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Status and challenges of the higher agricultural education sector in Ghana

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ABSTRACT

African universities have to play a central role in Africa's development through the provision of quality training, knowledge and innovations. This is particularly crucial in ensuring a food secure Africa through a knowledge-based transformation of agriculture and related activities. Information on the state and challenges of higher agricultural education can inform actions aimed at positioning institutions to play the roles expected of them. The overall objective of this study was to assess the current status of the higher education sector in Ghana to identify current challenges and gaps and develop specific recommendations towards enhancing its performance and contribution to science, technology and innovation. Focusing on the five main public universities in Ghana, the study comprised a desk research and interviews with key officials of selected institutions. The findings suggest low quality of service to students due to large gaps in funding, teaching staff, and academic facilities. The demand for higher education in general far exceeds the supply. The total number of applicants to agricultural programmes increased sluggishly between 2004 and 2014, with female applicants hovering around 20%. Funding gaps, low technical or infrastructural capacity and declining number of applicants to science, technology, engineering and mathematics programmes are key issues that require urgent attention.

Key words: Challenges, Ghana, Higher Agricultural Education, Science, Technology and Innovation, Ranking.

RÉSUMÉ

Les universités africaines ont un rôle central à jouer dans le développement de l'Afrique par le biais de la fourniture d'une formation de qualité, des connaissances et des innovations. Cela est particulièrement crucial pour assurer une sécurité alimentaire en Afrique grâce à une transformation fondée sur les connaissances de l'agriculture et les activités connexes. Les informations sur l'état et les défis de l'enseignement agricole supérieur peuvent renseigner les actions visant à positionner les institutions pour jouer le rôle attendu d'eux. L'objectif général de cette étude était d'évaluer l'état actuel du secteur de l'enseignement supérieur au Ghana pour cerner les enjeux actuels, les lacunes et élaborer des recommandations précises en vue d'améliorer ses performances et sa contribution à la science, la technologie et l'innovation. En se concentrant sur les cinq principales universités publiques au Ghana, l'étude comprenait une recherche documentaire et des entrevues avec des représentants clés des institutions sélectionnées. Les résultats suggèrent une faible qualité de service aux étudiants en raison de grandes lacunes dans le financement, le personnel enseignant et les établissements universitaires. La demande pour l'enseignement supérieur en général dépasse de loin l'offre. Le nombre total de demandeurs de programmes agricoles a augmenté lentement entre 2004 et 2014, avec les applications féminines oscillant autour de 20 %. Les écarts en matière de financement, la faible capacité technique ou d'infrastructure et diminution du nombre d'étudiants dans les programmes de science, de technologie, d'ingénierie et des mathématiques sont les questions clés qui requièrent une attention urgente.

Mots clés : défis, Ghana, enseignement agricole supérieur, science, technologie et l'innovation, classement.

INTRODUCTION

Trained human resources in a wide range of topics, aligned to the Science Agenda for African Agriculture,

are central to stimulating science-based technology innovation. Universities must lead the way in the effort to build Science, Technology and Innovation (STI)

Status and challenges of the higher agricultural education sector capacity of the next generation of the African workforce. Science, Technology and Innovation (STI) is critical for responding to the challenges of African agriculture and to elevate its performance and contribution towards economic development and poverty alleviation. Research has shown that the returns to investment in higher education are around 20%, and in Africa closer to 30% (Borland *et al.*, 2000; Montenegro and Patrinos, 2013). These are higher returns to investments than in both secondary and primary education.

The landscape of the educational sector in Ghana

The present structure of education in Ghana is a 6-3-3-4 system representing, 6 years of primary education, 3 years of Junior High School, 3 years of Senior High School and 4 years of University education. Students who successfully pass the Senior High School Certificate examination can also follow courses at the Polytechnic or College of Education. The first 9 years form the basic education is free and compulsory. The basic education is designed to expose children to a wide variety of ideas and skills and instil attitudes that will help them cope creatively with their environment and stimulate them to be an asset to their country. The Primary School level curriculum consists of English, Ghanaian language and Culture, Mathematics, Environmental studies, Integrated Science, Religious and Moral Education and physical activities such as Music, Dance and Physical Education. The Junior High School level curriculum is made up of Basic Design and Technology (BDT), Integrated Science, Social Studies, Mathematics, English, Religious and Moral Education (RME), ICT, Ghanaian Language and French as a third language.

At the Senior High School every student takes four (4) core subjects: English Language, Mathematics, Integrated Science (made up of Science, Agriculture and Environmental studies) and Social Studies (Economics, Geography, History and Government). Students also choose three (3) elective subjects from five (5) available programmes: Agriculture Programme, General Programme (Arts or Science option), Business Programme, Vocational Programme and Technical programme.

The Tertiary Education Sector

The public tertiary education sector in Ghana is composed of nine (9) universities, ten (10) polytechnic institutions and a number of professional institutes. A number of private universities and higher education

institutions have been established since 2002, although they account for only 5 percent of total tertiary enrolments. There are 64 private tertiary institutions accredited by the National Accreditation Board.

Tertiary Agricultural Education

Tertiary Agricultural Education is offered in some of the nation's universities, polytechnics and training colleges. Five out of the nine (9) public Universities offer agriculture viz. University of Cape Coast (UCC), University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University for Development Studies (UDS) and University of Education, Winneba (UEW). Some private universities such as the Presbyterian University College, Akuapem campus and the University College of Agriculture and Environmental Studies (UCAES) at Bunso in the Eastern Region also offer agriculture. Out of the ten (10) Polytechnics in the country, only five (5) offer programmes in agriculture. The Polytechnics offer Higher National Diplomas (HNDs) in some areas of study in Agriculture. Students in the Polytechnics are trained as technologists. Agriculture was previously taught in Year 1 and Year 2 as part of the curriculum in the Colleges of Education that offer Science. However, beginning from 2015, they began to offer Integrated Science, which is a combination of Physical Sciences and Agriculture instead of Agriculture. Consequently, the agriculture content in the syllabus has been drastically reduced. Two elective courses in Agriculture—Elective Agriculture 1 and Elective Agriculture 2 are optional.

Globally, although higher education enrolment and graduation rates have increased considerably gross enrolment ratios remain low, with only 6% of Africans enrolled in universities (Bloom *et al.*, 2006) compared to 40% in Latin America and 94% in North America. Moreover, the increase has come at the expense of quality with expenditure per student falling significantly. There is thus an urgent need to invest in higher education and for higher education to transform itself to produce the quality of graduates and knowledge needed to achieve the African Unions Agenda 2063¹.

The current expansion in both public and private higher education system in Africa without strategic reform is not likely to respond to the challenges the agriculture sector is facing and may rather exacerbate current institutional challenges. The low number of qualified faculty members (PhD level staff in most universities range between 20-40% of academic staffing) is likely

¹ The African Union (AU) Agenda 2063 envisions an African future of Pan-African unity, integration, prosperity and peace. This vision is placed in the hands of African people as drivers and dynamic forces operating within the global area.

to be stretched further to meet the teaching and other demands of the expanding education systems. Only a small proportion of the about 1500 public and private universities offer graduate programmes (Hayward and Ncayiyana, 2014). Key reported challenges for universities include: a) increased student enrolments that are not balanced with requisite staff increases, nor infrastructure and facilities, nor funding; b) inadequate opportunities to undertake research and for training at MSc and PhD level; c) low funding and investments in higher education institutions; and d) weak monitoring and evaluation frameworks that do not adequately link performance of universities to funding frameworks.

Objectives and rationale

African higher education needs to be transformed so that it produces the graduates and research that will increase the use of science, technology and innovation for economic growth and ensure an Africa that is food secure. Investments must be targeted to ensure the development of strong local post-graduate programmes and to transform universities so that they use modern technologies applied to local situations to provide the human resources that Africa needs for tomorrow.

It is against this background that this study was undertaken to review the higher education sector in Ghana with specific focus on agricultural higher education to identify opportunities for enhancing its performance. Specifically, the study aimed to identify current challenges and gaps and develop specific recommendations towards enhancing the performance and contribution to the Science, Technology and Innovation at national level. Furthermore, the study highlights the current gaps and strengths at Ghana's universities and provide the base material for input into policy dialogues and finally towards decisions at the AU Heads of States level in 2016.

RESEARCH METHODOLOGY

The study focused on the five main public universities that offer Agriculture in Ghana, i.e., University of Cape Coast (UCC), University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University for Development Studies (UDS) and University of Education (UEW). The study comprised a desk research and interviews. The desk research involved literature review and document analysis regarding the higher education sector in Ghana. Documents available online were retrieved and those offline were obtained from the relevant institutions such as the National Accreditation Board (NAB), National Council for Tertiary Education (NCTE), Ministry of Education (MOE), Ministry of Science, Environment, Technology and Innovation (MESTI), The Association of African Universities (AAU),

Secretariat of Vice-Chancellors Ghana (VCG) and the selected public universities. The National Accreditation Board (NAB) is a body with the constitutional mandate to audit and accredit all tertiary institutions and programmes in Ghana. The NAB ensures that all tertiary institutions have the required human, material, infrastructural and financial resources to run tertiary programmes. The NAB also undertakes continuous review and periodic re-accreditation of existing programmes in accredited institutions to ensure quality. The National Council for Tertiary Education (NCTE) is a body that oversees the general administration of tertiary institutions in Ghana. The Vice-Chancellors Ghana (VCG) is a body made up of the heads of the public universities. It is a platform for the Vice-Chancellors to identify areas of common interest for the purpose of advocacy and to compare notes for standardization. A check list detailing specific information to be elicited from specific institutions was prepared and served to the bodies concerned on appointment where explanations were offered when delivering the list to the selected institutions. The desk research helped retrieve information on funding, enrolment, staffing, policies, among others.

Interviews were conducted with key personnel in the selected institutions to obtain information or their opinions on issues such as teaching/research capacity and challenges, current status of higher agricultural education, university ranking system for Africa, academic mobility in Africa, among others. A thirty (30) point interview guide was constructed to aid the data collection. Data obtained during the study was analyzed by descriptive statistics using Microsoft Excel.

RESULTS AND DISCUSSION

Gap between supply and demand for university education

During the 2004/2005 to the 2013/2014 academic years, the demand for higher education in the five main public universities grew steadily and far exceeded the supply (Table 1). For all the universities considered, the number of graduates for each academic year was used as a proxy for intake capacity (Table 1). Thus, regardless of actual intake, the gap between demand and supply can be deduced from Table 1. Using the University of Ghana as an example, the number of applicants increased substantially from approximately 19,000 in 2004 to 79,000 in 2014. For the 2013/2014 academic year, assuming the University of Ghana was able to admit 10,000 students out of the total number of applicants, the remaining number of applicants who could not gain admission would be over 68,000. Even though some of these applicants might gain admission into other universities (due to multiple applications), the large demand-supply gap would remain practically unchanged.

Table 1: Number of graduates and applicants for the five main universities offering programmes in STI and agriculture from 2004/2005 to 2013/2014 academic year

Year	UG		KNUST		UCC		UEW		UDS	
	Grads.	Applicants	Grads.	Applicants	Grads.	Applicants	Grads.	Applicants	Grads.	Applicants
2004/2005	3,752	19,421	2,280	13,267		14,749		6,838	141	3,535
200/2006	4,066	21,999	3,185	18,303	2,104	14,229	3,013	8,796	317	4,320
2006/2007	6,426	18,215	3,239	19,722	3,113	16,363	2,559	7,841	834	4,709
2007/2008	6,379	22,708	3,314	18,544	6,193	14,883	3,788	9,607	-	7,207
2008/2009	6,696	27,795	4,749	16,975	4,681	13,935	5,558	12,119	-	7,619
2009/2010	10,914	34,092	5,537	19,766	3,761	14,896	9,547	9,340	1,453	-
2010/2011	8,059	29,175	5,445	28,178	4,926	16,937	8,245	13,672	2,033	15,351
2011/2012	7,259	36,330	5,643	33,430	4,103	-	18,572	-	2,186	-
2012/2013	8,324	42,083	6,305	42,582	4,926	14,562	17,841	11,702	2,536	11,244
2013/2014	7,711	78,618	8,199	57,277	3,932	17,008	16,567	13,074	5,380	19,450

Key: UG is University of Ghana; KNUST is Kwame Nkrumah University of Science and Technology; UCC is University of Cape Coast; UEW is University of Education, Winneba; UDS is University for Development Studies

Adu and Orivel (2006) earlier reported that demand for higher education has far outpaced the supply capacity and even the projected growth in demand by the Ghana Ministry of Education. Between 1990/1991 and 2007/2008 academic year, enrolment in public universities increased from 9,997 to 93,973 (about 840%), with an average annual growth rate of 13.26% (Vice-Chancellors of Ghana, 2009). The universities responded to the surging demand for higher education by increasing intake without prior improvement or expansion in facilities. The consequence of this sharp rise in enrolment was overcrowding of and deterioration in facilities. According to Atuahene and Owusu-Ansah (2013), the Arts and Humanities account for a large proportion of the increase in enrolment, a situation that can have adverse implications for graduate employment and national development (Adu and Orivel, 2006). The low number of students in Science, Technology, Engineering and Mathematics (STEM) programmes are largely attributed to inadequate physical infrastructure (e.g. laboratories and workshops), human capacity (e.g. research faculty, technicians), poor enforcement of policy targets for STEM programmes by higher educational institutions and low number of qualified applicants (Atuahene and Owusu-Ansah, 2013). However, structural factors such as employment opportunities, cost of training and changes in perceptions or actual prestige of some professions also partly account for the increase in demand for the Arts and Humanities.

Contrary to the government’s policy target of 60:40 enrolment ratio for programmes in STEM and the Arts and Humanities, respectively (Ministry of Education, 2010), the STEM and Arts/Humanities enrolment ratios were 36:64 in 2001/2002, 35:65 in 2002/2003, 38:62 in 2007/2008 academic years in public universities

(Atuahene and Owusu-Ansah, 2013). The ratio improved slightly to 40:60 only in the 2010/2011 academic year. Somuah (2008) recommended that annual growth in enrolment for STEM programmes and Arts/Humanities should be pegged at 8% and 0%, respectively, if the expected ratio is to be realized within twelve years.

Trends in applications to agriculture and related programmes

From the 2004/2005 to 2013/2014 academic years, UG (the largest university) had a steady increase in the number of applicants to agriculture and related programmes, whereas UCC experienced a decline (Figure 1). The largest number of applicants (3,197) was observed for UG during the 2013/2014 academic year whereas UCC recorded the lowest number of applicants in 2008/2009 academic year. For the other universities, the numbers have been fluctuating over the period. The overall trend might suggest changes in preference for agricultural programmes or increase in opportunities for admission in the respective universities.

The trend in total number of applicants to agricultural and agriculture-related programmes for the five main public universities is shown in Figure 2. The trend shows a sluggish increase from 2004/2005 to 2008/2009, followed by a period of fluctuations and finally an increase again. In absolute terms, the total number of applicants increased from 2,929 in 2004 to 6,890 in 2014. It must be noted that these numbers include multiple applications to different universities during any academic year.

The proportion of females in the total number of applicants in each of the five main public universities

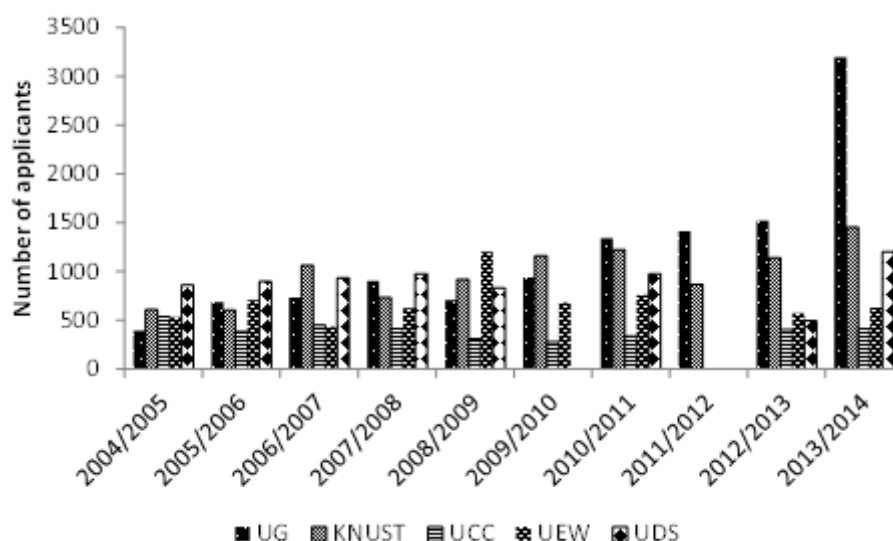


Figure 1: Total number of applicants to agricultural programmes in each of the five main public universities

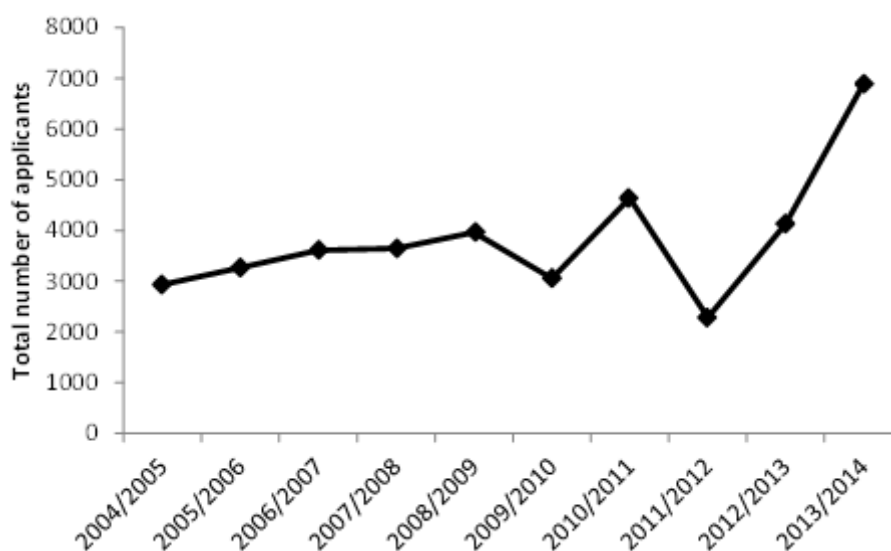


Figure 2: Trend in total number of applicants to agricultural programmes

offering agricultural programmes is shown in Figure 3. With the exception of the UG, the proportion of female applicants to agricultural programmes generally hovered around 20% of the total applicants.

CHALLENGES

Funding gap

Public universities are, by law, to be fully funded by the state. They receive grants from Government as a share of allocations made to the tertiary sub-sector by the Ministry of Education. On the whole, total funding for the tertiary education sector has increased from approximately GH¢88 million in 2005 to GH¢2 billion in 2015 (Table 2). Of these values, compensation has been the largest component, followed by funds generated internally by the institutions, with investments in assets being the lowest. It is noteworthy that the

GETFund (Ghana Education Trust Fund, established in the year 2000) contributed substantially over the period under consideration. The GETFund is an accessory or intervention grant given to institutions to support budgets for specific projects such as infrastructural development or staff training. For the period under consideration, donor funding was small and discontinuous. For the first time, the tertiary education sector was given a dedicated budgetary allocation of GH¢ 32,813,528 under the Annual Budget Funding Amount (ABFA) in 2015.

Funding has been and continues to be a key issue and challenge to tertiary education in Ghana (Adu and Orivel, 2006; Vice Chancellors of Ghana, 2009). Government grant has been the major source of funding for public higher education institutions in Ghana. In

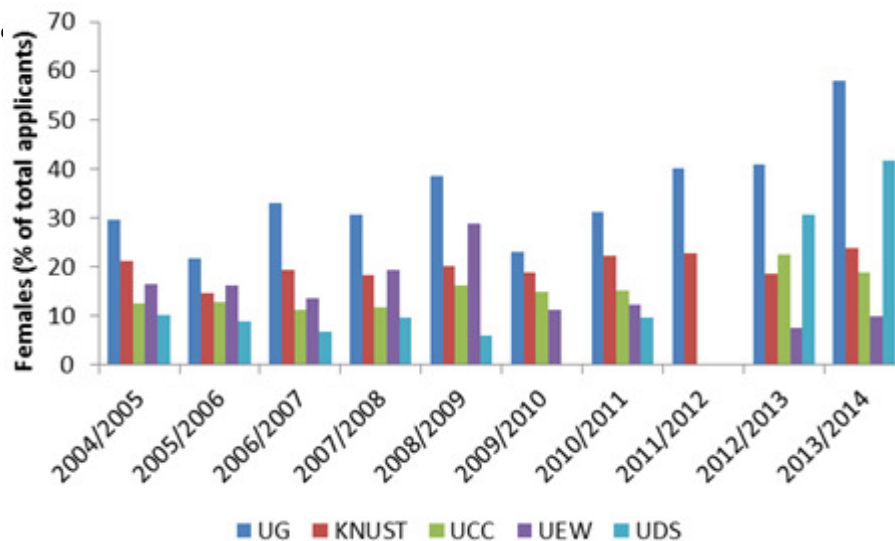


Figure 3: Number of female applicants as a percentage of total

1996, a cost sharing mechanism was introduced to bridge the gaps in funding. Under this arrangement, students pay Academic Facility User Fees (AFUF) and Residential Facility User Fees (RFUF) annually, which should support non-salary expenditure. In 2009, Vice-Chancellors of public universities of Ghana made a report on the funding gaps existing in the public universities for the period 1990/1991 to 2007/2008 and the implications for quality education (Vice-Chancellors of Ghana, 2009). The report noted that the mechanism of funding of public universities was unsatisfactory. The report showed that total revenue accruing to public universities over the period considered was made up of 77% Government Grant and 23% IGF. About 84% of the Government Grant (or 65% of total revenue) went into personnel emoluments. With AFUF contributing just about 5% to total revenue, the universities consistently ran deficit in funding between 34.24% and 63.28% for the period considered. This deficit is the difference between the amount required to train a student in public universities (determined yearly by NCTE) and the actual revenue accruing to the universities. Due to the funding gap for teaching purposes, consideration of funding for research was relegated to the background. The implications of the funding gap include decline in quality and capacity of public universities, restricted access to higher education and poor research. Several propositions were made to address the challenges, including the need to increase Government grant for recurrent expenditure, increase GETFund allocation for capital and training investments, increasing the number of fee paying students and the establishment of a Research Fund for the universities. Some of these propositions are being implemented, e.g. gradual increase in the number of full fee paying students, which currently cover a significant part of recurrent expenditure (Adu and Orivel, 2006), and the modalities for establishing a research fund are still being discussed.

The funding gap in the public universities can best be appreciated in terms of the total funds required to train a student. For the period 2003/04 to 2007/08, for example, the funding gap per student in the public universities increased from GH¢ 713.82 to 3,913.05 (or 34.25% to 63.28%) (Table 3). The gap in funding implies trading down of quality teaching and related services, as well as research.

Imbalance in staffing

The National Council for Tertiary Education (NCTE) has a normative system for determining the desired levels of different categories of staff. For the teaching staff, the student-teacher-ratio (STR) is used. For example, as at 2008, the deficit in teachers in relation to number of students (per NCTE requirement) ranged from 32.4% (UDS) to 51.8% (UEW) (Table 4). The non-teaching staff also seem to be in excess of NCTE threshold per teaching staff. Vice-Chancellors of Ghana (2009) reported that the operating STRs of the public universities have been consistently larger than the NCTE threshold, suggesting low quality of service to students (in terms of teaching and attention or supervision). However, the STR thresholds set by the NCTE appear unrealistic given Ghana's stage in economic and tertiary educational system development.

From the survey responses, the universities indicated that although they have some competent and qualified staff to deliver a decent level of quality of teaching, learning and research, the low number of teaching and technical staff, together with funding, is the main contributor to deteriorating quality of teaching, learning and research as the few staff are overtasked.

Technical/Infrastructural

The universities surveyed have crop and animal farms, as well as laboratories, for teaching and research purposes. Efforts to increase the number of lecture

Table 2: Main sources of funding of tertiary institutions in Ghana. Source: National Council for Tertiary Education (NCTE)

Funding source	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Amount (GH¢ x 10 ³)											
GOG											
Compensation	51,040	79,731	95,164	100,000	115,000	256,000	259,864	474,046	471,862	923,374	960,000
Goods and Services	8,714	13,180	17,050	17,605	17,800	16,000	16,000	16,100	12,369	12,000	9,000
Assets	300	200	440	358	505	504	473	473	765	1,770	-
IGF Target	27,916	41,986	59,903	73,949	81,315	111,397	150,800	155,079	375,475	640,704	803,539
GETFUND	-	51,920	53,200	27,280	37,850	51,731	56,405	84,753	80,500	132,051	206,989
Sub-Total	87,970	187,017	225,757	219,192	252,470	435,632	483,542	730,451	940,971	1,709,899	1,979,528
Donor				16,873		24,532	27,925	218			38,870
Grand Total	87,970	187,017	225,757	236,065	252,470	460,164	511,467	730,669	940,971	1,709,899	2,018,398

Key: GOG is Government of Ghana; IGF is internally generated funds; GETFund is Ghana Education Trust Fund.

theatres or expand spaces for teaching and learning are on-going. However, all the five universities surveyed suggested that the current demand on these teaching and research facilities far exceeds the installed capacities. As a result, laboratory and field practical sessions for students, for example, are often conducted in groups. In some cases, practical exercises are simply demonstrated to the students due to large numbers and little resources such as inadequate laboratory supplies or spaces. In situations where an equipment or instrument is non-existent, a picture and oral information are used to explain a process or how that equipment works. Field trips are also limited due to funding constraints.

The main method of teaching is 'face to face lectures', in which students have to take notes or study mainly from hand-outs. Thus, learning is largely passive. Some of the universities surveyed have projectors fixed in some lecture theatres; but the traditional mode of lectures (using writing board with e.g. markers, without PowerPoint or computers and accessories) is predominant. The available ICT facilities, although limited, are mainly used for administrative purposes (e.g. managing student records). There are good building facilities for libraries but the collections are either limited or some are out-dated. Use of digital collections (such as journal subscriptions, e-textbooks) is limited. In all, the universities indicated inadequate lecture theatres, laboratory (spaces, equipment and supplies) and library resources as the main technical/infrastructural challenges. The universities recommended improved funding and increased number of teaching and technical staff, as well as deliberate investment in scientific instruments/equipment and library collections, as the way to improve the quality of agricultural education and research in Ghana.

The imperative for African university ranking system

Ranking is a measure or evaluation of institutional excellence that may help to allocate funding in a rational manner, prioritize research and educational investment. Ranking systems inform the public, guide the burgeoning market of candidate students and junior researchers and above all help institutions in internal self-evaluation and improvement. However, all ranking systems lend themselves to varied interpretations and acceptability.

African universities ought to operate at the cutting edge of intellectual and scientific development if they are to serve the Science Agenda of the African Union. Ranking of such institutions of higher learning is therefore crucial to ensure a standard of quality and to justify resource allocation to the institutions. African universities, however, have largely ranked very low on the global level (Ioannidis *et al.*, 2008). The fact

Table 3: Funding gap for the public universities (2003/04-2007/08) (Amount in GH¢). Source: Vice-Chancellors of Ghana (2009)

Cost	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
Average cost per student	2,084.11	2,471.06	3,273.56	4,847.22	6,184.00
Revenue per student	1,370.29	1,442.61	1,657.64	2,022.37	2,270.95
Funding gap	713.82	1,028.45	1,615.92	2,824.85	3,913.05
% of gap	34.25	41.62	49.36	58.28	63.28

Table 4: Teaching staff in the five main public universities as at 2008. Source: Vice-Chancellors, Ghana, 2009

Category of staff	UG	KNUST	UCC	UEW	UDS
Professors	63	16	11	8	2
Associate Professors	117	55	44	21	8
Senior Lecturers	267	151	91	72	38
Lecturers	418	452	272	211	178
Sub-Total (A)	865	708	426	322	232
No. of Students (B)	28,920	23,866	16,835	15,378	7,891
NCTE Average STR per Institution	19:1	18:1	20:1	23:1	19:1
% Deficit of Teachers to meet NCTESTR	43.2	46.6	49.4	51.8	32.4

that African universities are poorly resourced creates an imperative or provides a justification for an African-centred ranking system. The question is, what will be the nature, component and operation of such a ranking system.

The two most prominent international ranking systems that allow for broad benchmark comparisons of institutions across national borders are those prepared by the Times Higher Education Supplement (THES) and Shanghai's Jiao Tong University (SJTU). Ioannidis *et al.* (2008) examined these two main ranking systems and pointed out methodological issues that can explain the low ranking of African universities. Also, discrepancies between the two main ranking systems suggest that each can be interpreted or applied differently. In 2006, for example, four of the top 50 on the Shanghai list did not even make the top 500 of the Times list, and several top Times choices disappeared on the Shanghai list (Ioannidis *et al.*, 2008). Thus, the extent of the disagreement and the methods or components of these ranking systems can provide food for thought regarding the ranking of African universities.

A case for the Ghanaian Institutions

In 2012, Vice-Chancellors Ghana constituted a technical committee to develop proposals on the criteria for the ranking of universities in Ghana, and respondents from the universities referred to these proposals as a starting point. The committee proposed that any ranking system to be put in place should be transparent and serve as a

self-evaluation of all universities in Ghana. Anybody charged with managing the system should be independent and adequately-resourced to promote effective implementation of the system. They further proposed that any criteria used for the ranking exercise should be measurable, objective and generally acceptable.

Since international bodies use different methods in ranking, for the ranking system to be successfully implemented, it must take the Ghana peculiar situation into consideration. For the ranking to be relevant and useful, the philosophy behind it should be based on the purpose for which the various universities were set up. Hence, the ranking system should be two-pronged: ranking of academic programs and overall ranking of universities.

Proposed Criteria for Ranking Ghanaian Universities

After a thorough study of the various criteria adopted by different ranking bodies, seven core areas for assessment were proposed to constitute the criteria for a Ghana-specific ranking system as described in the following sections.

- a. **Teaching and learning facilities:** These refer to the facilities available to execute the core mandate of the university- research, teaching and learning. Areas for concentration under this are:
 - i. **Infrastructure:** Classrooms furniture, halls of residence, offices, classrooms- quality of space, adequacy of space;

- ii. **Library:** Adequate books for programmes, automation, institutional commitment to the library, journal subscriptions including online journals;
 - iii. **ICT:** Bandwidth usage for students' assignment, teaching, research, admissions, registration, website, and portals.
 - iv. **Laboratories, equipment and technical staff:** Must have basic facilities (water & electricity), qualified technical staff, equipment (equipment should be up to date and relevant to the programmes), language laboratory (where necessary);
 - v. **Institutional facilities:** Internship arrangements, policy for internship/work experience, curriculum should make provision for internship, officers in charge and reports available;
 - vi. **Instructional facilities:** Projectors, public address systems, screens, smart boards, DVD, VHS players and accessories where necessary.
- b. Outputs:** This refers to the outcomes of the university's core activities of teaching and research. Areas for concentration for assessment are:
- i. On-going research
 - ii. Publications/patents (number and quality of journals) per faculty per year;
 - iii. Percentage of undergraduates graduating, that is entry/ exit ratio;
 - iv. Percentage of postgraduates (M. A., MPhil., PhD) graduating, that is entry/exit ratio
 - v. Employability: how the students produced are predisposed for employment; and percentage employed within a specified period.
 - vi. Commercial products e.g. University farm products for sale, remote sensing services etc.
- c. Attractiveness:** This refers to how the university is attractive to students, potential students and staff. Areas for assessment are:
- i. Acceptability; the percentage of students that accept admission out of the total number offered admission;
 - ii. Academic staff profile (proportions of professors, associate professors etc. That is percentages of teaching staff at various levels);
 - iii. Staff with terminal degrees (percentage of staff with terminal degrees);
 - iv. Number of accredited programmes (percentage of the programmes that are running);
 - v. Staff/student ratio;
 - vi. Average grades of admitted students, grades of students who apply to the university;
- I. International Students – percentage of international students enrolment;
- II. Accessibility – innovations. Range of different categories of students admitted: Physically challenged, brilliant but needy, deprived and poorly endowed schools, gender proportions, and affirmative action; and the various ways in which the university responds to innovations to attract and give access to these students.
- d. Visibility**
- How the university positions itself to be seen and appreciated worldwide. Areas for concentration for assessment are:
- i. Organization and attendance of conferences, seminars and workshops per year;
 - ii. Website: frequency of uploading information, how often site is visited, volume of information, response to request;
 - iii. Awards and recognition received by staff, students and alumni;
 - iv. Annual lecturers;
 - v. Staff/students exchange programmes;
 - vi. Institutional mentoring.
- e. Processes and mechanisms orientation:** The effectiveness of various processes that drive the university to enable it achieve its core mandate of producing middle and high level manpower. Areas for concentration for assessment are:
- i. **Admission and orientation:** Admission process, quality of advertisements, committees in charge of admission of, students, security measures, information to fresh students, quality and relevance of orientation programmes;
 - ii. **Assessment:** Information to students, setting, vetting and processing of examination questions, involvement of external examiners, rules and regulations, processing and release of results, examination centres, accessibility of scripts to students;
 - iii. **Mechanisms:** Mentoring and quality assurance mechanisms;
 - iv. **Counseling:** Academic and social;
 - v. **Recruitment/Orientation:** The processes involved in employing new staff: advertisement, selection, appointment, integration of staff, resources available for the task assigned etc.
- f. Finance:** This refers to the ability to generate and account for funds to support programmes and students. Areas for concentration are:
- i. Internally generated funds, research grants, academic facility user fees, other fees, consultancies and commercial projects e.g. Farms;
 - ii. Endowment funds;

- iii. Scholarships/students assistance /grants
- iv. Favourable audited reports

g. Support Services - Two areas of focus

- i. Hospitals, Canteens, restaurants, schools, sports facilities, (including gyms), security services, residential facilities, water, electricity, roads and environment.
- ii. Quality of space, adequacy of space, ventilation, furniture, fire alarms emergency exits, lighting, accessibility for physically challenged persons and the visually impaired, and toilets. The essential services and facilities that support the day – today activities of staff and students of the university.

Areas for concentration for assessment are:

- i. Eating places and restaurants;
- ii. Hospitals and clinics;
- iii. Banks and shops;
- iv. Sports facilities;
- v. Schools;
- vi. Security;
- vii. Residential facilities (students and lecturers);
- viii. Water, electricity; roads and environment.

Arguably, the work of the Vice-Chancellors Technical Committee was quite comprehensive. However, other pieces of information gleaned as expert opinions are worthy of consideration. For instance, the respondent from the NAB was of the view that an African Universities ranking system is unnecessary as it is diversionary. The respondent thought that the limited resources available to the institutions should be channelled into growing the institutions and developing better quality standards.

The respondent from the Association of African Universities also submitted that an African Universities ranking system would be useful but cautioned that the standards underpinning such a system should be comparable to the global systems to ensure and / or maintain higher standards in the delivery of university education. In this regard, the respondent further suggested the inclusion of the following components into any such ranking system.

- i. Staff to student ratio
- ii Methods of instruction used
- iii Funding base
- iv Research outputs
- v Visibility of research
- vi Community impact
- vii E-resources and library collections
- viii Access to computers and internet

The challenges identified in the implementation of an African University ranking system include the fact that

data and information is still not organized in most universities as monitoring systems are still not well established; how to rate private and public universities using a common criteria due to varying funding base, system of governance and students preference exist among these institutions. Another key challenge is how to get all institutions concerned to agree on indicators that they would approve. However, as regards the organization to be responsible for developing and implementing the system, the suggestion was to use regional quality assurance bodies such as Inter-University Council of East Africa (IUCEA) and Higher Education Quality Management Initiative for Southern Africa (HEQMISA).

CONCLUSION

The study showed that there is a large gap between demand and supply of education in the public universities in Ghana. While enrolment has increased substantially (especially in the arts and humanities) in response to increasing demand, there has not been a commensurate expansion in teaching and learning facilities. The number of applicants to agricultural programmes increased from 2004 to 2014, but no clear, stable pattern was found in agriculture student populations across the universities.

The study also indicated that the proportion of female applicants to agricultural programmes generally hovered around 20% of the total applicants. Government grant is the major source of funding to the public universities. Although total funding for the tertiary education sector increased from approximately GH¢88 million in 2005 to GH¢2 billion in 2015, the public universities in Ghana operate on large deficits in funding and teaching staff, suggesting low quality of service to students. Moreover, the study revealed that the current demand on existing teaching and research facilities far exceeds the installed capacities. Therefore, there is the need for a smart funding scheme for universities and students, expansion and improvement of existing facilities and creation of new institutions and enforcement of policy goals such as ratio of enrolment in the sciences and the arts/humanities.

There is a desire for a specific ranking system for African universities as expressed by the proposals for ranking universities in Ghana. However, such a ranking system should foster quality, competitiveness and, to some extent, meet international expectations.

Recommendations to strengthen higher education in Ghana

The respondents in the survey kept referring to the Strategic Plan developed by Vice Chancellors Ghana (VCG, 2009) as a blueprint for strengthening higher education in Ghana (regardless of the programme).

Key recommendations identified in the VCG strategic plan that can enhance higher agriculture education include the following:

1. Strengthening the collaboration between industry and academic institutions, from curriculum design, through training, to employment.
2. A clear political vision and commitment to the promotion of science, technology, engineering, and mathematics education
3. Reducing the high cost of STEM programmes in public universities and improving science education at the secondary school level to increase the supply of science-oriented students to the universities.
4. Empowering public funded universities to concentrate on producing STEM graduates while private universities with minimal resources focus on training students in the arts and humanities.
5. Promotion of internships, seminars, and field work by education and training institutions to enhance links between training and the world of work.
6. Raising teacher motivation with incentives such as salary enhancement, better pension packages, and promotion based on performance rather than on length of service.
7. Tightening supervision and monitoring systems.
8. Increasing investment in the provision of better infrastructure, teaching aids, and other facilities to promote effective teaching and learning.

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STATEMENT OF NO CONFLICT OF INTEREST

We the authors of this paper hereby declare that there are no competing interests in this publication.

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