



## Exploring the Effect of Teaching Methods on Development of Agricultural Skills for Food Security: Case Study of Colleges of Education in North-East Region, Nigeria

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### Abstract

*The study investigated teaching methods employed by agriculture lecturers in federal and state-owned colleges of education and its effect on students' skills development for food security. Descriptive survey design was employed on a target population of 4,996 students and 84 agriculture lecturers. The actual sample size was 393 students and 77 agriculture lecturers. Data was collected using Agricultural Teachers 'Interview Timetable and Students' Focus Group Conversation Guide. The study found that discussion approach provides ways for the teacher to learn from the students and promote the application of the educational objectives. It equally revealed that demonstration method was the most significant approach to agricultural teaching that develops skills for food security. The views of the students suggest that discussion and demonstration are the most effective approaches to developing food security skills, but the most widely used method was lecturing.*

**Keywords:** Food security; Practical agriculture; Skill development; Teaching methods;

### Introduction

The goal of every country, non-governmental organizations as well as agricultural extension programs is to reach and feed every citizen. However, almost 1 billion people across the world suffer from persistent food shortages (Food and Agriculture Organisation, FAO 2018). At the same time, global food demand is projected to rise significantly as agricultural activities and production have already been influenced by the increasing world population and climate change (US Agency for International Development, USAID 2018).

In several developing countries, where food systems faced serious challenges in ensuring access to sufficient, healthy and nutritious food for everyone, the development of agricultural skills and their implementation are either missing or insufficient (IFAD 2012). Nigeria in particular is one of the countries endowed with vast agricultural land with about 30.7 million hectares (76 million acres), or 33% of Nigeria's land area under cultivation. Nigeria's diverse climate, from the tropical areas of the coast to the arid zone of the north, make it possible to produce virtually all agricultural products that can be grown in the tropical and semitropical areas of the world (Chauvin, Mulangu & Porto, 2012). However, her agricultural production has not kept pace with population growth rate hence food security is becoming a concern.

The primary objective of Nigeria's agricultural is to diversify its economy by making agriculture the core of economic development while at the same time ensuring a hunger-free country. A nation free of poverty is one that is protected by food. Food preservation has become a national concern for the country given the food shortage of the vast majority of its 198.1 million population (FMARD, 2016). Despite its favorable agro-ecological endowments, food and nutritional deficiency is widespread in Nigeria. It has a total land mass of 92.4 million hectares, of which only about 32 million hectares are planted, or 34.63 percent. Therefore, Nigeria lacks both the willingness and the potential to fulfill the food and nutritional needs of its large population. As such, Nigeria's nutritional poverty and under-nutrition prevalence are among the highest globally (Fadare et al, 2019).

The portrait of food and nutrition poverty in Nigeria has been on a deteriorating trend. According to FAO et al (2019), the overall number of undernourished Nigerians between 2004 and 2006 was 9.1 million. Between 2016 and 2018, this figure rose to 25.6 million individuals, or 281.32 percent. As the population of Nigeria continues to expand with a growth rate of 3.1 percent, the country's food and nutrition requirements would also increase with the probability that food and



nutrition insecurity could take on alarming dimensions.

Even though Nigeria is yet to allocate 10 percent of its yearly national budget to agriculture to be on track towards realizing 6 percent growth in productivity as projected in the Comprehensive Africa Agricultural Development Program (CAADP) and the ECOWAS Agricultural Policy (ECOWAP) documents. Since 2010, Nigeria has introduced and implemented new agricultural policies (FMARD, 2016). There are still huge differences between domestic supply and demand for many staple crops, although significant progress has been made in the production of cassava and rice. Nigeria is therefore investing an immense amount of its scarce wealth on food imports. Central Bank sources in Nigeria suggested that the monthly import bill for the country in 2015 was US\$ 665.4 million. Additionally, recent information from the same source shows that by October 2018, the number had fell dramatically to US\$ 160.4 million monthly (Popoola, 2018). Despite these performance fragments, the ultimate picture is that Nigeria is grossly vulnerable with the lurking danger that it might fall into acute food poverty without warning due to the degradation of agricultural efficiency.

Food security is a situation in which all people have access to affordable, safe and nutritious food at all times, physically and economically, that meets their dietary needs and food choices for an active and healthy life (FAO 2008; WHO 2018). Thus, its development, accessibility, protection, nutrition and constancy of supply are facets of food security. Availability, accessibility, usage and safety are the four major pillars of food security that are related to the above dimensions (WFP 2017).

The teaching of agriculture in colleges is very crucial in the life of youths who are the future leaders. In addition to imparting knowledge for development, the teaching of secondary school agriculture should also include all aspects of food security. Therefore, the emphasis should be on improving skills in the fields of food production, accessibility, food security and nutrition, as well as develop management skills, such as planning and budgeting, and adding value to the food produced. By applying effective teaching strategies, specific skills can be established

that can effectively help achieve the four pillars of food security. The processing skills in all food groups, for example, maintain a healthy diet for individuals that helps avoid dietary diseases such as kwashiorkor, anemia, scurvy, impaired vision, osteoporosis, and osteomalacia. Skills in food wastes management can be developed in order to reduce food shortages in the manufacturing and supply chain. For instance, during peak harvest periods, the harvesting of fruit and vegetables on the farm, as well as the production of sustainable quantities of food. Such skills will further contribute to achieving Sustainable Development Target on increased resource quality, reduced waste and proven practices of sustainability in all sectors of the economy (UN 2010).

There is a symbiotic relationship between agricultural education and nutrition, which can be clarified by teaching approaches. For example, the kitchen garden model encourages dietary diversification due to women and children using enhanced agricultural techniques that preserve scarce resources (Global Communities 2018). At the same time, food hygiene skills will avoid pollution, bacterial diseases and radioactive contaminants that can be dangerous to human life from processing and preparation for consumption (Ndem 2013). In compliance with the CODEX food safety guidelines (CODEX, 2019), students may improve their skills. These skills can help protect against threats to food safety, such as the ingestion of leftover chemicals in crops and international bodies, such as heavy metals and detergents in waste water. The practical approaches can also be based on the skills of students as directed by African Food, best way to handle (EAC 2015) and secure harvested grains such as maize that form the country's staple food core. For example, moisture management skills, management of vermin in grain stores, proper aeration and frequent storage monitoring can vastly improve protection and minimize post-harvest losses. In addition, agricultural planning and budgeting skills will contribute to the production of adequate staple crops for the consumption of households as well as providing ample disposable income to fulfill their food requirements for the market (Saina et al. 2012).



The United Nations (UN 2010) effort of outlining the first Millennium Development Goal (MDG) to eliminate global poverty and hunger is also accomplished when the methods used in teaching secondary school agriculture are in a position to build skills among students that encourage avenues for food security. In its vision plans for 2015-2020, food security is one of the main agendas that the Nigerian government needs to discuss. Within global, continental and national growth frameworks, the agenda is very well streamlined with the 2030 Framework for Sustainable Growth, which is anchored by the 17 Sustainable Development Goals (SDGs). The agenda also aligns well with the 'The Africa We Want' theme of Africa's Agenda 2063, which lays forth the growth goals of Africa by 2063.

The contribution of agricultural skills to the above-mentioned facets of food security cannot be effectively accomplished if constraints such as crowded agricultural syllabus, insufficient time on school time tables and inadequate teaching and learning materials are not properly tackled. With regard to the secondary school agriculture curriculum in Nigeria, the general objectives of food security include improved skills required for agricultural activities, improved self-reliance, resourcefulness and problem-solving skills in agriculture, as well as for schools to engage effectively in national development through agricultural interventions. The researcher discusses the need for a revision of the secondary school agriculture curriculum so that learning activities that are directed towards providing hands-on interactions for better food security can be integrated. Accordingly, this study results are intended to be used as guides for Nigerian education policy makers in secondary school curriculum.

Several approaches are used to teach agriculture in secondary schools and institutions of higher learning. This include lecture method, class discussions, classroom activities, field trips, demonstration as well as discovery / problem-solving approaches (Gill 2013). The popular thing about them is that they pass knowledge to the learner. At the same time, they can all be implemented using a mixed method approach. The dual approach incorporates the best of everything that the teacher has to say (Gill 2013).

Despite their aim to impart knowledge and develop agricultural skills to learners, the acquisition of skills geared towards food security continues to be a challenge. Numerous scholars have suggested that learning the appropriate skills for food security in a country should concentrate on realistic approaches to teaching agriculture (Amuriyaga, Zakaria, and Abujaja 2018; Donna, Wims, and Tony 2016). If achieved without well-defined guidelines, the transfer of knowledge will remain theoretical, examination-oriented and with class projects limited to the main examinations only.

Developing skills by well-established learning ventures such as school gardens, is a great and fun way to make virtually every classroom curriculum come alive and teach students 'true life' sense as they study (Parella 1995). Via school gardens, students have the ability to engage in hands-on learning that teaches not only the intended subject but also commitment, teamwork and reverence for nature. It also encourages healthy eating practices and supports locally grown food supplies (Bucklin-Sporer and Pringle 2010; Ozer 2007). School gardens are also a realistic way for students to reconnect with the environment and biodiversity that surrounds them (Ozer 2007).

The inclusion of community-based school programs is also an avenue for hands-on learning of expertise that can improve food security across classrooms. FAO's (2014) research demonstrates that significant aspects played by studying outside formal institutions, such as informal learning from parents and friends, the development of conventional and modern knowledge and skills by rural youth, and the need for greater ties between informal, non-formal and formal learning, are part of lifelong learning.

This study adopts Dewey's Constructivist Theory (1998), which states that learning is the mechanism by which knowledge is centered on a given scheme. It further argues that learning is more successful when a pupil is personally engaged in the learning process than when he or she attempts passively to receive knowledge. Constructivist theory informs this research on the basis of the assumption that the student learns better from personal experience. Practical techniques place learners at the forefront of learning and, through their constructive involvement, they



acquire hands on the expertise that builds the skills that can be applied in the food industry. These perceptions are what Kolb and Kolb (2005) define as a core component of constructivist learning or, simply, experiential learning. This research understands that the main aim of using this approach is for students to learn how to learn by providing them an initiative towards their own learning experience. The researchers have operationally described food security as a situation in which individuals can access sufficient, healthy and nutritionally balanced food in an economical manner. Respondents were then asked to offer their opinions on the influence of agricultural teaching approaches on the development of skills that could be

applied to the supply chain in order to satisfy the above-mentioned aspects of food.

### Research Question

The study was guided by one question: what are the effects of approaches to teaching colleges of education students agriculture on skills development for food security? It explores the manner in which each approach leads to the development of skills with specific regard to food security. Specifically, the research focuses on colleges of education in north-east region of Nigeria. This paper adds to a growing body of knowledge by identifying several learning experiences that could build more hands on food security skills.

**Table 1. Food security and required skills development.**

Food security pillar	Aspects of food security and nutrition	Required skills development on students
Availability – it is the physical existence of food	Production: a) Domestic or commercial imports and exports, food aid and domestic food Stocks. b) Own production or bought food	<ul style="list-style-type: none"> <li>• Crop and livestock production Practices.</li> <li>• Timely planting to take advantage of unexpectedly early favorable soil and air conditions.</li> <li>• Timely field management practices such as weed, pest and disease control</li> <li>• Soil and water management including prevention of water logging and salinization</li> <li>• Seed selection and its quality</li> <li>• Infrastructure development for water harvesting</li> <li>• Planning and management of local water user groups to minimize risks of scarce resources and reduce conflicts</li> <li>• Appropriate livestock production</li> <li>• practices such as selection and breeding, nutrition and health management</li> </ul>
Accessibility – for sufficient quantity, quality and diversity for nutritional diet	a) Physical access b) Social access c) Economic access-income and expenditure d) Policy environment-marketing strategies and its timing	<ul style="list-style-type: none"> <li>• Infrastructure construction such as weirs and rock catchment</li> <li>• Improved drainage</li> <li>• Preservation and rehabilitation of ecosystems</li> <li>• Early warning systems and emergency Plans</li> </ul>



Utilization	a) Food safety aspects such as sanitary facilities, healthy physical environment, as well as understanding and awareness of proper health care b) Nutritional aspects such as biological utilization, diversity of the diet, good feeding practices as well as proper food preparation	<ul style="list-style-type: none"><li>• Safe drinking water</li><li>• Safe food preparation</li><li>• Management of agriculture waste water</li><li>• Diversity of crop variety production</li><li>• Food combination at consumption level</li><li>• Post-harvest management practices</li></ul>
Stability	a) Constancy in supply b) External risk factors such as natural disaster and climatic change c) Price volatility d) Conflicts and epidemics	<ul style="list-style-type: none"><li>• Insurance against drought and crop failure</li><li>• Environmental protection</li><li>• Sustainable use of natural resources like land, soil and water.</li></ul>

Source: FAO 2008.

## Methodology

### Study location

The study was carried out in north-east region representing the 6 states in Nigeria with regards to resource endowment, climatic conditions, rural versus urban areas, federal versus state owned colleges of education as well as diversity in population distribution. These discrepancies have an impact on the various teaching approaches and their impact on skills development for food security.

### Research design

The study used a descriptive survey design to collect both qualitative and quantitative data. The study used this design because the researchers were only interested in the respondents' opinions on the effects of various approaches to teaching agriculture on skill development for food security.

### Sampling procedures and sample size

The research used mixed sampling techniques, using both random and non-random sampling designs. The north-eastern region was selected for the purpose. Stratified random sampling was conducted to achieve the number of colleges needed in both federal and state colleges. Systematic random sampling has also been applied to individual

schools, as well as to agricultural teachers. Simple random sampling was conducted on students in colleges. This was done by collecting the number of students specialized in agriculture in NCE 2 and 3 from their lecturers. However, the class registers of the lecturers in NCE 1 and 2 were used to classify the students present. This was based on the premise that they would not have chosen their subject choices by the end of NCE 2. The researcher then distributed random numbers to all students to sample those that might participate in the research.

### Research instruments

In this study, the researchers also used an Agriculture Teachers' Interview Schedule (ATIS) containing 20 questions which has been developed. These were distributed into ten open-ended questions and ten closed ended questions. The Student Focus Group Discussion Guide (SFGDG) was also equipped with a series of 20 open-ended questions that encouraged students to talk openly and give as much information as they could. It is from these points that the question on the effects of agricultural teaching approaches on the development of skills for food security has been addressed.



**Table 2. Population sample**

Subject category	Target population	Expected sample	Actual sample	% sample
Federal colleges	186	132	60	41.67
State owned colleges	12	12	8	0.06
Agriculture teachers	235	148	111	75.00
Students	46,340	381	490	128.61

Source: Target Population: Federal Ministry of Education Statistics Office.

Actual Sample: Field Data.

### Data collection procedures

A letter of introduction from Modibbo Adama University of Technology Yola helped the researcher obtain a research permit from Federal Ministry of Education (FMOE). The researchers also obtained a consent letter from the executive secretary before contacting the heads of departments to prepare for data collection. The research instruments were administered over a period of 3 months, during which interviews with agricultural lecturers were held. In these months, the researchers even worked with the students in their focus group meetings. Two research assistants were included in documenting interviews and conversations.

### Data analysis

The edited data was coded and entered into the computer to be analyzed with the Statistical Package for Social Sciences (SPSS) version 23 for Windows. The audio data from face-to-face interviews and focus group discussions were transcribed by the researchers. The responses of the students and agriculture lecturers were read and re-read for proper interpretation. The qualitative data was explained using content analysis. A one-sample t-test was used to determine whether or not the differences in mean contribution of agricultural teaching

approaches to skill development for food security were statistically significant.

### Results

Lecturers' opinions on the effect of the agricultural teaching approaches on skills development for food security

The researchers first sought to know from the agriculture teachers the percentage time spent in a week on each of the teaching approach they applied in teaching the subject. Their responses are presented as Table 3.

The statistics in Table 3 shows that discussion approach in teaching agriculture took the largest percentage of the allocated time for agriculture lesson (41.9%) followed by class project with 38.4%, then lecture came in third having 22.6% whereas class project was fourth at 15.2%. It is worth noting that demonstration was given the least time yet students ought to carry out more demonstration so as to put into practice the theory they had learnt in class. Some teachers allocated discussion methods in teaching of agriculture as high as 89% of allocated time, lecture as high as 72% of the allocated time, the highest time that was allocated for demonstration was 77% then problem solving has 46% and class project had an allocation of 62%.

**Table 3. Descriptive statistics on percentage teaching time spent in the teaching methods**

	N	Lowest	Highest	%	SD
Lecture	111	3.41	72.00	22.6%	33.6
Discussion	130	13.13	89.00	41.9%	29.7
Demonstration	78	8.22	77.00	15.2%	18.4
Problem Solving	62	7.00	46.00	17.7%	13.2
Class Projects	88	1.33	62.00	38.4%	23.5

The researchers then asked the agriculture lecturers to rank the teaching approaches they employed based on their contribution in developing skills for food security. The results are as shown in Table 4.

It was observed that 71(61.8%) of the respondents felt that demonstration was the most important teaching method that developed skills for food security followed



by discussion as reported by 63(52.9%) of the agricultural science teachers. A total of 62(41.6%) of the teachers felt that class project ranked third in developing skills for food security. A total of 40(44.0%) of the agriculture teachers said that problem solving method was important in developing skills for food security. It is worth noting that

41(27.5%) of teachers felt that lecturing was the least important teaching approach that develops skills for food security. This implies that more emphasis should be put in class projects and problem solving as they were seen to contribute greatly in developing skills for food security.

**Table 4. Contribution of the teaching approach employed in developing skills for food security.**

	Most important		Important		Least important	
	n	%	N	%	N	%
Lecture	22	17.7	37	32.3	41	27.5
Problem Solving/Discovery	48	26.2	40	44.0	12	48.1
Class project	62	41.6	23	41.6	15	52
Demonstration	71	61.8	18	69.2	11	11.7
Discussion	63	52.9	16	44.7	21	13.2

The researchers also sought to learn from the students about the approaches that needed to be incorporated into their learning in order for them to develop more skills for food security.

Individually, students were asked to rank the most preferred approaches from a handout labeled B. Table 5 contains their recommendations.

**Table 5. Students' perceptions on approaches that might increase their skills for food security**

Approach	N	%
Colleges of education should send their students to SIWES for at least one and a half years at agricultural-based schools.	115	29.26%
Technical specialists at agricultural institutions should be more committed.	138	35.11%
Increased teaching sessions by allotting more time for practical targeted at food security	140	36.62%
<b>Total</b>	<b>393</b>	<b>100.0%</b>

A total of 115 (29.26%) respondents indicated that colleges of education should send their students to SIWES for at least one and a half years at agricultural-based institutions. This will provide students with the necessary real-world exposure and experience. This would not only equip students for future professions, but would also allow them to build skills for food security while in school, which would be similar to on-the-job training. A total of 138 (35.11%) students believed that technical experts at agricultural institutions should be more devoted since this was required in schools because it would provide students with more and new skills. Lastly, 140 (36.62%) of the students indicated that the teaching sessions should be increased by giving additional time for practical focusing on food security.

### Findings of the study

Findings emanating from the study revealed that:

1. Discussion approach in agricultural teaching took the greatest proportion of the time available for agricultural lessons.
2. Lecturer's discussion approach provides ways for the teacher to learn from the students to promote the application of the educational objectives.
3. Demonstration was the most significant method to agricultural teaching that developed skills for food security.
4. The students suggested that discussion and demonstration are the most effective methods to



developing food security skills, but the most widely used method was lecturing.

### Discussion

The researchers first sought to understand lecturers' views on the effects of agricultural teaching methods on the development of skills for food security. Results of the study indicate that the discussion method to agricultural teaching took the greatest proportion of the time available for the lesson in agriculture. This finding is in accordance with Njura and Taaliu (2021) who found that teaching strategies such as discussion, problem solving, demonstration, project strategies as well as field trips, improves the effectiveness of teachers. They clarified that an interaction between the teachers and the students in an exchange of ideas requires the discussion approach of teaching. This approach makes the teacher efficient because the students' efforts make the teacher's lesson better. They further elaborated that the Socrates used the discussion approach that defines the problems of the student in order to find solution to the problems identified. This teaching method makes the work of the teacher simpler and makes student-teacher-oriented class activities. This suggests that the teacher's discussion method provides ways for the teacher to learn from the students to promote the application of the educational objectives.

In comparison, the result is in tandem with Hasni and Potvin (2015), who found that the use of suitable teaching methods such as discussion and demonstration methods plays an important role in science teaching, such as agricultural science. They mentioned that the approach of demonstration makes the teacher's task smoother and allows them to introduce to the learners' abstract ideas for greater comprehension. In addition, the result is consistent with Losco, Grant, Armson, Meyer and Walker (2017), who reported that demonstration approach to teaching saves teachers' time and energy and deepens students' comprehension and internalization of what has been taught in the teaching process. They also noted that demonstration approach encourages the focus, interest and enthusiasm of the learners and enhances the guidance of the teacher.

The respondents were then asked to rate the teaching strategies they used on the basis of their commitment to the development of food security skills. The findings indicate that demonstration was the most significant approach to agricultural teaching that developed skills for food security. Teacher strategies that have the potential to improve skills for food security are ranked last in their usage in schools in comparison to the percentage of teaching time spent in the delivery class. This indicates that practical agriculture was theoretically taught in lectures that added very little to the development of skills for food security in the area of research. This argument is in line with the report by Ransford et al. (2016) that Senior High School teachers of agricultural science felt more relaxed using the 'Lecture' teaching method than the other teaching methods.

The lecturers' views suggest that discussion and demonstration are the most effective methods to developing food security skills, but the most widely used method was lecture. This is an indication that there are considerations that might promote the use of the lecture method. These may be related to the requirement for teachers to cover a huge amount of information in a single class, limited teaching and learning tools or even limited expert or expertise in some subjects to explain to the students. Given that these variables remained outside the reach of this article, the researchers suggested for further study.

The results of the study also revealed that most students in their respective classes believed that the work being undertaken to develop agricultural skills in them for food security was firm in their schools. In teaching the agriculture courses, the different approaches introduced by their lectures included lecturing, class discussions and presentation as well as class projects. The demonstration approach has been stated to be the most effective tool for improving agricultural skills for food security. This include the cultivation of plants and the raising of livestock. Much job was, however, entrusted to the men of the school grounds or attendants to handle the businesses, leaving too little room for the practice of the students. Some students indicated that demonstration farms were performed by their classes,





providing students the opportunity to practice agriculture.

Ogologo and Wagbara (2013) confirm this finding as they stated that demonstration of teaching agriculture has an impact on the academic achievement of students. Sahu (2013) also found that the demonstration-based teaching method was effective for imparting practical agricultural science. The students taught with demonstration method were found to have high ASAT achievement scores relative to their counterparts in the test group taught with traditional teaching method. This finding is consistent with that of Idoko and Oladimeji (2002) and Alio (1997) earlier results. They noticed that students in the experimental group who were permitted to communicate and conduct group tasks performed higher than those in the control group who in their classes were simply passive listeners. The demonstration technique used in this study was activity-oriented and facilitates content experiences between students, teachers, students, and students. The use of a more activity-oriented teaching approach (demonstration approach) was demonstrated to students in the study community who reported high achievement ratings.

### Conclusion

The aim of the study was to determine the effects of agricultural teaching methods used in colleges of education on the development of skills for food security. The study findings showed that the lecture method, interviews, demonstrations, class experiment / projects, problem solving / guided research, and occasionally field trips and tours are the agricultural teaching approaches employed in Nigerian colleges of education. The teaching methods used in these colleges contributed greatly to the development of skills, which in turn led to improved food security. However, in contrast to other teaching methods, lecturing has not been shown to add significantly to improving skills for food security. The study concludes that, through lectures, there is a lot of theory that needs to be discouraged in agricultural classes in order to improve the development of appropriate skills for food security in the study area.

### Recommendations

This research stresses the need to combine practical methods with practical knowledge in agricultural teaching and learning to enhance the development of skills and their transition to the food industry. In the teaching and learning process, the poor incorporation of practical agriculture derails the adequate development of skills and their application to areas of food security.

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