British Journal of Education

Vol.5, No.7, Pp. 94-103, July 2017

Published By European Centre For Research Training And Development UK (www.eajournals.org)

CHEMISTRY EDUCATION AND ENHANCEMENT OF AGRICULTURAL PRODUCTION: IMPLICATIONS FOR FOOD SECURITY IN NIGERIA

[1]Theresa M. Udofia, Ph.D & [2]Antiabong O. Ekong, Ph.D

[1]Department of Science Education, University of Uyo, Uyo
[2]Institute of Education, University of Uyo, Uyo

ABSTRACT: *This paper discussed the indispensible role of Chemistry Education in agricultural production and food security in the context of economic realities in Nigeria. Nigeria is faced with food crisis as a result of internal problems of insecurity, political conflicts, poor youth orientation, and dwindling national economy among others. The price of staple foodstuff such as rice, garri, maize, wheat are beyond the average Nigerians. The imbalance between agricultural food supply and food intake has forced the growing population to increasingly become dependent on imported foods. The challenges of food security demands effective application of Chemistry Education to change students' orientation and mind-set towards applying the scientific knowledge and skills acquired to agricultural production and other agricultural businesses. The situation calls for a real exploit of the scientific knowledge via crop improvement; smarter use of agro chemicals like fertilizers, pesticides, fungicides and effective management to ensure increased productivity and* food security. *Chemistry Education constitutes an excellent tool to catalyse the development of the necessary know-how, creative skills and attitudes among youths for enhancement of agricultural productivity. The onus of this paper therefore, lies in the identification and support processes and linkages that promote technological and attitudinal change towards agricultural production as well as the implications of using Chemistry Education to attain food security in Nigeria.*

KEYWORDS*:* Chemistry Education, Food Security, Enhancement, Agricultural Production, Scientific knowledge.

INTRODUCTION

Chemistry is an important science subject taught across secondary to tertiary levels of education. It is a core science subject that permeates other science disciplines thereby equipping individual students with scientific knowledge, skills, attitudes and aptitudes for self reliance. This is demonstrated by the various applications of chemistry in the areas of pharmaceutical, transportation, space science, engineering, industry and the military. In agriculture in terms of fertilizers, herbicides, drugs, laboratory chemicals, fungicides agricultural equipments among others. According to Abubakar and Ashiru (2010), chemistry has utility values in all spheres of

ISSN 2054-6351 (print), ISSN 2054-636X (online)

life. Earlier, Adesoji and Olatunbosum (2008) had advanced that chemistry has the potential of exerting a dominant influence on the life of an individual as well as on the developmental efforts of a nation. Currently, science and technology, which hinges strongly on chemistry, is the key driver of developments in the modern society. Every chemistry concept in the syllabus exposed to students provide an excellent opportunity for advancing scientific and chemical knowledge, attitudes, aptitude and problem solving skills towards attaining scientific, technological and economic security. Chemistry education is the vehicle through which chemical knowledge and skills reach the people who are in need of capacities and potentials for development. Chemistry education in the view of Emmanuel (2013) helps to address the social objectives of substance development as education is the primary means for empowerment, participation, cultural preservation, social mobility and equity. 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.

Indeed, the applications of chemistry to solving everyday life problems are demonstrated through inculcation of skills, knowledge, attitude and values for adoption of new technologies. Skills such as problem solving, innovative ability, manipulation, measuring, experimenting, reasoning, adopting of existing technology, communication, analysis and appropriate management skills are very necessary for increased food production. Also, mental ability like creativity, understanding, application, resourcefulness, improvisation and initiative developed will serve as foundation towards applying the scientific knowledge to attaining food security through increase agricultural productivity. Furthermore, positive attitude like consciousness, appreciation, and self confidence as well as responsible values of honesty, hard work, interest, team-spirit, patience and commitment among others would significantly play a key role in promoting sensitivity to practical application of chemistry education to solving societal problems like food production. Hence, the capacity to produce or preserve food is directly linked to the level of scientific knowledge and technological development.

Food security is defined differently by different authors over the years due to global food challenges. In the World Food Conference of 1974, food security was defined in terms of food supply ensuring the availability and price stability of basic foodstuffs at the international and national level thus: “Availability at all times of adequate supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”. Food security according to Food and Agricultural Organisation (FAO) (2011) exists 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 preferences for active and healthy life. Thus, to achieve food security in Nigeria is a task that requires a holistic approach in terms of commitment, knowledge and skills acquisition by all categories of individuals especially the youths at all levels of education. Egbule (2016) described youths as the young ones full of energy, strength, zealous and industrious. They are needed in the agricultural production process for improved productivity. It is on this basis that the paper looked at the link between chemistry education and

ISSN 2054-6351 (print), ISSN 2054-636X (online)

agricultural production with the aim of bringing about food security in Nigeria through meaningful teaching and learning of chemistry. In specific terms, this paper discusses Chemistry Education, agricultural production; the problems of food security; enhancing agricultural production through Chemistry Education and its implications for food security in Nigeria.

Chemistry Education.

Education is the developments of skills and training in problem solving through identification of problems, matured judgment, critical thinking as well as change values, attitude and beliefs. Chemistry education plays an important role in enhancing the quality of teaching, learning and research that helps to shape and revolutionalize the thinking, practice and vision of the 21st century especially in agriculture. A major thrust of teaching and learning of Chemistry education is to make an individual scientifically literate. Scientific literacy is defined by Dass (1999) as the recognition, understanding and application of scientific principles and concepts to real life problems both at personal and societal levels. Chemistry education therefore, is the vehicle through which students can be endowed with chemical knowledge and skills as necessary capacities and potentials for technological, agricultural and economic development.

Chemistry education according to Emendu (2014) equip students with good knowledge to produce goods and services to meet human needs in terms of food, health care products and other materials aimed at improving the quality of life. The ability of plants to derive energy from sunlight, animals and humans in turn derive energy from plants as food, begins and ends with the principles and laws of chemistry. Chemistry therefore is related to agricultural productions which provide food to man. The food nutrients are chemical elements which are studied in chemistry education. Every single material thing in the universe is chemical in nature and the ability to understand and manipulate these chemicals is what brings about the modern food and drugs to plastics and computers that make live more convenient. Chemistry Education is therefore imperative for the youths who are the future leaders to acquire deep knowledge about the environment, attitudes and values for social life, skills to explore, utilize and transform available resources for agricultural production both for domestic use and for export. As pointed out by Okebukola (2012), an increase in the average education of farmers by one year increases the value added to agricultural production by 24%. Unfortunately, food production in Nigeria is carried out by illiterate peasant farmers who lack capital, skills, energy and other viable ingredients to produce large quantity (Otaha, 2013).

Moreover, Chemistry education could never be of more importance than now that advances in research and its resulting technologies have irrevocably expanded the scope and application of unique training in observation and reasoning for agricultural production. Knowledge of Chemistry is required for deep understanding of agro ecosystem function in particular, nutrient cycles and the molecular reactions within and between species. The unique characteristics and knowledge of chemistry increases understanding in areas of interactions between crops and

ISSN 2054-6351 (print), ISSN 2054-636X (online)

pests, how plants obtain and use nutrients from the soil and how to increase production through the use of new agro chemicals. Indeed, the success and confidence of using chemistry to find solution to problems of everyday life is important. According to Egbule (2016) food production and security was largely through knowledge, skills, attitudes and values gained through agricultural training. This goes to show the extent to which appropriate knowledge, reasoning, observations and experiments which are unique features of chemistry education would help students to develop scientific approach to problem solving of real life challenges particularly food supply.

Agricultural Production

Agricultural production is one of the most important responsibilities of any nation as it is directly linked with health, job productivity, security and development of the nation. In Nigeria, agricultural production has been a challenging issue over the years with each successive government evolving policies to address the persistent problem though with very little success. According to FAO (2004), societies have defined themselves by the way and degree to which they have succeeded in increasing agricultural production. Adequate agricultural production is therefore a necessity for productive life and national security. Agricultural production in Nigeria is characterized by considerable ecological and crop diversity due to varying climatic conditions. The major crops/agricultural products in Nigeria include **c**ocoa, peanuts, cotton, palm oil, corn, rice, sorghum, millet, cassava (manioc, tapioca), yams, rubber; cattle, sheep, goats, pigs; timber; fish and so on.

In Akwa Ibom State, agricultural production has traditionally been the major occupation of women who continuously produce food crops and animals like pumpkins, cocoyam, cassava, okro, maize pumpkins and chicken respectively for domestic consumption (Ekong, 2007). An agricultural expert, Mr Sotonye Anga, in an interview with the News Agency of Nigeria (NAN) concerning food supply to feed population said that Nigeria presently spends N17bn to feed its population of 170 million, with every Nigerian spending an average of N100 per day, meaning that the country spends N17bn every day. This goes to show that Nigeria domestic agricultural production output is still under developed for a number of reasons. Among the reasons according to Orji (2013) are lack of scientific and technological know-how, use of manual farm tools/methods, lack of formal education, ignorance, lack of modern farm machines and techniques, lack of food storage or processing facilities and global warming. Similarly, Ojo and Adebayo (2012) reported that agricultural production is still regarded as a vocation for the less educated and the poor in the rural communities while the politicians, retired generals and businessmen who venture into agriculture engage largely in crops or animal production, producing pineapple, ostrich, piggery and other exotic produce rather than common staple food. However, it is no news and worrisome that Nigeria is a country suffering in the mist of plenty, with over 71million hectares of cultivable land lying fallow over the years but depending heavily on imported goods.

ISSN 2054-6351 (print), ISSN 2054-636X (online)

The problem of food security in Nigeria

Food remains an issue, either it is too much or not enough in the continuing development of the human race (Fanzo ,Remans and Sanchez, 2011). In Maslow hierarchy of needs, food is a basic survival need that must be met before other needs like security and self actualization can be achieved. Food is defined as material, usually of plant or animal origin, which contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals, and is ingested and assimilated by an organism to produce energy, stimulate growth, and maintain life (http://www.yourdictionary.com/food).

Food security is built on three pillars namely food availability, access and use. Availability means sufficient quantities of food available on a consistent basis; food access refers to having sufficient resources to obtain appropriate foods for a balanced nutritious diet and food use which explains appropriate use based on knowledge of basic nutrition and care. In a simple term, food security refers to both physical and economic access to food that meets the individual home dietary requirement as well as their individual member's food preferences. Thus household food security is attained when all members, at all times, according to their food preference have access to enough food for an active, healthy and psychologically balanced life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern. In other words, food insecurity exists when people do not have adequate access to available, accessible and utilizable food.

Food security in this study is defined as the ability to harness both material and human resources to boost agricultural production of staple crops and animals in quantity and quality for human consumption and healthy life. Currently, Nigeria is suffering from food poverty**.** The daily experiences have shown that prices of staple foodstuff like rice, garri, yam, cocoyam, potatoes and plantain among others are sky rocketing beyond the reach of the common citizen. This high food prices have not only placed considerable pressure on poorer households to spend more on food but has narrowed down access to affordable nutritious food in quality and quantity, forcing both urban and rural dwellers to cut down on food consumption. By the situation, the country is at a sorry state of depending on imported food. According to Lyddon (2015), Nigeria still remains a food deficit country with domestic agriculture still under developed.

In Nigeria, according to Okebukola (2008), agriculture has a huge untapped capacity with over 60% of arable land not yet cultivated. Similarly, IFAD (2012) reported that only a half of the 71 million hectares of cultivable land and 7% of irrigable land are currently used for farming. Compounding the problem of food security are political conflicts, poor youths orientation about farming, insecurity, dwindling national economy, economic poverty, corruption, poor policy implementation and growing population which have worsened the already poor agricultural supply in the country resulting in serious food crisis. According to FAO (2011), for a country to have sustainable food security, food supplies must keep pace with increase population and urbanization. It is therefore not surprising that Nigeria is in the present dilemma due to an

ISSN 2054-6351 (print), ISSN 2054-636X (online)

imbalance between agricultural production and population growth. Nigeria with the current inflation rate as reported by the National Bureau of Statistics, (2016) 'Nigerian annual inflation rate rose to 11.3 percent in Feb, 2016, being the highest so far from March 2015 and driven by food prices.

Table 1: Nigeria Food Inflation Rate

Year/ month	2015										2016	
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Percen-tage of food Inflation	9.37	9.48	9.78	10.01	10.06	10.10	10.20	10.10	10.30	10.60	10.60	11.30

Source: National Bureau of Statistics, 2016, Nigeria

Table 1, shows that Nigeria is seriously threatened by shortage of food supply hence the continuous increase in prices of staple food for a period of one year. This invariably affects the rate of quality and nutritious food intake in Nigerian households. Otaha (2013) posited that the food intake requirements of majority of Nigerians have fallen far below the international standard. This is very worrisome and demands urgent intervention by all to ameliorate the pains of hunger, malnutrition and health breakdown faced especially by the low income citizens.
Agricultural production ought to be the responsibility of every citizen including youths in the secondary schools and this can be achieved only if the youths are effectively and meaningfully empowered with scientific knowledge, skills and attitude derivable from Chemistry Education. An important goal of chemistry education is to foster human enterprise through experimentation, observation, application and carefully designed resource management systems. Hence, Nigeria requires as a matter of urgency, an effective application of Chemistry Education to change the orientation and focus of citizens especially the youths towards enhancing agricultural production.

Enhancing Agricultural Production through Chemistry Education.

Naturally, Nigeria is a well endowed nation with abundant material resources such as arable landmass, sea ports and irrigable swamps that can be cultivated to provide enough agricultural products for consumption and export. Nigeria was once an exporter of foodstuff such as groundnut, palm oil, cocoa, rubber, hides and skin among others and could still be. Every individual needs adequate quantity, quality and nutritious food to be healthy and productive. Udofia (2010) discussing the use of Science, Technology and Mathematics Education as a

ISSN 2054-6351 (print), ISSN 2054-636X (online)

panacea for economic meltdown submitted that youths should be sensitized scientifically with the main focus of using modern production technologies for agricultural production for self reliance. A report by the Pan Africa Chemistry Network (2012) on increasing Africa's Agricultural Productivity emphasized that increase in agricultural productivity needs scientific intervention and fundamental research in chemical sciences in partnership with other disciplines. Chemistry education is a scientific tool that could be used to harness natural resources to enhance living through solving visible societal problems, such as easing economic poverty, disease, food insecurity and making lives more convenient. Advances in chemistry Education have resulted in production of new chemicals and food engineering thereby bringing endless innovations in additives and food products currently found in market stores and supermarkets all over Nigeria. For example, advancement in chemistry has brought about production of chemicals, pesticides, herbicides and improved seeds that are used to facilitate food production in terms of quality and quantity. Hence, in the daily food preparation, a lot of food additives, flavours, preservatives, spices, emulsifiers, food coloring and food seasoning are used to make food tasty, attractive, and nutritious and ensures preservation without losing quality. It is therefore critical that chemistry students be exposed to appropriate knowledge of chemistry in the areas of agrochemicals and chemical-based technologies to boost agricultural production and enhance social, environmental and economic sustainability of food security.

In the present dwindling economy, addressing hunger through Chemistry education is inextricably linked to knowledge acquisition, understanding and manipulating crop-enhancing agricultural chemicals to ensure viable agricultural products. Chemistry applications as posited by Fanzo ,Remans and Sanchez, (2011) play a critical role in enhancing agricultural production through soil and crop management, enhanced understanding of soil processes, plant nutrition, fertilizer production and application, development of improved crop varieties and methods of controlling pests and diseases. The onus, therefore, lies in the identification and support of processes and linkages that promote attitude change for increased agricultural production.

Chemistry through Chemistry Education is involved in all aspects of crops and animals production, food safety, quality control, nutrition, processing and utilization of materials including bio-energy. In basic research, chemists study the various components and properties of proteins, fats, starches, and carbohydrates, as well as micro components such as additives and food flavors to determine how each works in food as well as their health benefits**.** Enhancing domestic agricultural production and supply is a necessity as it is the only way to curb the high rate of food inflation, put food on the table, and promotes good health and productivity in the country. As a potential solution to food insecurity, chemistry education should be used to enhance skills and change attitudes of students to become more curious about application of knowledge and skills acquired for agricultural products and other societal problems.

ISSN 2054-6351 (print), ISSN 2054-636X (online)

IMPLICATIONS OF CHEMISTRY EDUCATION FOR FOOD SECURITY IN NIGERIA.

The implications of Chemistry Education is to the extent of advancing agricultural production for a far reaching effect on food security, economic development and social life of the citizens. It is obvious that an effective application of chemistry education would improve students' productivity and go to the extent of increasing capacity, skills and attitude change for productivity increase and invariably food supply in quantity and quality. This therefore, would reduce the rate of inflation, hunger, malnutrition and associated diseases arising from poor nutrition. Definitely, it would reduce importation of basic staple food stuff like rice, sorghum, millet, chicken and boost the nation's dwindling economy for long term survival. Furthermore, youths restiveness arising from lack of employment would be reduced if the youths are meaningfully engaged in agricultural production.

CONCLUSION

This paper focused on the relevance of Chemistry Education in attaining food security in Nigeria now that the country is experiencing dwindling economy with resultant food inflation. For the food security in Nigeria to be realized, the teaching of chemistry must target the students who are energetic and strong with commitment and focus of involving them in agricultural production. Chemistry education is very essential in meeting the challenges of poor scientific knowledge, poor orientation, lack of initiative and negative interest through inculcation of skills, knowledge, attitude and values for adoption of new technologies. It is therefore, imperative that Chemistry Education should be used to accelerate, motivate, and provide a comprehensive knowledge base and skills towards improving students' productivity in agriculture through deployment of existing and new technologies for production, processing, preservation, and distribution of agricultural products for food security in Nigeria.

REFERENCES

Abubakar, M.N and Ashiru, A.G. 2010. Towards effective teaching of inorganic chemistry. *Science Teachers Association of Nigeria chemistry panel series 5, 16-21.*

Adesoji, F.A. and Olatunbosun, S. (2008). Student, teachers and school environmental factors as determinants of achievement in secondary school chemistry in Oyo State Nigeria. *The Journal of International Social Research*. 1(2), 13-34. Retrieved June 18th, 2012 from Uluslararasi sosyal Ara-turmalar Dergisi.

Dass,P.M.(1999). Science Education for the 21st Century challenges and promising approaches. Internationally Journal of Curriculum and instruction. 2(1) 11-17

Egbule, P. E (2016). Farms without youths: Making gamblers the career farmars.49th Inaugural lectures of Delta State University, Abraka- Nigeria. University Printing Press 1-91.

ISSN 2054-6351 (print), ISSN 2054-636X (online)

Ekong , A.O. (2007). Issues on women in agriculture. Dorand Publishers. Uyo, Akwa Ibom State.

Emmanuel .B. (2013). The place of Nigeria certificate in Education chemistry Teachers in UBE Basic Science programme. *Proceedings of the 54th International Annual conference of STAN on Attaining the MDGS through STEM Education,* O. Abonyi Ed. HENBN Publishers Plc. 177-181.

Emendu, N.B. (2014). The role of Chemistry Education in National Development. The International Journal of Engineering and Science (IJES) 3 (3) 12-17

Food and Agricultural Organisation FAO. (1996). Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November 1996. Rome

Food and Agricultural Organisation (FAO), (2004). The Ethics of Sustainable Agricultural Intensification.FAO Rome, Italy www/fao,org: Editional Production and Design Group Publishing Management Services.

http://E:/presidentialresearchandcommunicationsunitgovernmentinaction.htmaccaccessed.

FAO (2011). The State of the World's Land and Water Resources for Food and Agriculture: Managing systems at risk. Retrieved March 14th from http://www.scidev.net/global/food-security/feature/sustainable-food-production-facts-and-figures.html

Fanzo, J , Remans, R and Sanchez, P (2011). The role of chemistry in addressing hunger and food security The Chemical Element: Chemistry's Contribution to Our Global Future, First Edition. Javier Garcia-Martinez, Elena Serrano-Torregrosa(Eds) Wiley-VCH Verlag GmbH and Co. KGaA.71-97.

Food definition. Retrieved March 14th 2016 from http://www.yourdictionary.com/food

International Fund for Agricultural Development (IFAD) (2012). *The State of Food Insecurity in the World). Rome: FAO.* http://www.ifad.org/

Lyddon, C. (2015). Focus on Nigeria**:** The Grain and Grain Processing Information. Retrieved March 14TH 2016 from Sitehttp://www.world-grain.com/Departments/Country%20Focus/Country%20Focus%20Home/Focus%20on%20Nigeria%202015.aspx

Ojo, E. O and Adebayo, P.F (2012) Food Security in Nigeria: An overview: European Journal of Sustainable Development, 1(2) 199-222.

Orji,S. C. (2013) 12 Major problems of food and agriculture in Nigeria The Nigerian Voice 20 march 2013 . Retrieved 14th March, 2016 from http://www.thenigerianvoice.com/news/110350/12-major-problems-of-food-agriculture-in-ni.html

Otaha, I. J. (2013). Food Insecurity in Nigeria: Way Forward. *African Research Review* 7 (4), 31:26-35. Retrieved March 30th 2016 from http://dx.doi.org/10.4314/afrrev.7i4.2

Okebukola, P.A.O (2008). Education reform: Imperative for achieving vision 20-2020. Education Reforms for 20-2020. Senate Committee on Education Summit.

Udofia, T.M. (2010). Science Technology and Mathematics Education: The panacea for economic meltdown in Nigeria. *Proceedings of the 51st International Annual conference of*

ISSN 2054-6351 (print), ISSN 2054-636X (online)

STAN of STEM Education and Global Economic Crisis. Nsikak-Abasi udofia Ed. HENBN Publishers Plc. 124-129.

World Food Programme (2016). Hunger Statistics. A report by the Pan Africa Chemistry Network. The Royal Society of Chemistry www.rsc.org/pacn. Retrieved March 28th from www. wfp.orga./hum.

ISSN 2054-6351 (print), ISSN 2054-636X (online)