowledge to produce goods and services to meet human need in terms of food, health care products and other materials aimed at improving the quality of life. As noted by Okebukola, (2012), an increase in the average education of the farmers by one year increases the value added to agricultural production by 24%. But unfortunately, food production in Nigeria as observed by Otaha, (2013) is carried out by illiterate farmers who lack capital, skills, energy and other viable ingredients to produce large quantity.

Food chemistry as defined by Wikipedia (<https://en.m.wikipedia.org/food-chemistry>) is the study of chemical processes and interactions of all biological and non-biological components of food. The biological substances include such items as meat, poultry, lettuce and milk as examples. Food chemistry according to Walstra, (2003) include how products change under certain food processing techniques and ways either of enhanced or to prevent them from happening. An example of enhancing a process would be to encourage fermentation of dairy products with microorganisms that convert lactose to lactic acid, and the example of preventing a process would be stopping the browning on the surface of freshly cut apples using lemon juice or other acidulated water (Schwartzberg, Henry, Richard, 1992).

Generally, (Food) chemistry has taught us not only the essential of food our bodies absorb, but that the chemical composition of the foods consumed in specific combinations and the quality of the diet are critical in meeting dietary needs (Fanzo *et al*, 2011). It's in this concept (Food and organic chemistry) that eight amino acids are known to be regarded as essential for humans: Isolencine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. In addition to this, arginine, cysteine, histadine and tyrosine are similarly required by infants and growing children (Fanzo *et al*, 2011). Meanwhile, the diet in cereal and vegetable origin do not contain all the essential amino acids necessary for daily consumption and requirements. In contrast, animal sources such as meat, poultry, eggs, fish, milk and cheese provide all of the essential amino acids but are not consumed on a daily basis by the majority of the global population (particularly in developing world like Nigeria) due to cost and supply (Fanzo *et al*, 2011).

In food technology or industry, the major component of food is water, which can encompass anywhere from 50% in meat product to 95% in lettuce, cabbage and tomato products. It is also an excellent place for bacterial growth and food spoilage if it is not properly processed (Walstra, 2003). One way which this is known in food is by water activity which is very important in the shelf life of many foods during

processing (Schwartzberg *et al.*, 1992). Within the Nigerian context, the nexus of Chemistry education and food chemistry can serve as a tool in addressing the food insecurity in the country. Thus, given the economic benefits especially in the area of agrochemicals such as pesticides, herbicides, fungicides, food fortification, and improved varieties with high nutrient content for high nutrition and high productivity.

Objectives of Food Fortification

Food fortification is the process of adding micro-nutrients (essential trace elements and vitamins) to food (Wikipedia). As also defined by World Health Organization W.H.O, (2014) and Food and Agricultural Organization FAO, (2011), food fortification refers to the practice of deliberately increasing the content of an essential, micro-nutrients i.e vitamins and minerals (including trace elements) in a food irrespective of whether the nutrients were originally in the food before processing or not. Thus, improve the nutritional quality of the food supply and to improve a public health benefit with minimal risk to health (WHO, 2014 and FAO in www.copenhagenconsensus.com). Sometimes it's a purely commercial choice to provide extra nutrient in a food, while other times it is a public health policy which aims to reduce the number of people with dietary deficiencies within a population (Gernah, Ukeyima, Ikya, Odo and Ogunbade, 2013; FAO, 2008). To address the problem of food insecurity in Nigeria, agriculture, agrochemicals in collaboration with food chemists must be encouraged in different phases from farming (agriculture), food production in high yield (use of agrochemicals) to processing to packaging and marketing (food chemistry) must be pursued by the public and private sectors (Okechukwu, Onyishi, Okala and Uchen, 2014). Therefore, to achieve these, the following objectives must be at forefront:

- To maintain the nutritional quality of food (Gernah *et al.*, 2013)
- Provision of substantial import substitution through local production of major commodities (Federal Ministry of Information and Culture, FMIC, 2016)
- Improve and maintain the productivity, quality and efficiency of food substance (e.g Vitamin in Flour etc (FMIC, 2016)
- To keep nutrient level (Gernah, *et al.*, 2013)
- Adequate to correct or prevent specific nutritional deficiencies in the population or in groups at risk of certain deficiencies (Gernah *et al.*, 2013).

Food Insecurity and Food Security Discussed

The statistical breakdown of malnourished children in Nigeria shows that 42.8% of children in the Northeast are suffering from stunting and are at high risk of death due to malnutrition if urgent care is not received. Similarly, the report revealed that 29.7% of children in the North central, 20.8% in the southwest and 17.2% of children in the southeast are stunted (Premium time, 2018). Food is defined as a material, usually of plant or animal origin, which contains essential nutrient, such as carbohydrates, fats, proteins, vitamins or minerals and is ingested and assimilated by an organism to produce energy, stimulate growth and maintain life (www.yourdictionary.com/food). Food insecurity exists when people lack sustainable physical or economic access to enough socially acceptable food for a healthy and productive life (Fawole *et al.*, 2015). Food insecurity may be chronic, seasonal or temporary (Fawole *et al.*, 2015) results in catastrophic amount of human suffering (FAO, 2010; Fawole, *et al.*, 2015).

According to FAO, (2008), FAO (2010) food insecurity refers to the consequences of inadequate to consumption of nutritious food, considering the physiological used of food by the body as being within the domain of nutrition and health. Another related development Vanguard (2018) explained that, the chronic food "insecurity" is a condition where a country, its area, its population, a group or a family experience food insecurity, if there is no access to constant consumption of food due to the inability to buy it (lack of income) or to produce the required amount of food.

On the other hand, food security is define as "when all people at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preference for an active and healthy life" (FAO, 2010). Similarly, Otaha, (2013), food security was considered as the availability of food and one's access to it. Furthermore, the World Bank Study (WBS, 2006) defined food security as access to by all people at all times to enough food for an active healthy life. Its believed that, food security affect more than human health and welfare and similarly contributes to economic and political stability as it often noticed that, most countries of the world where there is political instability are associated with food insecure territories, the food insecurity in such countries might have been as a result of political instability or the political instability was a result of food insecurity (Fawole, *et al.*, 2015).

The achievement food security in any nation depends upon four distinct but connected pillars which are briefly discussed below:

- **Food Availability:** food availability relies not only on availability of food but also on ability of the household to prepare and store food (Hanning *et al.*, 2012). There has to be physical, social and economic access to sufficient and nutritious food by all people and at all times; such food must be satisfy the dietary needs and preference of people (FAO, 2008, Simon, 2012). It's the amount of food physically available in a region or place (FAO 2008; FAO 2010). To a great extent, food availability depends on the level of local production, imports, stock levels and net trade in food items (FAO, 2008).
- **Food Accessibility:** This refers to economic, social and physical access to food by all people at all times. However, access to food by Hanning, *et al.*, (2012) is the ability to obtain sufficient quantity and quality of food, whether through purchasing or production. That is an adequate amount of food is available at the regional, national or international level does not imply it is accessible at household level it must be locally accessible and affordable (FAO, 2008; Simon, 2012).
- **Food Utilization:** Refers to the pattern in which the body makes use and benefits from the various food nutrients (FAO, 2008). Utilization is determined by food quality, nutritional values, preparation method and storage as well as feeding pattern (Simon, 2012).
- **Food Stability:** This refers to the stability of food availability, accessibility and utilization over time. All the three components must be present simultaneously at all times (Simon, 2012). A person who has adequate access to quality food today is still considered food insecure if he has periodic inadequate access to food which may cause his nutritional levels to deteriorate (FAO, 2008).

Major Causes of Food Insecurity

The root causes of food insecurity in developing countries (Nigeria inclusive) are the inability of people to gain access to food due to poverty. Nevertheless, the rest of the developing nations have made significant progress towards poverty alleviations. This is why Otaha, (2013) believed that, to discuss the causes of food insecurity in Nigeria is a very difficult task, this is because most Nigerians develop apathy towards locally produced food and patronized imported food which they considered as superior to domestically produced one.

The following are considered to be the major causes of food insecurity in Nigeria:

1. Climate Change: Climate change is one of the reasons why there is food shortage in Nigeria and most of African countries (The Guardian, 2015). Climate change has changed the productivity pattern, as the rain and water are less predictable now than before (Beddington, 2010; Fawole, *et al.*, 2015). Frequent climate change leading to shortage of rainfall and persists drought in Northern part of the Nigeria and excessive rainfall and flood in southern and middle belt regions of the country contributed immensely to low food production in Nigeria (Otaha, 2013). However, Beddington, (2010) further explained that, the substantial increase in food production that required meeting global demand must therefore be achieved in parallel to deliver a step toward reduction in greenhouse gases emission. The

emissions of these gases could be reducing through a combination of changing farming practice and employing new technologies (Beddington, 2010). Thus, focusing on better use of fertilizers, breeding programmes for crops and livestock and improvements in drainage system (Stireman, 2005).

However, global changing is another important driver of food insecurity that cannot be underestimated. Amongst other impacts according to Adeagbo (2012) and Behnass, Draggan and Yaya, (2011) climate change is responsible for biodiversity, loss in the ecosystem as well as other physical access. In similar development, Adeagbo (2012) describe this climate change phenomenon as a time bomb that is already ticking and waiting to explode. Although developing nations are largely responsible for emission of greenhouse gas, the impact of the resultant climate change is more severe in developing countries (Matemilola and Elegbede, 2017).

2. High Demand for Biofuels: Since 2003, the UK and other European countries have effectively poured billions of Euros in to biofuels, on the premise that they reduce emissions from transport (The Guardian, 2013). According to a report from International Food Policy Research Institute (IFPRI) biofuel demand is increasing because of a combination of growing energy needs, rising oil costs, the pursuit of clean, renewable sources of energy and desire to boost farm income in developed countries (IFPRI, 2008). However, the need for crops such as maize and sugarcane-to be used as feedstock for biofuels has had significant and increasing impacts on global food systems. Although expanding demand for biofuels is only one of many factors underlying the recent price increase, the rapid growth in biofuel production will affect food security at the national and household levels mainly through its impact on food prices and income (IFPRI, 2008). The higher prices of commodities resulting from biofuel feedstock production can mean higher incomes for some farmers in developing countries like Nigeria and better agricultural wages for laborers.

3. Population Growth and Poor Agricultural Policy: The world population is expected to grow to almost 10 billion by 2050. With 3.4 billion more mouths to feed and the growing desire of the middle class for meat and dairy in developing countries, global demand for food could increase by 59% and 98% (Cho, 2018). Currently, Nigeria is the 6th populous country in the world with the estimated population of about 200 million people with annual growth of 3%. Thus, this has increased the demand for food products just like other countries of the world (The Guardian, 2013; Fawole, *et al.*, 2018). Food insecurity has persisted in Nigeria and many developing countries because of insufficient policies especially with respect to agriculture, trade, economics and other adjoining sectors (Matemilola and Elegbede, 2017). If government fails with these policies, hunger will naturally persist or even worsen. This failure of policies are attributed to many factors of which frequent policy changes, poor performance of Nigerian monitoring and implementation agencies and lack of public interest (Ilaboya, Atikpo, Omofuma, Asekhana, and Umunkoro, 2012). Reflecting population growth and rising food insecurity, the number of hungry people on the African continent rose by 20 million from 2007 to 2010-2012 (PCS, 2019). According to a report by World Food Program (WFP) which indicated that, 707,000 people are assisted with foods and other items in November 2018 out of 1.7 million people food insecure (WFP, 2018).

4. Conflict and Political Instability: The major causes of food insecurity in Nigeria come from the insurgency and ongoing crisis like farmers and herdsman clashes. Nigeria like all other countries of the world, is faced and passing through one of the greatest challenges of insecurity which do not only provide the staple food like grain, wheat and other food items but is equally responsible for the provision of greater percentage of dairy products and animal protein in form of meat is under siege by insurgents (Fawole *et al.*, 2015). The ongoing menace in Borno, Adamawa and Yobe (BAY), Zamfara states and some part of Sokoto state like Isa, Goronyo and Sabon-birni has crippled the agricultural activities in the state or region while business or properties worth millions of U.S dollars have equally being halted. This according to Fawole *et al.*, (2015), has contributed immensely to the food shortage not only in the affected areas or regions but almost every part of the country leading to the rise in the price of food commodities in Nigeria.

5. Poor Storage Facilities: Post-harvest losses due rodents, insects and microbial spoilage in some areas amount to 30% or more of the harvest crop (Olaoye, *et al.*, 2014). Maize is an excellent food

sources and ideal breeding site for storage (Fanzo, *et al.*, 2011). Pest as defined by FAO, are those organisms that cause damage resulting in an economic loss to maize and other plants in the field or in storage (FAO, 2010). A pest usually called with many name such as Larger Grain Borer (LGB), Greater Grain Borer (GGB) and usually given name like "Osama" is the single most serious pest of stored maize and dried cassava roots (Fanzo, *et al.*, 2011). According to National Maize Experts (NME) maize losses due to storage pest range from 30% to 60% in Malawi, Tanzania and Kenya, much of which is attributed to the presence of the Large Grain Borer and figures far exceed what is currently recorded in the literatures (Fanzo *et al.*, 2011). This has according to Normile, (2010) resulted in wasted seed, water, fertilizer and labour. Post-harvest losses must be attacked with locally appropriate improvement in available technology.

The Challenges of Food Insecurity

The global problem of food insecurity is one of the most important issues of humanity, and hunger as the most severe consequence as well as comprehensive social "disease" has always had an extraordinary influence on the lives of people in different times with different striking destructive force (Ibori, 2018). There are many challenges or problems on the part of government and non-government that affect the food security in Nigeria. Some of the government regulatory/policy problems affecting food security in Nigeria as identified by Matemilola and Elegbede (2017) include:

1. Habitual alteration/termination of other non-agricultural policies but which may have bearing on agriculture due to changing government regime.
2. Poor planning model and structural framework.
3. Unsustainable extension of service system.
4. A number of national policies were not helpful in the government effort to transform the agricultural sector e.g land use Act, importation tariff and other unproductive policies.
5. Inadequate financing of agricultural research and industry as well as farmers capacity building e.t.c.
6. Nonconductive business environment that makes investment in agriculture unattractive to foreign investors.

In addition to the above regulatory problems from the part of government, below are also factors which seriously affect the level of food security in Nigeria:

1. Inability of people to gained access to food due to widespread poverty and unemployment which also inhibits purchasing power and prevents access to food security (Okechukwu, *et al.*, 2014).
2. Increase in the price of food has significant effect on the food security in Nigeria as many Nigerians depend on a market for their food supply and vulnerable to high food prices (FAO, 2011).
3. Changing climate conditions affect both the physical and economic availability of certain preferred food items. Their impacts on income-earning opportunities can affect: the ability to buy food, the availability of certain food products and prices (Okechukwu, *et al.*, 2014).
4. Nigerian farmers have limited access to credit and less than 10% of irrigable land is being irrigated (Okechukwu, *et al.*, 2014)
5. Insecurity level of the Country: In a report by National Emergency Management Agency (NEMA) which indicated that, about 65% of northern farmers had been migrated to the south because of the ongoing insecurity they are facing (Okechukwu, *et al.*, 2014). The attacks on these farmers who produce beans, onions, maize, rice, livestock and catfish in the lake Chad area.
6. Low soil fertility caused by erosion and lack of moisture (Ibori, 2018).

However, the failure of some of the past initiative like operation feed the nation, lower River Basin Development, Green Revolution and Regulatory Bodies such as the Directorate of Foods Roads and Rural Infrastructure (DFRRI) and National Agricultural and Land Development Authority (NALDA) have engendered poor agricultural and food productivity in Nigeria (Otaha, 2013)

Strategies to Improve the Food Availability in Nigeria

There are many strategies for improving the availability of food in Nigeria, but the following are recommended by different scholars:

1. Provision of credit and incentives to the farmers (Oni, Ekonya, Pender, Philip and Kato, 2009)
2. Improved management of industrial effluents (Oni, *et al.*, 2009)
3. Regulation of the use of fertilizers and other agrochemicals (Metemilola and Elegbede, 2017).
4. Crop rotation and diversification (Matemilola and Elegbede, 2017).
5. Irrigation system (Oni, *et al.*, 2009).
6. Promoting decent employment in the agriculture sector particularly in the rural areas (Matemilola and Elegbede, 2017)
7. Promoting the non-farm economy in rural areas i.e government should encourage orientation programs and enable environment for diversification of rural economy (Matemilola and Elegbede, 2017)
8. Accessible education and provision of infrastructure (Oni, *et al.*, 2009; Matemilola and Elegbede, 2017).

Recommendations

This paper recommended the following as the way forward to the current food insecurity in Nigeria:

1. Adequate funding of the agricultural sectors.
2. There should be an effective implementation of National policy on agriculture.
3. The fortification of locally made food substance should be encouraged in order to provide the nutritional content needed for health benefits.
4. Access to roads network for transporting the agricultural products around the country.
5. Academic research institutions should direct their research efforts towards climate change.
6. Provision of good and enough storage facilities of agricultural products.
7. Government should provide large farms to farmers in rural areas which will contribute to the development of local markets to avoid urbanization.
8. Emphasis should also place on research in area of agrochemicals.

Conclusion

The far long traditional routes of food production in Nigeria is carried out by illiterate farmers who lack capital, skills, energy, manpower and other viable ingredients to produce the food Nigeria needed for it population. This critically discussed the major causes attributed to low yield in the agricultural products, impacts of chemistry education and food chemistry in combating the food insecurity. However, advanced in chemistry has in many ways brought about the production of chemicals, pesticides, herbicides and improved seed that are used to facilitate food production in term of quality and quantity. Thus, the knowledge of chemistry education and food chemistry will be of great help to individual students and the general public in the area of agrochemicals and chemical-based technologies to boost agricultural yield which will equally raise the social and economic status of the country.

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