Abolition of Agricultural Science as a Single Subject in Basic Schools in Ghana: Implications for Basic Educational Reforms

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Abstract. The implementation of new educational reforms in 2012 academic year in Ghana led to the abolition of Agriculture Science as a single subject in basic schools and agriculture science course was subsumed into Integrated Science. Concerns have been raised by stakeholders as to whether the reforms give room for adequate covering of agriculture needed in basic schools. A census of 107 Academic staff in the School of Agriculture and selected Departments from the Faculty of Education, University of Cape Coast, Ghana was undertaken to find out their perceptions on the abolition of Agricultural Science as a Single Subject in the Basic School Curriculum (ASSSBSC) in Ghana. Content validated questionnaire was used for data collection and data was analysed using descriptive statistics, chi-square test, Mann-Whitney U - test and Binary Logistic Regression. The findings of the study showed that majority (85%) of the respondents **do not support** the abolition of ASSSBSC in Ghana. Majority (95%) of the respondents generally agreed that Agricultural Science, like other subjects, should be treated as a single subject in basic schools. However, few (27%) suggested that even though it should be treated as single subject, it must not be a compulsory subject but optional. The binary logistic regression analysis showed that "agriculture science forms part of general science subject" was the best predictor of respondents' reason for supporting or otherwise, the abolishing of ASSSBSC in Ghana. The study recommended that the issue of whether agricultural science should be integrated into the general science in the basic schools or not should be revisited and re-examined by the stakeholders. Future educational reforms may use a tracer study as a major stakeholder participation tool for making informed decisions towards sustainable basic education in Ghana.

Keywords: Agricultural Science Education; Academic staff; Basic Educational Reforms, Ghana

1.0 Introduction

Agricultural education at the basic school level has been identified as vital for training young ones in the basic principles of agriculture, changing their attitudes towards agriculture and providing avenues for the development of their skills towards sustainable agricultural development (GES, 1987). Education, according to UNESCO, 'is an organized and sustained instruction designed to communicate a combination of knowledge, skills and understanding valuable for all the activities of life (Terry, Thomas and Marshall, 1979). Farrant (2004) also describes education as the total process of human learning by which knowledge is imparted, faculties trained and skills developed.

According to Anamuah- Mensah (2002), basic education is the minimum period of schooling needed to ensure that children acquire basic literacy, numeracy and problem-solving skills as well as skills for creativity and healthy living. The Ghana educational system currently provides for an eleven-year free Compulsory Universal Basic Education(fCUBE); comprising of 2 years of kindergarten, 6 years of primary and 3 years of junior high school education (Anamuah-Mensah, 2002). Agricultural education, as defined by Barrick (1988), is "the scientific study of the principles and methods of teaching and learning as they pertain to agriculture." Maguire (2000) also defined agricultural education as an "applied discipline concerned with the preparation of agricultural workers including farmers, teachers of agriculture, extension staff, researchers, agribusiness practitioners etc to satisfy individual, community and national needs in the field of agriculture and agribusiness."

The main purpose of the agricultural education at the basic level is to train pupils in the basic principles of agriculture, provide them options for the development of their skills and change their attitudes towards farming and agriculture-related businesses (GES, 1987). Agricultural education also assists in the development of desirable attitudes and interest, and in the development of social sensitivity and resourcefulness of students (Addo-Quaye, Osei, Annor-Frempong, Adam, and Ghartey, 2007).

Training of the younger ones in agriculture at the basic level is very crucial for development of the future generation of farmers and agriculturists. They will need basic technical, managerial and entrepreneurial skills to be able to establish businesses that will ensure agricultural development and economic development since Ghana's economy is agrarian-based (ISSER, 2014). In order to achieve these objectives, the Ghana government has made significant investment in curriculum development, development of instructional materials, and training of teachers to improve the teaching and learning conditions in schools. This is based on the public policy of education that seeks to provide equal and adequate educational opportunities in all fields and at all levels for all Ghanaians (Ghana Government Gazette, 1982).

According to Kwarteng, Owens and Okorley (2002), agricultural education must be viewed as a continuum of learning from basic through secondary and tertiary education. Such education must also be at both the formal and non-formal sectors. Even though agricultural education is an essential tool for development, it still faces a lot of challenges in sub-Saharan Africa including Ghana. Maguire (2000) noted that, agricultural education in Africa now faces swift and often perplexing changes in the environments in which it exists. Though efforts have been made in sub-Saharan Africa to give the necessary support to agricultural education as part of the overall education development programmes, much remains to be done to enable it responds adequately to new and emerging challenges in the sector.

Various curriculum reforms have been made in Ghana even before and after independence in 1957 (Anum-Odoom, 2008). The current reforms implemented in 2012 academic year has led to the abolishing of Agriculture Science as a single subject in basic schools and agriculture has been subsumed into Integrated Science. The purpose of the reform was to ensure the "formation of human capital for industrial growth, for ensuring competitiveness in the global economy; ability to make use of recent developments in Science and Technology, especially Information and Communication Technology (ICT); radical transformation in the field of work and employment; and the preservation of cultural identity and traditional indigenous knowledge and creativity. The reform intended to place high premium on technical/vocational education and training and improving the quality of instruction and making it flexible enough to accommodate diverse student abilities". (Ministry of Education, 2012).

The abolition of ASSSBSC has raised some concerns and controversies among some stakeholders. While some support the government's decision, others stand strongly against this decision. One of the effects of this abolition is that the contact hours of instructional time for teaching agriculture has been reduced by 75%. This is because integrated science formerly combined the teaching of three (3) disciplines namely biology, physics and chemistry, however, the new curriculum added agricultural science to be part of the integrated science making agricultural science the fourth discipline to be added to the integrated science. Some stakeholders are of the view that the abolition has led to disunity and lack of cohesion among agriculture topics, weaker foundation for higher agricultural science education, reduction in the interest of pupils in agricultural science and the current General Science syllabus has become very voluminous. Hence, General Science teachers either do not teach agriculture topics very well or neglect it all together. Some students even believe that if they do not study agricultural science aspect of the integrated science, they could still pass integrated science since it forms only 25th percent of the integrated science subject. However, the advantages of teaching agriculture as a single subjective in basic schools have been advocated by Addo Quaye et al (2007) and Essumang and Bentum (2007). These includes: It ensures unity and cohesion like in any other subject, helps to develop the interest of pupils/ students in Agriculture, prepares and gives students stronger foundation for higher Agricultural education and allows for an in-depth study as a single entity which allows for

better evaluation. Moyo (2014) has also advocated that students should have an appreciation of agriculture at an early age if they would take it serious in future.

One of the reasons advanced for the poor performance of agriculture in sub-Saharan Africa is the weak system of agricultural education which also includes basic education in agriculture (Oniang'o and Eicher, 1999). Zimbabwe, for example, recently introduced agriculture as a single subject in basic schools in 2014 because Zimbabwean viewed their economy as agriculture-based and therefore decided to teach agriculture as a single subject starting from basic schools (Majoni, 2016). To engage in more meaningful discussion of the issue, there is the need to identify the perception of major stakeholders in Agricultural education in Ghana on the abolition of Agriculture Science as a single subject in basic schools.

1.1. Objective of the Study

The main objective of the study was to investigate how academic staff (faculty) of School of Agriculture (SOA) and Faculty of Education (FOE) in the University of Cape Coast (UCC), Ghana perceive the abolition of agricultural science as a single subject in basic schools and the factors that affect their reason for supporting or otherwise, the abolishing.

2.0. Methodology

A census of all academic staff in the selected Departments concerned or having direct link with agriculture and basic education was undertaken to investigate their perceptions on the abolition of Agricultural Science as a Single Subject in the Basic School Curriculum (ASSSBSC) in Ghana. In school of Agriculture, all the academic staff in all the five Departments (Animal Science, Crop Science, Agricultural Engineering, Soil Science and Agricultural Economics and Extension) participated in the study while in the Faculty of Education the following were included; the Department of Basic Education, the Department of Educational Foundation, the Institute of Education and the Department of Vocational and Technical Education. The total population was One Hundred and Seven (107) respondents.

Content validated questionnaires were used in the data collection. The Cronbach's alpha reliability coefficient was used to determine the internal consistency of all Likert-type scales in the questionnaire. The Cronbach's alpha coefficients for the 9 items on the 'Reasons for Supporting or otherwise, the Abolition of ASSSBSC' scale was 0.816 indicating that the scale was reliable (Pallant 2010). Out of the 107 questionnaires distributed to all the academic staff in the study area, 76 responded indicating about 71% response rate. With the help of SPSS (version 21), the data was analysed using descriptive statistics, Continuity correction of the chi-square test, Mann-Whitney U-test and Binary Logistic Regression.

2.1 Empirical Model Specification

In the following empirical model, specifiedin equation 1, Y =1 defines respondents' support for the Abolition of ASSSBSC; Y=0 defines otherwise. The X's define independent variables that explain the probability that the respondent will support the abolition ASSSBSC and ε_i is error term. The equation is as follows:

$$logit[P(Y_i = 1)]$$
$$= \beta_{0i} + \beta_{i1}X_{i1} + \beta_{i2}X_{i2} + \beta_{i3}X_{i3} + \beta_{i4}X_{i4} + \beta_{i5}X_{i5} + \beta_{i6}X_{i6}$$
$$+ \beta_{i7}X_{i7} + \beta_{i8}X_{i8} + \beta_{i9}X_{i9} + \varepsilon_i$$

(Equation 1)

The dependent variable was measured as dummy with 1 and 0 indicating supporting or not supporting the abolition of ASSSBSC respectively.

The Independent Variables (determinants/predictors) were respondents perceived reasons for supporting or otherwise the abolition ASSSBSC in Ghana measured on the Likert-type format ranging from 1 to 5, with 1 indicating strongly disagree on the statement/item and 5 indicating strongly agree on the item. The nine (9) items are:

X1 =   Qualified agriculture teachers are not available
X2 =   Qualified agriculture teachers are not adequate
X3 =   Agriculture. science forms part of general science subject
X4 =   Agricultural Science is not relevant at the basic school level

X5 =   There are no adequate teaching and learning materials/ resources
X6 =   Agricultural science subject is too bulky/ voluminous
X7 =   Agriculture is a boring subject
X8 =   Without it pupils can still pursue agriculture at the Senior High
          School level.
X9 =   Agriculture is the backbone of Ghana's economy

3.0. Results and Discussion

3.1. Demographic Characteristics of Respondents

Table 1 shows the distribution of respondents by sex, age, working experience and rank or position in academia. Majority (76%) of the respondents were males and nearly 40% were above the age of 49 years. Majority (58%) of the respondents were lecturers with about two-thirds having been working in academia for less than 20 years.

Table 1: Sex, Age, Working Experience and Rank of Respondents in Academia

Variable	f	%
Sex		
Male	58	76
Famale	18	24
Age (years)	**f**	**%**
30- 39	28	36.8
40- 49	19	25.0
Above 49	29	38.2
Working experience (Years)	**f**	**%**
<10	29	38.2
10-19	23	30.3
Above 20	24	31.5
Rank / Position	**f**	**%**
Lecturer	44	57.9
Snr. Lecturer	21	27.6
Assoc. Professor	6	7.9
Professor	5	6.6

N= 76.

3.2. Awareness and Support of the Abolition of ASSSBSC

Table 2 shows the distribution of respondent on the awareness and support of the abolition of ASSSBSC in Ghana.

Table 2: Distribution of Respondents by Awareness and Support of the abolition of ASSSBSC

Item	YES		NO	
	f	%	f	%
Awareness of the abolition of ASSSBSC in Ghana	64	86.5	11	14.9
Support to the abolition of ASSSBSC in Ghana	10	13.5	63	85.1
Agricultural. Science be treated as a single subject in Basic Schools	70	94.6	4	5.4

N=74.

Majority (87%) of the respondents were aware that agricultural science had been abolished as a single subject in the basic school curriculum. On the contrary, a greater proportion (85%) of the respondents claimed they do not support the

ASSSBSC. The main reasons given for non-support of the abolition of ASSSBSC were: 1. Agriculture is the backbone of Ghana's economy 2. The interest of pupils is developed in the study of Agriculture at the basic school level and 3. Agriculture is not a pure science and therefore, must not be integrated into the General Science subject. Approximately (95%) of the respondents generally agreed that Agricultural Science, like other subjects, should be treated as a single subject in basic schools. These findings seem to agree with the opinions of Addo-Quaye (2007) and Essumang and Bentum (2007) who asserted that treating agriculture as a single subject in basic schools prepares and gives students stronger foundation for higher Agricultural education and allows for an in-depth study as a single entity which allows for better evaluation.

3.3. Reason for Supporting or not supporting the Abolition ASSSBSC

Table 3 shows that respondents agreed (Mean=4.1, SD=1.13) that "Agriculture is the backbone of Ghana's economy" therefore abolishing it at the basic level of education is out of place.

Table 3: Respondents' Reasons for Supporting or not Supporting the Abolition ASSSBSC

Reasons for supporting the abolition or otherwise	N	Mean	SD
Agriculture is the backbone of Ghana's economy	74	4.16	1.147
Agricultural science forms part of general science subject	76	2.83	1.237
Without it pupils can still pursue agriculture at the Senior High School level	76	2.55	1.351
There are no adequate teaching and learning materials/ resources	76	2.51	1.205
Qualified agriculture teachers are not adequate	76	2.42	1.169
Agricultural science subject is too bulky/ voluminous	76	2.08	1.105
Qualified agriculture teachers are not available	76	1.84	1.033
It is not relevant at the basic school level	76	1.63	1.094
it is a boring subject	76	1.61	.865

Scale: 5-strongly agree, 4-Agree, 3-somewhat agree, 2-Disagree, 1-strongly disagree

However, respondents disagreed to the assertion that "qualified agricultural science teachers are not adequate" (Mean=2.4, SD=1.17) and "Agricultural. science subject is too bulky/voluminous" (Mean =2.1, SD=1.11) as a reason for it abolition. Respondents disagreed again with reasons such as "qualified agricultural science teachers are not available" (Mean=1.8, SD=1.0), "Agriculture is not relevant at the basic school level" (Mean=1.6, SD=1.0), and "it is a boring subject" (Mean= 1.6, SD=.86). According to Evenson and Fuglie (2010) the rapid agricultural productivity growth in Brazil and China was as a result of

investment in "technology capital", i.e., in agricultural research, education and extension. They further stated that productivity growth entails much more than direct physical capital in agriculture. Therefore, investments in agriculture must focus in areas such as primary and secondary agricultural education, roads, power and community and market institutions.

Table 4: Relationship between Awareness and the Support Abolition of Agricultural Science in the Basic School

Abolition of agric. science as a single subject in the basic school	Aware		Not aware		Total		Chi-square	Continuity Correction	Sig.
	f	%	f	%	f	%			
Support	8	12.7	3	27.3	11	14.9			
Dot not support	55	87.3	8	72.7	63	85.1	1.572	.631	.352
Total	63	100	11	100	74	100			

N= 74, p< 0.05

A crosstabulation of the relationship between awareness and support of respondents towards the abolition of Agriculture science was done to examine whether the fact that the respondents were aware or not of the abolition influenced their decision to support it or not. Table 4 revealed that 85% of the respondents were aware of the abolition but do not support and 15% of the respondents were not aware but support the abolition. However, the continuity correction test (.631) from the chi-square analysis was not significant (sig. 352) at p< 0.05 alpha level. Yates 'Correction for Continuity was used instead of the chi-quare value in other to compensates for the overestimate of the chi-square value when used with a 2 by 2 table (Pallant, 2001). Hence, whether respondents were aware or not of the abolition did not influence their decision to support or not the abolition.

Mann-Whitney U -test was conducted to find out if significant differences exist between the mean ranks of respondents in school of agriculture and faculty of education on reasons for supporting or otherwise, the ASSSBSC. Table 5 shows that there was significant difference in the mean ranks of school of agriculture and faculty of education (sig.0.038) on the reason "without agriculture at the basic level pupils can still pursue agriculture at the Senior High School (SHS") at p< 0.05 alpha level. This implied that whiles respondents in the subject area of agriculture (SOA) feel that students can still pursue Agriculture in Higher levels without doing it at the basic levels, respondents in the technical area (FOE) feel that it is necessary to start agriculture at the basic level to enable them develop interest at the younger stage. The latter seems to agree with GES (1987) assertion that training at the basic school level can change the attitudes of the young

children towards agriculture as they grow. It seems that respondents from SOA are primarily focusing on the content of agriculture in Senior High School Curriculum which they feel that student can pursue it without having to take Agriculture as a single subject in basic school, whereas, those from FOE are focusing on the need to also generate interest at the early stage and giving them stronger foundation.

Table 5: Mann-Whitney U test between Respondents in SOA and FOE on Reasons for Supporting or otherwise, the Abolition of ASSSBSC

Items	Faculty/ School	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Sig.
Qualified agriculture teachers are not available	SOA	33	39.35	1298.50	681.5	0.751
	FOE	43	37.85	1627.50		
Qualified agriculture teachers are not adequate	SOA	33	42.80	1412.50	567.5	.122
	FOE	43	35.20	1513.50		
Agricultura science forms part of general science subject	SOA	33	35.67	1177.00	616.0	.312
	FOE	43	40.67	1749.00		
It is not relevant at the basic school level	SOA	33	36.97	1220.00	659.0	.536
	FOE	43	39.67	1706.00		
There are no adequate teaching and learning materials/ resources	SOA	33	38.02	1254.50	693.5	.863
	FOE	43	38.87	1671.50		
Agric. science subject is too bulky/ voluminous	SOA	33	36.62	1208.50	647.5	.493
	FOE	43	39.94	1717.50		
Agriculture is a boring subject	SOA	33	37.79	1247.00	686.0	.781
	FOE	43	39.05	1679.00		
Without it pupils can still pursue agriculture at the SHS	SOA	33	44.30	1462.00	518.0	0.038*
	FOE	43	34.05	1464.00		
Agriculture is the backbone of Ghana's economy	SOA	33	40.88	1349.00	565	.181
	FOE	41	34.78	1426.00		

*p< 0.05 . Scale: 5-strongly agree, 4-Agree, 3-somewhat agree, 2-Disagree, 1-strongly disagree.
        SOA= School of Agriculture, FOE= Faculty of Education
   N= 76.

However, there were no significant differences in the mean ranks of respondents in SOA and FOE at p< 0.05 alpha level on the rest of issue raised in Table 4 on the reasons for supporting or otherwise the abolition of ASSSBSC.

3.4. Predictors of Respondents' Decision to Support or otherwise the Abolition of ASSSBSC

The result of the analysis in Table 6 indicates that Cox Snell R- Square and Nagelkerke R- Square (pseudo R Squares) are .317and .599 respectively. It implies that between 32% to 60 % of the variance in respondents' reason for supporting the abolition or otherwise is being explained by the predictor variable (Agricultural science forms part of general science subject). The chi-square test of the regression model was significant at alpha level 0.05 and this means that the variable in the model has a significant composite effect in explaining respondents' reason for supporting the abolition or otherwise. All other factors were not statistically significant in predicting the respondents' support or otherwise the abolition.

Table 6: Logistic Regression showing predictors of respondents' reasons for supporting or otherwise the abolition ASSSBSC

Explanatory variables	β coefficient	Wald	Sig	Odd Ratio
Constant	-3.844	1.828	.176	.021
Qualified agriculture teachers are not available	-.725	1.167	.280	.485
Qualified agriculture teachers are not adequate	-.065	.009	.923	.937
Agriculture. science forms part of general science subject	1.455	5.368	.021*	4.285
Agriculture Science is not relevant at the basic school level	.478	.620	.431	1.613
There are no adequate teaching and learning materials/ resources	-.347	.585	.445	.707
Agriculture science subject is too bulky/ voluminous	.436	.355	.551	1.547
Agriculture is a boring subject	-1.304	1.839	.175	.272
Without it pupils can still pursue agriculture at the Senior High School	.739	1.969	.161	2.093
Agriculture is the backbone of Ghana's economy	-.674	2.044	.153	.510
	Model Summary			
Cox Snell R- Square	.317			
Nagelkerke R- Square	.599			
Chi- square	27.482*			
Sig. (p - value)	.001			

N= 76, p< 0.05

In the Table 6, the Odd ratio of 4.285 of the best predictor variable ("Agricultural science forms part of general science subject") implies that the adequacy of agriculture component in the general or integrated science subject in the basic school curriculum is about 4 times more likely to positively influence the respondents' decision to support the abolition of ASSSBSC (Pallant, 2010). Hence, if the agricultural science component of the Integrated Science subject is adequate, well-covered and well- taught as part of the integrated science subject, then there will be no need to treat it as a single subject in basic school. However, the concern has been whether agricultural component of the general/integrated science necessary for basic school is adequate and if it is, it could still be covered adequately alongside other subject like physics, chemistry and biology which is part of the integrated science subject in basic school (Addo Quaye *et al*, 2007)

4.0. Conclusions

The findings of the study revealed that majority (76%) of the respondents were male and approximately (63%) are above the age of 40 years. Approximately two-thirds have been working in the academia for less than 20 years.

Even though majority (87%) of the respondents were aware of the abolishing of ASSSBSC, about 85% of the respondents do not support the abolition of ASSSBSC in Ghana. The main reasons given for their non-support were: 1. Agriculture is the backbone of Ghana's economy 2. The interest of pupils is developed in the study of Agriculture at the basic school level and 3. Agriculture is not a pure science and therefore, must not be integrated into the General Science subject. Majority (95%) of the respondents generally agreed that Agricultural education plays a vital role in basic schools and that Agricultural Science, like other subjects, should be treated as a single subject in basic schools. However, few (27%) suggested that even though it should be treated as single subject, it must not be a compulsory subject but optional. The Mann-Whitney U-test showed that there was no significant difference between school of agriculture and faculty of education reasons for supporting or otherwise the abolition of agricultural science at the basic school level except "without it pupils can still pursue agricultural science at the Senior High School (SHS)" which was significant at $p < 0.05$ alpha level. Results from the Binary Logistic regression shows that "agriculture science forms part of general science subject" was the best predictor of respondents' reason for supporting or not supporting, the abolishing of ASSSBSC in Ghana. This predictor variable explained between 32% to 60% variations in respondents' support or otherwise for the abolition of ASSSBSC in Ghana.

The study recommended that the issue of whether agricultural science should be integrated into the general/integrated science in the basic schools or not should be revisited and re-examined by major stakeholders (University academic staff, Curriculum Research & Development Division (CRDD), basic school teachers, Ghana Education Service and other stakeholders). Future educational reforms

should use a tracer study as a major stakeholder participation tool for making informed decisions towards sustainable basic education in Ghana.

5.0. References

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