

EFFECTS OF MODERN AGRICULTURAL TECHNOLOGY ON THE TEACHING AND LEARNING OF AGRICULTURAL SCIENCE IN SENIOR SECONDARY SCHOOLS IN EMOLGA, RIVERS STATE

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ABSTRACT: The study investigated the effects of modern agricultural technology on the teaching and learning of agricultural science in senior secondary schools in Emolga, Rivers State. The purpose of the study was to determine the effect of modern agricultural input, methods and farm machineries on the teaching and learning of agricultural science in senior secondary school in Emolga. The study adopted descriptive survey design. The population of the study was all agricultural science teachers and students in senior secondary school in Emolga Rivers State. The sample size was 32 agricultural science teachers and 170 agricultural science students. The instrument for the study was structured questionnaire in the pattern of Likert 5-point rating scale. The reliability of the instrument was determined using Cronbach Alpha. Hence, the reliability coefficient of 0.97 was obtained. Mean and standard deviation were used to answer the research questions while Z-test was used to test the hypotheses at 0.05 level of significance. The study found that the use of modern agricultural inputs provides in-depth knowledge on principle of operation of modern agricultural inputs, updates students' knowledge on current farm inputs, acquaint the learners with most profitable system of farming. Findings of the study also revealed that the use of modern farming methods in the teaching and learning of agricultural science acquaint students with relevant skills in the application of modern farm chemicals, enables the agric. teachers to see the need for workshop and in-service training among others. The study also found that the use of farm machineries in the teaching of agricultural science equips learners with farm mechanics skills, creates more interest among learners among others. The study therefore recommended that government should provide necessary inputs and farm machineries for teaching and learning agricultural science.

KEYWORDS: Agriculture, Modern, Technology, Teaching, Learning, Science, Nigeria

INTRODUCTION

Agricultural operation in modern time is exceedingly different compared to those performed few decades ago, basically because of alarming scientific and technological advancement in the modern society. Consequently, modern agriculture engages in the usage of various sophisticated technologies. It is in this view that Rehman, Jingdong, Khatoon and Hussain (2016) noted that in modern agriculture external inputs such as inorganic fertilizer, pesticides, animal feedstuffs, tractors and other agricultural machineries have substituted natural resources and processes. Pesticides have replaced biological, cultural and mechanical methods of controlling pests, weeds and diseases. Inorganic fertilizers have substituted for livestock manure, composts and nitrogen fixing crops. So, agricultural technology in the



modern time is far beyond cutlass and hoe, rather the integration of scientific knowledge to develop techniques, machines and useful chemicals for enhanced agricultural operation.

According to Okon (2008) the aim of agro-modern technology generation is to develop better techniques of land development, crop and animal management and achieve higher yields. Agricultural technology involves the application of mechanical, chemical and biological inputs such as tractors, fertilizers, agro-chemicals, livestock breeds, high yielding crops, storage and processing facilities to improve food production (Ayichi, 1995). Agricultural technology entails the appliance of modern farm machineries, new farming methods and agrochemicals to agriculture (Bolade 1990).

The application of agricultural technology has enabled agricultural sector to be able to meet the rising demands of food accompanied population increase. Food security implies access to the desired quantity and quality of food at all times by every men, women and children. There are three component of food security. They include availability, stability and thirdly accessibility. Food availability is influence by the level of food production and importation. Food stability is considerably influenced by the extent of post-harvest losses, while food accessibility is greatly determined by the purchasing power of the population (Adeyeye, 2007). However, these three dimensions of food security is accomplishable through implementation of modern agricultural technologies to enhance productivity. To establish this, Nnodim and Raji (2020) has it that agricultural technology is the integration of advanced engineering principles, farming techniques and scientific development to manipulate the growth, maturity and well-being of crops and livestock. This therefore tends to produce faster and larger farm products for consumption of the masses. Traditional farming is limited in its capacity to produce a miniature quantity of food for the masses. It is based on this impediment that the use of modern agricultural technology is essential for the teaching and learning of agricultural science in secondary schools.

Teaching and Learning agriculture science as a subject in secondary school has flourished over the years in many developing countries. This is because the rationale for teaching the subject and the basis for its popularity is to permit students a wider set of future career options particularly farming and farming related careers than is offered by the usual academic or general subjects (Tesha, 2018). This shows that effective teaching and learning of Agricultural science subject in secondary schools is recognized by the level at which students are encouraged to venture into agriculture as a future career. However, this motivation cannot be created in students having recognized the extent of drudgery and ardent tasks involved in traditional farming. Tesha (2018) noted that effective teaching and learning of agricultural science subject, creates the desire for farming profession among students with the following pre-requisites

- (a) Physical facilities such as well-equipped library, Agricultural science laboratory, workshop, school farm and classrooms;
- (b) Qualified teachers who can effectively teach students new skills in agriculture different from the known traditional knowledge.
- (c) Implements and machinery resources such as tractors, ploughs and harrows;
- (d) Textbooks and other supplementary textual teaching and learning materials;



However, the researchers focused on the effect of modern agricultural technologies in the teaching and learning of agricultural science in secondary schools.

Based on the forgoing description of agricultural technology, teaching and learning agriculture requires the utilization of modern agricultural methods, machineries and farm inputs for updated transfer of knowledge. The use of modern technologies in teaching and learning do not only create motivation for learning among learners but also boost their interest and enhance their decision to choose agriculture for future career. Equipping students with modern agricultural techniques and methods will facilitate farm productivity especially in the rural areas.

Modern agricultural methods are aspect of agricultural technology concerned with new ways of carrying out agricultural practices easily and more efficiently. The rhetoric of teaching students the modern methods of farming lies in the slow adoption features of farmers. In other words, students will tend to develop more capacity to adopt new methods of farming when they are already enlightened to it in their various schools. Majorly, different government introduced agricultural science as a subject in secondary schools to smoothen and enhance transition of students who may not have ability to proceed for further education to farm employment (Benavot, 2006). So, the utilization of modern farming methods in teaching and learning will benefits students who are to be future farmers in such that they are adequately equipped with better methods of farming. Students who possess modern agricultural skills with substantial positive results may become tools to induce change into farmers Okorie (1974)

Nnodim and Raji (2020) posited that agricultural technologies increases agricultural production and sustainability substantially. For example, new disease resistant hybrid reduces the rate of risk and uncertainties in crop and livestock farming. This shows that farm inputs are also aspect of agricultural technologies, which are needed for effective impartation of agricultural knowledge to students. In teaching agricultural science, modern farm input should be an indispensable resource when carrying out practical exercises of agricultural science curriculum. United Nation Educational Scientific Cultural Organization (2012) asserted that effective teaching and learning of the curriculum requires efficient systems that would provide supportive learning environment, motivated teachers with mastery of pedagogy and their subject matter, adequate access to teaching and learning resources as well as students who are ready to learn. Utilization of modern agricultural inputs such as fertilizers, agrochemicals and improved seeds in delivering agricultural science curriculum content helps to create awareness to agricultural science students on modern inputs available to them for efficient farm productivity. (Laugo, 2009). This demand will also in turn enables Agricultural science teachers participate in agricultural extension activities from the schools.

The implementation of machinery resources could increase the effectiveness of teaching and learning of agricultural science as a subject as many students would be able to acquire needed skills to operate farm machines (Tesha, 2018). He however stated that the lack of tractor and other farm implements for teaching could increase drudgery to students working in schools' farms which, in turn, hinders students to realize value of machines and modern implements in simplifying farm activities. It is based on this demand that World Bank has been investing heavily in the effective implementation of Agricultural science curriculum in secondary schools so that young ones would see simplicity in agricultural practices negating their traditional believes on agriculture (World Bank, 2005).

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Without advancements in farming innovation, mankind would likely not have progressed through the twentieth century without major famines or devastating food wars. It is in this view that United Nations development programme (2008) reported that 70 percent of food that must counter upcoming population demand must come from the use of new and existing technologies and methods. Due to the fact that adoption process of these technologies takes much longer among adult farmers, utilizing agricultural science in secondary schools could be substantial tool to train young farmers to-be on the operation of emerging agricultural technologies.

Purpose of the Study

The purpose of the study was to determine the effect of modern agricultural technology on the teaching and learning of agricultural science in senior secondary school in Emolga. Specifically, the study sought to:

- 1. Determine the effect of modern agricultural input on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State
- 2. Determine the effect of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State
- 3. Determine the effect of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State

Research Questions

Based on the stated purpose of the study, the following research questions guided the study:

- 1. What are the effect of modern agricultural input on the teaching and learning of agricultural science in senior secondary school in Emolga, River State?
- 2. What are the effect of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State?
- 3. What are the effect of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State?

Hypotheses

- 1. There is no significant difference in the mean response of agricultural science teachers and students on the effects of agricultural input on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State
- 2. There is no significant difference in the mean response of agricultural science teachers and Students on the effects of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State
- 3. There is no significant difference in the mean response of agricultural science teachers and Students on the effects of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State



METHODOLOGY

The study adopted a descriptive survey design. The study was carried out in Emohua Local Government Area of Rivers State. The population of the study Consist of all agricultural science teachers and students in eleven senior secondary schools in Emohua Local Government Area in Rivers State. The sample size of the study was thirty-two (32) Agricultural science Teachers and one hundred and seventy (170) students selected using simple random. The instrument for the study was a self-designed questionnaire title "Effect of Modern Agricultural Technologies on Teaching and learning of Agricultural Science in Senior Secondary Schools in Emolga Rivers State EMATTAS" This instrument was structured in the pattern of Likert 5-point rating scale. The instrument was content validated by two experts in the Department of Vocational and Technology Education, Rivers State University, Port-Harcourt. The reliability of the instrument was established through Cronbach Alpha. A total of 8 respondents who were not part of the sample size were used in testing the reliability of the instrument. The reliability coefficient of 0.97 was obtained. Mean and standard deviation were used to answer the research questions while Z-test was used to test the hypotheses at 0.05 level of significance.

RESULTS AND DISCUSSION OF FINDINGS

Research Question 1

What are the effect of modern agricultural input on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State?

Table 1: Mean Responses on the effect of modern	agricultural inputs on teaching and
learning of agricultural science in senior secondar	y schools in Emolga, Rivers state

S/N	Items	Agric	ultura	l Science	Agricultural Science			
			Teach	ers	Students			
		Mean	S.D	Remarks	Mean	S.D	Remarks	
1	Teaching with modern farm inputs	3.85	1.05	Agree	3.56	1.22	Agree	
	Provide in-depth knowledge on principle of operating modern agricultural inputs							
2	Update students' knowledge on current farm inputs.	3.88	1.01	Agree	3.54	1.24	Agree	
3	Provides a bay where students can conveniently learn how to use apply modern fertilizers in the farm.	3.66	1.13	Agree	3.67	1.20	Agree	
4	Provide students with	3.76		Agree				
	awareness of improved seeds of crops available to them		1.05		3.73	1.12	Agree	
5	Enable students to know how to operate farm with improved crop varieties.	3.98	0.87	Agree	4.02	1.02	Agree	

African Journal of Agriculture and Food Science ISSN: 2689-5331 Volume 3, Issue 3, 2020 (pp. 1-11) www.abjournals.org 6 Acquaint students with 4.01 0.93 Agree 4.20 0.81 Agree necessary agrochemicals for farm operations **Grand Total** 3.86 1.01 3.79 1.10

Source: Field Survey, 2020

Table 1 shows the effect of modern agricultural inputs on the teaching and learning of agricultural science in senior secondary school in Emolga. The items with mean value greater that or equals to the criterion mean (3.00) were accepted. Hence analyzed data showed that the use of modern agricultural inputs in teaching and learning agricultural science provides in-depth knowledge on principle of operation of modern agricultural inputs (3.85 & 3.56), updates students' knowledge on current farm inputs (3.88 & 3.55), provide a bay where students can conveniently learn how to use apply modern fertilizers in the farm (3.66 & 3.67). It provides students to know how to operate farm with improved crop varieties (3.98 & 4.02), and acquaints students with necessary agrochemicals for farm operations (4.01 & 4.20). This is line with Laugo (2009) who noted that utilization of modern agricultural inputs science curriculum content helps to create awareness to agricultural science students on modern inputs available to them for efficient farm productivity.

Research Question 2: What are the effect of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga?

S/N	Items	Agric	ultura	l Science	Agricultural Science			
			Teach	ers	Students			
		Mean	S.D	Remarks	Mean	S.D	Remarks	
7	Teaching agriculture with modern agricultural methods help to equip students with latest skills in agricultural operation.	4.08	1.19	Agree	3.57	1.15	Agree	
8	Acquaint students with relevant skills in the application of modern farm chemicals	3.11	1.44	Agree	3.36	1.33	Agree	
9	Help to adapt to the evolving scientific, technological and socio-economic changes by coordinating with current and projected training action	3.19	1.38	Agree	3.28	1.34	Agree	

 Table 2: Mean Responses on the effect of modern agricultural methods on teaching and
 learning of agricultural science in senior secondary schools in Emolga, Rivers state

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	Grand Total	3.75	1.05	Agree	3.76	1.09	Agree
	learners						
	creates motivation among	3.81	0.90	Agree	4.09	1.03	Agree
	skills for environmental						
14	Equips learners with farming	3.87	0.78	Agree	3.91	0.99	Agree
	most profitable system of						
13	methods of farming Acquaint the learners with	4.20	0.98	Agree	4.08	0.83	Agree
12	Equip the learners with	4.02	0.67	Agree	4.05	0.95	Agree
	see the need for workshop and in-service training						
11	than written test/exams for continuous assessment Enable the agric. teachers to	3.80	0.98	Agree	3.74	1.08	Agree
10	Encourage practical test more	3.68	1.10	Agree	3.79	1.08	Agree

Field Survey, 2020.

Table 2 presents the mean responses on the effect of modern agricultural methods on teaching and learning of agricultural science in senior secondary schools in Emolga, Rivers state. Based on the criterion mean value, respondents agreed that the use of modern agricultural method in teaching and learning equip students with latest skills in agricultural operation (4.08 & 3.57), acquaint students with relevant skills in the application of modern farm chemicals (3.11 & 3.36), adapting to the evolving scientific, technological and socioeconomic changes by coordinating with current and projected training action (3.19 & 3.28), using practical test more than written test/exams for continuous assessment in modern agricultural science (3.68 & 3.79), establishing criteria and standards subject to periodic review and evaluation (3.69 & 3.81), enables the agric. teachers to see the need for workshop and in-service training (3.80 & 3.74), equips the learners with irrigation and drainage methods of farming (4.02 &4.05), acquaint the learners with most profitable system of farming (4.20 & 4.08), equips learners with farming skills for environmental conservation (3.87 & 3.91), creates motivation among learners (3.81 & 4.09). This findings is in line with Okorie (1974) who asserted that the utilization of modern farming methods in teaching and learning will benefits students who are to be future farmers in such that they are adequately equipped with better methods of farming. He further stated that students who possess modern agricultural skills with substantial positive results may become tools to induce change into farmers.

Research Question 3

What are the effect of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga?



Table 3: Mean Response on the effect of modern agricultural machineries on the
teaching and learning of agricultural science in senior secondary school in Emolga,
Rivers State

S/N	Items	Ag	ric Tea	chers	Agric Students			
		Μ	S.D	Remarks	Μ	S.D	Remarks	
15	Equips learners with farm mechanics skills	3.19	0.79	Agreed	3.22	0.70	Agreed	
16	The use of tractor creates more interest among learners	3.43	0.83	Agreed	3.55	0.56	Agreed	
	enhances school farm usage	3.56	0.66	Agreed	3.30	0.82	Agreed	
17	Provides learners with machine operation skills	3.40	0.56	Agreed	3.39	0.79	Agreed	
18	equips students with ability to Utilize tractors with other farm implements	4.22	0.70	Agreed	4.19	0.77	Agreed	
19	Enforces teachers for capacity building	3.80	0.89	Agreed	4.09	1.03	Agreed	
20	Equips students with application principles of different farm machines	3.65	0.92	Agreed	3.93	0.93	Agreed	
21	Makes learning more realistic among learners	3.34	1.00	Agreed	4.40	0.87	Agreed	
	Grand Total	3.57	0.79	Agreed	3.76	0.81	Agreed	

Source: Field Survey, 2020.

Table 3 revealed that the respondents accepted all the items on the effect of modern agricultural machineries on teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State. The mean of each items shows the effects of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school; equips learners with farm mechanics skills (3.19 & 3.22), creates more interest among learners (3.43 & 3.55), enhances school farm usage (3.56 & 3.30), provides learners with machine operation skills (3.40 & 3.39), equips students with ability to utilize tractors with other farm implements (4.22 & 4.19), enforces teachers for capacity building (3.80 & 4.09), equip students with application principles of different farm machines (3.65 & 3.93), makes learning more realistic among learners (3.34 &4.40). The findings is in conformity with Tesha (2018) who observed that the implementation of machinery resources could increase the effectiveness of teaching and learning of agricultural science as a subject as many students would be able to acquire needed skills to operate farm machines. It is hence worthy to note that when agricultural science teachers utilize farm machineries in teaching practical agriculture, there is certainty that students will not only acquire necessary skills to operate farm machines but also motivated with the simplicity of farm work using farm machines. World Bank (2005) stated that effective implementation of Agricultural science curriculum in secondary schools is highly required so that young ones would see simplicity in agricultural practices negating their traditional believes on agriculture. Hootstein (2002) notably supported that the utilization agricultural machineries in delivery of agricultural



instruction in schools will serve as an effective tool for increased attention among students and skill acquisition in agricultural productivity

Hypothesis

H₀₁: There is no significant difference in the mean response of Agricultural Teachers and Students on effect of modern agricultural input in the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

Table 4: Z-test analysis of Agricultural Teachers and Students on the effect of modernagricultural input on the teaching and learning of agricultural science in seniorsecondary school in Emolga

Category	Ν	Mean	S.D	Sig. level	Z-cal	Z-crit	Decision
Agricultural Teachers	32	3.86	1.01				
				0.05	0.33	1.96	Fail to reject
Students	170	3.79	1.10				-
Field Survey, 2020.							

Table 4 showed that the calculated Z-test was 0.33 which is less than the Z-crit of 1.96. Therefore, the null hypothesis was accepted. Thus, there was no significant difference between agricultural science teachers and agricultural science students on the effect of modern agricultural input on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

 H_{02} : There is no significant difference in the mean response of Agricultural Teachers and Students on effect of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

Table 5: Z-test analysis of Agricultural Teachers and Students on the effect of modern agricultural methods on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

Category	Ν	Mean	S.D	Sig.level	Z-cal	Z-crit	Decision
Agricultural Teachers	32	3.57	0.79				
				0.05	0.048	1.96	Fail to reject
Students	170	3.76	0.81				-
Field study, 2020							

Table 5 showed that the calculated Z-test was 0.048 which is less than the Z-crit of 1.96. Therefore, the null hypothesis was accepted. This implies that there is no significant difference between the mean responses of teachers and Students on the effect of modern agricultural method on the teaching and learning of agricultural science in senior secondary school in Emolga Rivers State.



H₀₃: There is no significant difference in the mean response of Agricultural Teachers and Students on effect of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

Table 6: Z-test analysis of Agricultural Teachers and Students on the effect of modern agricultural machineries on the teaching and learning of agricultural science in senior secondary school in Emolga, Rivers State.

Category	Ν	Mean	S.D	Sig. level	Z-cal	Z-crit	Decision
Agricultural Teachers	32	3.75	1.05				
				0.05	1.22	1.96	Fail to reject
Students	170	3.76	1.09				-
Field study, 2020							

Table 6 showed that the calculated Z-test was 1.22 which is less than the Z-crit of 1.96. Therefore, the null hypothesis was accepted. This implies that there is no significant difference between the mean responses of teachers and Students on the effect of modern agricultural machineries on the teaching of agricultural science in senior secondary school in Emolga Rivers State.

CONCLUSION

The study concludes that the utilization of modern farm technologies in teaching and learning agriculture will not only equip learners with modern skills for farming but also create motivation for farming among upcoming generation. Since, choosing farming as career among students is dwindling, the use of modern farming technology could serve as a medium of arousing students' interest in agriculture as a career.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

- 1. There should be training and re-training among teachers and students of agricultural science on use of modern agricultural technology for teaching and learning in secondary schools.
- 2. Government should provide necessary inputs and farm machineries for teaching and learning agricultural science.
- 3. Schools should ensure the establishment of demonstration farm in order to encourage practical work among students.
- 4. Agricultural science studentsshould go for field-trips and excursion in technologyoriented farms to enhance to further boost their motivation from agriculture.
- 5. Government should fund and invest inagricultural education programme in higher institutions so as to equip student- teachers of agriculture.



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