Effective Teaching and Learning of Agricultural Science for Food Security and National Sustainability

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Abstract

Agro-economy-based nations rarely experience food insecurity. Such nations have already set machinery in motion towards achieving one of the Millennium Development Goals MDGs, which emphasizes on eradicating extreme poverty and hunger. This could be the major reason, developing nations like Nigeria that has been a mono-economy-based nation is leaving no stones unturned to restore and reposition its agricultural sector. Introduction of agricultural science in secondary school curriculum in Nigeria is a worthwhile effort towards adequate food security by equipping the grater percent of the youths. The study investigated effective teaching and learning of agricultural science for food security and national sustainability. It was a descriptive survey design. All the 267 principals and all the 513 agricultural science teachers in the 267 public secondary schools in Abia state of Nigeria form the sample size i.e. 780 respondents. Two research questions and one null hypothesis guided the study. The instrument for data collection was a 26 item researchers' made structured questionnaire built on a 4-point rating scale. The reliability index values of 0.88 and 0.85 were obtained using Cronbach alpha technique. Content and face validity were established by two experts. Means and grand means were used to answer the research questions while ANOVA statistic tool was used to test for the hypothesis at 0.05 level of significance. Findings indicated the following: teachers' qualifications matter in achieving quality teaching and learning of agricultural science; majority of the teachers are non degree holders; some degree holders are non-professionals; learning of the subject is more of theoretical; traditional classroom-based method of teaching and learning; inadequate facilities; means of updating knowledge were inadequate etc. Based on the findings, recommendations were made.

Keywords: *Agriculture, Agricultural Science teachers, Teaching and Learning, Food Security, National Sustainability.*

Introduction

Over a century ago, Nigeria was an agro-economy-based nation. Then Nigerian economy was sustained through agricultural produce such as cocoa, ground nut, palm produce etc. The citizens could complain of poverty but not extreme hunger. This could be probably because virtually everybody was in one way or the other involved in agricultural activities/practices. Though the practice appeared crude and unnecessary energy sapping due to crude implements in use and inadequate application of modern agricultural practices, innovative skills and facilities. Agriculture then seemed sustaining because everybody was involved, everybody had interest and it appeared to be everybody's major source of family sustenance. There were less cases of unemployment due

to less interest or crazy of white collar jobs. Families were not complaining of hunger as there were food surplus in most homes. The problem then was inadequate money (cash) to educate young ones, procure quality health facilities and enhanced standard of living in line with the developed nations. Today, the shift of economy to oil as major source of national economy has actually improved the lots of the nation. There is more money in the nation, improved quality life among the citizens in terms of enjoyment of amenities such as electricity, water plant, information and communication networks etc. The other side of the oil boom is the complete diversion of the citizens and national interests from agriculture as source of income. Citizens presently tend to lose interest in agricultural practices because it is treated as business for the less privileged, peasants, never do wells etc. The repercussions are that agricultural practices has been deserted, hunger and poverty have taken over, besieged the nation as well as unemployment syndrome. Food security is now the order of the day especially at this era of incessant occurrence of various forms of natural disasters such as flood, erosion, desertification etc. The only way forward is re-embracing agriculture as a veritable source of income, food, employment, hobby, tourism etc. No wonder majority of these third world nations are leaving no stone unturned in repositioning their agricultural sector as one sure way of eradicating extreme poverty and hunger as recommended in millennium development goals (MDGs). Food security is one sure way of meeting up with this number one goal of MDGs.

Food Security in Nigeria Context

Food security is a situation where all the individual, household, national, regional and global levels at all times have physical and economic access to sufficient safe and nutritious food to meet their dietary needs, and food preference for active and healthy life (Abbey, 2011). It is also described as a world where person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent and where food originates from efficient, effective and low-cost food systems that are compatible with sustainable use of natural resources (Short, 2001). International Food Policy Research Institute (IFPRI) in Short (2001) emphasizes why investment in human resources as a means of revamping agricultural sector and achieving sustainable food security target by the 20:2010 must be a priority. No wonder Achor (2003) observes food security as one of the major challenges facing the third world nations. He discovers that government inability to provide sufficient food for its ever increasing population has been the root cause of extreme poverty and hunger among the citizens. Anyanwu and Anyanwu (2008) report that cases of food insecurity ensued due to sudden population increase which meant that the quantity of food and fruit gathered during hunting and local farming are now insufficient. It is not very easy now to make more food available to the ever increasing populace. The food security issue is not peculiar to Nigeria alone; many other developing nations are also facing acute food shortage due population explosion, poor management of resources, inability to adapt to new technology and utilizing education to with the new trends and new challenges. Nigeria past and present governments have made some reform efforts to this effect viz:

Operation Feed the Nation – OFN
Structural Adjustment Programme – SAP
Green Revolution – GR
Better Life for Rural Women – BLRN
Family Support Programme – FSP
Directorate of Foods, Roads and Rural Infrastructures – DFRRI etc

None of these efforts has actually addressed the backbone of the problem. The adults where these efforts are channeled are generally out of formal school system and with already formed opinion against practice of agriculture as a career. There is need to come down home, at the level of youths and children for re-orientation of value system and means of livelihood. The practice of

agriculture by all and Sunday is a panacea to food security if only the youths are caught at their prime to pick interest and skills necessary to elevate agriculture as source of national income. This could the source sudden enhanced interest of the present government in repositioning agricultural sector through quality teaching and learning of agricultural science in secondary schools in Nigeria. FRN (2004) believes that education is a veritable instrument for quality transformation of citizens as well as the nation. This education must gear towards youths at various levels of education. These youths need new orientation of values on life-long skill acquisition and vocational skills programmes with special reference to agricultural practices.

Agricultural Science Education

Agricultural science is one of the core vocational curricular subjects taught at both junior and senior secondary schools in Nigeria. Egbule (2004) defines it as a process of training learners in the process of Agricultural productivity as well as the techniques for teaching of agriculture. Wikipedia (2009) describes Agricultural science education as a broad multidisciplinary field that deals with the selection, breading and management of crops and domestic animals for economic production. It is a subject taught in secondary schools as a means for self-reliance and preparation for further studies. Agricultural science is therefore designed for inculcation of the necessary skills for the practice of agriculture for effective citizenship and contribution to food security for national sustainability. That is why the FRN (1994) outlines the seven major objectives of teaching and learning of agricultural science to reflect the;

1. ability to stimulate students interest in agriculture
2. Ability to enable students acquire basic knowledge of agriculture.
3. Ability to develop basic agricultural skills in students.
4. Ability to enable students integrate knowledge with skills in agriculture
5. Ability to expose students to opportunities in the field of agriculture
6. Ability to prepare students for further studies in agriculture and
7. Ability to prepare students for occupations in Agriculture.

Attainment of the above objectives depends on teachers' factors and pedagogical approaches. Teachers in this case are agricultural science teacher's agricultural science teachers. Agricultural science teachers are trained and groomed from teacher preparation institutions for quality impact of agricultural skills, knowledge attitudes and values for self-reliance, promotion of agriculture and food security in their future lives. It is therefore the duty of this group of teachers to; stimulate and sustain student's interest in agriculture, enable students acquire basic knowledge and practical skills in agriculture, enable students integrate knowledge with skills in Agriculture, prepare and expose students for occupation.

Attainment of the goals and objectives of agricultural science depends on effectiveness of teaching and learning going on.

Teaching and Learning of Agricultural Science

The education axiom that when a learner has not learnt that the teacher has not taught is true and directly relate to the concepts of teaching and learning as a process of inculcating the right values, attitudes, knowledge, modern life, long life skill acquisition necessary to make individuals benefit from the society as well as contribute meaningfully to the same society. Waliki and Usman (2009) see teaching as a systematic, rational and an organized process of transmitting knowledge, skills etc in accordance with professional principles. The implication is that agricultural science teachers who do not perform the act in accordance with the principles of teaching are therefore not teachers but cheaters. Naturally, the outcome of teaching is learning. Learning is an overt product of teaching which the major function of the teacher is. Learning occurs only where there is relatively

positive permanent change in an individual behaviour. The implication is that majority of graduates of secondary education are looming about looking for white collar jobs that are presently far-fetched and also a prerogatives of the sacred cows of the society, because they have not learnt agricultural lifelong and vocational skills. Agricultural science teachers have all failed the Nigerian students since their teaching have not led to students' learning. Teachers also have their own excuses which included that

- Students are most often adamant of instruction.
- Students show poor attitude to agricultural science lessons
- Students come from different home backgrounds that negate their interest and ability to learning etc.

Another education axiom believes that given equal opportunities to students that every learner (student) is a potential achiever. The teachers have no excuses for students' inadequate learning. Effective teaching brings about effective learning. That is what the paper is concerned about. Effective teaching and learning refers to the degree to which goals are achieved through teaching. Effective teaching of agricultural science will definitely give rise to effective learning of agricultural science i.e. attainment of goals of agricultural science as stated above. Ability to apply adequate pedagogical approaches is one sure way of achieving effective teaching and learning.

Teachers' Pedagogical Approaches

The teacher as an educator knows the right approach to effective teaching and learning. This entails teachers' ability to

a. move with trend in teaching method of teacher-centred to learner-centred methods.
b. Plan lesson and write lesson notes
c. Utilized adequate teaching methods per topic.
d. Utilize adequate teaching skills
e. Utilize adequate teaching strategies
f. Utilize adequate instructional aids
g. Implement Chinese axiom.

No wonder Egbule (2004) emphasizes that every agricultural teacher must be effective, liberally educated, current in subject matter and its pedagogy, aware of what is expected of teachers and schools, skillful and conscientious in planning, preparing for, carrying out instruction, respectful towards students and concern about their welfare, actively involved in faculty, professional and community affairs.

Learner Centered Method

This is the point of focus in the teaching and learning process. Agricultural students should occupy a prominent position in the teaching and learning of agricultural science. Teachers should therefore make these students centre of all activities. This entails:

a. encouraging active participation of agricultural science students in the teaching and learning process.
b. Agricultural science students being always actively involved in a manner that they interact with the teacher, with instructional aids and with the environment.
c. Teaching and learning of agricultural science that promote students' development of basic life skills.
d. Enabling students to utilize the learnt skills in solving their everyday problems using their own initiatives.

e. Agricultural science teachers' effort to discourage rote learning and passitinity in the classroom.

Modebelu and Duvie (2012) recommend four innovative teaching methods that could enhance quality and effective teaching and learning of subjects/courses. These could be adopted and apply by agriculture science teachers. These methods are:

1. Information transformation and reception method
2. Cognitive strategies development method
3. Attitudes development method
4. Cognitive and motor skills development method

These modern method approaches require combination of methods to achieve a purpose. Other methods relevant include: assignment, demonstration, project, field-trip, injury, experimental etc. Teaching skills vital for quality teaching and learning are the;

i. qualitative set induction
ii. quality questioning (lower order, middle, higher order and divergent)
iii. variation and variety (instructional aids to that could take care of individual differences).
iv. stimulus variation (ensuring that students' senses are involved)
v. repetition (simple, planned, mass etc).
vi. demonstration (simple, brief and concise)
vii. closure (white board summary, written exercises, oral summary etc).
viii. adequate non-verbal communication etc
ix. reinforcement (reward and relevant punishment).
x. effective communication
xi. supervision (closed supervision learning processes and activities).

Effective application of these teaching methods, skills or strategy depends greatly on the teacher ability to plan the lesson ahead. Ihebereme (2010) posits that quality teaching and learning is a sine-qua non to prudent adherence to quality indicators in the pedagogical approaches. Babalola (2011) reports of some contemporary soft skills that are imperative in teachers' effectiveness in today's global world. He argues that teachers should not only be trained to teach but to become polyvalent by mastering hard and soft skills that make teachers functional in a rapidly changing multicultural environment. The implication is that teachers are no longer trained for students' certification alone but for effective inculcation of learning to learn skills. Students should in addition to learning concepts and theme, must have deep understanding and application of the learning skills. Same is expected in the teaching and learning of agricultural science in Nigerian secondary schools. Obanya (2010) recommends teaching and learning that revolve around the principles of transformational pedagogy.

The problem of the study is that agricultural science taught at basic and secondary schools has not been able to transform the citizens and the nation adequately. Products of secondary education still lack basic vocational and entrepreneurial skills expected to be acquired from agricultural science. Products still wallow about in search of white collar jobs instead of becoming self reliant and employers of labour. The inability to manifest agricultural science practice skills and indication of interest in choosing agriculture as a career appear to be due to inadequate learning of the expected skills. It also appear to be due to inadequate teaching and learning process on the part of the agricultural science teachers in Nigerian secondary schools.

The study therefore investigated effective teaching and learning of agricultural science in secondary schools for attainment of food security and national sustainability.

Research Questions/Null Hypothesis

1. What are the challenges to effective teaching and learning of agricultural science in secondary schools in Nigeria?
2. In what ways could the challenges be managed for effective teaching and learning of agricultural science for enhanced food security and national sustainability?

HO_1: There is no statistical significant difference in mean scores of principals and agricultural science teachers on challenges to effective teaching and learning of agriculture science and ways of challenges could be managed.

Methodology

The study was a descriptive survey design that elicited vital information from the respondents on current situation of teaching and learning of agricultural science in Nigerian secondary schools for food security and national sustainability. Out of 5,836 classroom teachers in the 267 public secondary schools in the 23 Local Government Areas (LGAs), all the 513 agricultural science teachers and all the 267 principals from the state as sample size. Purposive sampling method was used to select all agricultural science teachers and all the principals in Abia state. This gave total respondents of 780. The survey used researchers self made questionnaire built on a 4 point scale containing 26 items. The instrument was validated on face and content validity by two experts in agricultural education and educational management and reliability index values of 0.88 and 0.85 were obtained using Cronbach alpha. Means and grand means were used to answer the research questions while the null hypothesis was tested at 0.05 level of significant using ANOVA statistic tool.

Results

Table 1: Mean ratings of principals and Agricultural Science teachers on challenges to effective teaching and learning of agricultural science for food security and national sustainability.

S/No.	Item	Principals $\overline{X}$	Teachers $\overline{X}$	Decision
(A)	**Inadequate qualification:**			
1.	Majority of agricultural science teachers are not professionals	2.98	2.76	Agreed
2.	Majority of the teachers are not holders B.Sc. Ed. in Agriculture	3.26	3.01	Agreed
3.	Majority of the teachers are still holders of NCE or HND in Agriculture	3.45	2.91	Agreed
(B)	**Inadequate Technical Know-how:**			
4.	Agricultural science teachers are not very proficient in the teaching and learning Agriculture	2.70	2.65	Agreed
5.	These teachers do not possess adequate modern skills for practical oriented teaching	3.15	2.92	Agreed
6.	The teachers are less resourceful	2.12	1.90	Disagreed
(C)	Inadequate Teaching Method:			
7.	These teachers use mainly traditional methods of teaching (lecture in confines of classroom/ laboration)	3.44	3.01	Agreed
8.	Teaching and learning of the subject is rarely learner-centered method	2.93	2.67	Agreed
9.	Teaching and learning is mainly teacher-centred method	4.00	4.00	Agreed
(D)	Inadequate Instruction Aids:			
10.	Instructional aids are not adequately available	3.22	3.81	Agreed
11.	Instructional aids available are not adequately being utilized	3.44	3.06	Agreed
12.	Teachers rarely improvise	3.52	3.33	Agreed
(E)	Inadequate farms:			
13.	There is adequate farm lands for practical lessons	3.00	3.77	Agreed
14.	Students do not regularly practice in farms or gardens or markets or industries	2.80	2.56	Agreed
(F)	Inadequate fund:			
15.	There is not adequate fund to manage practical oriented Agricultural science	4.00	4.00	Agreed
(G)	Poor students Attitudes:			
16.	Students do not show adequate interest in the subject	3.49	3.83	Agreed
	Grand Mean	**3.45**	**3.33**	

Result in table I reveal grand means of 3.45 and 3.33 for principals and agricultural science teachers respectively on challenges to effective teaching and learning of agricultural science. The means scored above 2.50 weighted mean indicating both principals and teachers general agreement with the 7 major factors that pose challenges to quality teaching and learning of agriculture in Nigerian secondary schools. The challenges are teachers' inadequate qualification, inadequate technical know-how, use of inadequate teaching methods, inadequate availability/utilization of instructional aids, inadequate farm lands for practical lessons, inadequate

funding and poor students' attitudes to learning of agricultural science. All the 16 items under the 7 major factors also serve as challenges and impediments to effective teaching and learning of agricultural science in secondary schools in Nigeria for attainment food security and national sustainability.

Table 2: Mean ratings of principals and teachers on ways the challenges can be managed.

S/No.	Item	Principals $\overline{X}$	Teachers $\overline{X}$	Decision
17.	Agricultural science teachers should be professionals and holders of B.Sc. Ed. in Agriculture	3.64	3.80	Agreed
18.	Repositioning teacher preparation institutions for qualitative Agricultural teachers production.	4.00	4.00	Agreed
19.	Teachers should be sound in concepts and pedagogy	4.00	4.00	Agreed
20.	Agricultural science teachers should be adequately motivated through improved working conditions	4.00	4.00	Agreed
21.	The teachers should be given opportunities for updating of knowledge and skills so as to move with the new trends	3.92	3.98	Agreed
22.	Every school must have adequate farm lands	4.00	4.00	Agreed
23.	Agricultural science should be adequately funded	4.00	4.00	Agreed
24.	Instructional aids should be made available by government	2.75	3.36	Agreed
25.	Teachers should be adequately sensitized on importance agriculture for food security and national development	3.74	3.88	Agreed
	Grand Mean	**3.70**	**3.79**	

Results in table 2 reveals grand means of 3.70 and 3.79 for principals and teachers respectively. The grand means scored above 2.50 indicating the respondent's general agreement with the items as ways the challenges can be managed for quality teaching and learning of agricultural science in secondary schools in Nigeria to ensure food security and national sustainability.

Table 3: ANOVA Analysis on mean ratings of principals and teachers on challenges and management strategies for effective teaching and learning of agricultural science.

Source variation	Sum squares	Degree of freedom	Mean squares	F-calculated value	f-critical value	Decision
Between Group	1478.663	3	292.888			
Within group	14070.103	90	160.910	1.82.	260	upheld the
Total	15548.766	93				null hypothesis

Results in table 3 shows that HO_3 is upheld. This is because at 0.05 level of significance critical F-value 2.60 is greater than calc. f-value of 1.82. Following this, the probability (P) of the difference in opinion due to error is greater than 0.05. Hence, significant differences do not exist in mean ratings of principals and teachers 407/934.

Discussion

The findings of the study showed that inability of agricultural science teachers to achieve effective teaching and learning of agricultural science for enhancement of food security and national sustainability are due to various challenges beyond their control. The seven major challenges identified showed that these teachers are not inadequate qualification of teachers, inadequate technical know-how, inadequate teaching methods, inadequate instructional aids, inadequate farms for practical, inadequate funding and poor attitudes of students towards agricultural science. These work against FRN (2004) & (1994) goals of secondary education and objectives of teaching and learning of agricultural science. The goals indicate that teachers should utilize the teaching and learning of agricultural science as a means of equipping the students for useful living, stimulating students' interest in agriculture, integrating their knowledge and skills etc. There is no way a teacher who is not professional trained in agricultural science can be efficient and effective, such inadequately qualified teachers will definitely lack proficiency in concepts, technical and pedagogical skills. In this situation, teaching and learning process will not only negate attainment food security but demoralizes students' interest in agriculture as a career. It does not agree with Ihebereme (2010) that posits that quality teaching and learning is inevitable for effective for effective learning and productivity.

It does not also agree with Egbule (2004) that believes teaching of agricultural science should involve the head (thinking), heart (feeling) and hands (skills). Egbule also discovered that agricultural science education programme delivery is bedeviled with problems such as inadequate finance, insufficient or non-availability of equipment and materials, shortage of professionals and technically qualified teachers, poor remuneration etc. So there are numerous impediments to utilization of quality teaching and learning to attain goals of agricultural science for food security plans and national developments.

The findings also identified ten possible ways of managing and redressing the challenges. These includes ensuring that only professional qualified teachers teach, teacher preparation institutions should be repositioned to produce highly relevant manpower who are conscientious and well motivated in the field, provision of instructional aids will greatly enhance the efficiency and effectiveness of teaching and learning of agricultural science etc. This is in confirmation of Modebelu and Duvie (2012) who recommended some innovative teaching methods for effective teaching and learning of agricultural science. These also agree with Egbule (2004) who insisted that teaching and learning of agricultural science must be geared towards competence-based, skilled and production-oriented. These quite agree with the findings as a management strategy.

The null hypothesis tested showed no significant difference in the opinion mean scores of both the principals and teachers on challenges and ways of managing the challenges for effective teaching and learning of agricultural science in secondary schools.

Conclusion

The primary goal of a teacher is to stimulate quality learning through quality teaching. Effective teaching and learning is imperative for attainment of classroom goals, school goals, education goal and natural goals. The study examined various challenges to effective teaching and learning of agricultural science in Nigerian secondary school as against attainment of food security and national sustainability. Seven factors serving as challenges were identified and ten ways of managing the challenges were also identified. These strategies emphasized that principles of learning must be observed, that teachers must be qualified professionals and technically prepared for the responsibility.

Recommendations

Based on the findings, these recommendations are made;

1. Government should endeavour to reposition teacher preparation institutions, especially the three sister universities of agriculture at Makurdi, Umudike and Abeokuta. This will enable them produce virile staff in agriculture for quality and quantity teaching and learning as well as food sufficiency and nation sustainability.
2. Government agencies should collaborate with community to provide relevant instructional aids for effective attainment of agricultural science goals.
3. In-service training opportunities should be made available and accessible to serving teachers. These teachers should also be assisted to attend conferences and workshops for updating of knowledge and skills.

References

Abbey, B.W. (2011). Post graduate education and sustainable food security in Nigeria. *A Public Lecture.* Umudike-Nigeria: Michael Okpara University of Agriculture.

Abelega, M.A. (2009). Work oriented education in agriculture. *A Journal of Teacher Education,* 7(1), 109 – 115.

Achor, E.E. (2003). Concretization of concepts in secondary school sciences using ICT as an adaptor. *Proceedings of the 44th Annual Conference of Science Teachers Association of Nigeria.*

Anyanwu A.C. & Anyanwu U.A. (2008). *Introduction to agricultural science in post primary schools.* Lagos: Africana Educational Publishers (Nig).

Clouse, P.C. (1985). The agricultural teacher: The Key in Programme Improvement. *The Agricultural Education Magazine*, 57(11), 21 – 23.

Egbule, P.E (2004). *Fundamentals and Practice of Agricultural Education.* Owerri: Totan Publishers Ltd.

Federal Republic of Nigeria FRN (1994). *Blueprint on Family Support Programme.* Lagos: NERDC.

Modebelu, M.N. & Duvie, A.N. (2012). Innovative methods and strategies for effective teaching and learning. *Mediterranean Journal of Social Sciences,* 3(13), 145 – 154.

Modebelu, M.N. (2007). Teachers' work behaviour under female principals administration of secondary schools in Nigeria. *Nigerian Journal of Educational Management* 6(1), 1 – 10.

Short, C. (2001). Food Insecurity: *A Symptom of Poverty in Sustainable Food Security for all by 2020.* Germany: Bonn.

Waliki, L.M. & Usman, M. (2009). Achieving the millennium development goals – MDGs by 2015 through Effective Teaching of Agricultural Science of Nigeria. *The Voice of Teachers,* 1(1), 32 – 36.