

Critical Needs of African Universities: A Shared African-Japanese Perspective

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Abstract

Africa is experiencing an explosion in the number of universities and their student population. Borne out of our experience in academia, and informed by a theoretical model of knowledge production formulated by Gibbons (2002), this paper argues that besides the widely recognized need for better mobilization of resources for universities, there are other critical needs, including, a need for increased applied orientation of teaching and research programmes in order to enhance greater impact on poverty reduction and sustainable development and, thereby promote sustainability through demonstrated social relevance in the African continent. A way of achieving this is for the academic programmes to place more emphasis on linkages between the university researchers/academics and farmers, particularly for the purpose of improving locally adapted traditional knowledge systems for managing the continent's rich biodiversity and natural resources, and upon linkages between researchers and manufacturers toward strengthening the underdeveloped industrial sector through value addition by processing. Other needs are greater external collaboration in knowledge sharing to generate positive synergies, and more imaginative internal revenue generation towards financially self-sustaining universities.

Key words: Africa, Japan, universities, needs, research, linkages, collaboration, sustainable development

Introduction

The African continent is richly endowed in natural resources such as minerals, flora, and vast tracts of fertile land. Therefore, it is paradoxical that poverty persists there. Low incomes, nutritional deficiency, food insecurity, famine, inadequate housing, limited access to safe water and other indicators of human wellbeing reflect the poverty which, as elaborated below, is linked to a low human capacity to manage the complex set of environmental, economic and social factors that constrain efficient utilization of the natural resources (Simenson 2008; Maathai 2009).

The diverse strategies pursued to improve this adverse situation include agricultural transformation, industrialization, external financial aid, technology transfer, democratic governance, education, and fore mostly, university-level education as is evidenced by the massive growth in the number of African universities, both public and private, and their student population. What the academic programmes of these rapidly expanding universities ought to emphasize and the attendant resource requirements for their sustainability warrant critical reflection. Two questions that come to bear on the futures of these universities are implied in this submission. The first is, what, if any, needs to be done in order to enhance the developmental impacts of what the universities teach and research? Secondly, how best may the universities be resourced so as to sustain this goal?

From the joint perspectives of the authors, a Ghanaian and a Japanese, both of them academics long resident in Ghana, a typical African country, this paper addresses critical needs of universities in Africa. Our basic premise is that, following the example of the developed countries, notably post-Second World War, Japan's university-led education of an applied or interventionist character is indispensable for lifting Africa from the quagmire of poverty and for moving it sustainably along the path of development.

The paper is structured into six parts. It starts with the introduction, which is followed by a section that profiles the developmental challenge facing Africa. A third major section discusses the role of education in the development process. The fourth section outlines the theoretical underpinning of the paper, while the fifth expatiates the educational needs of the African continent. Section 6, distils the findings to conclude the paper.

The challenge

The African Union has expressed that, *"The poverty and backwardness of Africa stand in stark contrast to the prosperity of the developed world. The continued marginalization of Africa from the globalization process and the social exclusion of the vast majority of its peoples constitute a serious threat to global stability"* (African Union 2001:1).

By almost all commonly used indexes of poverty and development, Africa, particularly the Sub-Saharan portion, ranks the lowest in the world. For example, the latest estimates show that income per capita averages US\$ 3,010 in Africa, compared to the global average of \$11,690, and the \$35,800 for the developed regions of the world. Infant mortality per 1,000 live births stands at 68 in Africa, compared to 40 in the world as a whole, and a mere 5 in the more developed regions. Average life expectancy in Africa is 59 years, compared to the global average of 70, and the 78 in the more developed regions. In Africa, over 50 percent of the people do not have access to safe water. No wonder, in a ranking based on the composite human development index, Africa emerges as the least developed major region of the world (Montgomery and Elimelech 2007; World Bank 2012; Population Reference Bureau 2013; Global Policy Forum 2014).

A myriad of environmental, economic, and social forces conditions the poverty and underdevelopment in Africa. They include land degradation, adverse climate, low labour productivity, political instability, and ethnic conflicts (African Union 2001; Ricupero 2003; Economic Commission for Africa). In line with the goals of the New Partnership for Africa's Development (NEPAD) of the African Union (African Union 2001) and with those of the United Nations Millennium Declaration (United Nations 2000; Economic Commission for Africa 2005), a fundamental challenge is to tackle these problems. Education, especially at the higher level, aimed at imparting relevant systematic knowledge and skills to strengthen human for optimal management of the continent's rich natural resources, is widely seen as holding a key to meeting this challenge.

The role of Education

The 1992 United Nations Conference on Environment and Development recognized the central role of education in the development process. Agenda 21 of that conference embodies this recognition in the form of a comprehensive international framework and action programme

collaboration in knowledge sharing and financing, including South-South partnerships within the continent and internal revenue generation which will lead to self-sustained institutions for sustainable development founded on research (United Nations 1992). A further recognition was the United Nations General Assembly declaration of the period 2005-2014 as the United Nations Decade of Education for Sustainable Development (UNDESD). The United Nations Education, Scientific and Cultural Organization (UNESCO), the body charged with implementing the declaration, expresses that:

“Higher education has a vital role to play in shaping the way in which future generations learn to cope with the complexities of sustainable development. Universities and higher education institutions educate highly qualified graduates and responsible citizens able to meet the needs of all sectors of human activity; they provide opportunities for higher learning...; they advance, create and disseminate knowledge through research and provide... relevant expertise to assist societies in cultural, social and economic development...” (UNESCO website, www.unesco.org).

In a similar vein, a World Bank report declares that:

“Higher-level institutions in Sub-Saharan Africa that are equipped to impart quality education and conduct relevant applied research can play a critical role in producing workers with the skills to assimilate technology and make effective decisions that help the industry to diversify into a broader range of products. Good-quality and relevant higher education is also a key to stimulating innovations in new varieties of crops, new materials, or sources of energy that would facilitate progress toward reducing poverty, achieving food security, and improving health (World Bank 2010: xiii).

The experiences of the developed countries, notably Japan, USA and those in Western Europe confirm these positive assertions. There, education, especially science and technology education, has been the principal driver of the stupendous economic growth and development, as it is destined to be in Africa if properly managed (Evenson 2004; Gyasi 2008; Earth Institute 2008; Association of African Universities 2009). In the case of Japan, the sound education systems, especially at the primary level, were laid in early 17th Century through the establishment of Temple schools (widely known as *terakoya*), which were private educational institutions

that taught reading, writing and arithmetic to the children of Japanese commoners. By the time a revised Elementary School Order was promulgated in Japan in 1907, the enrolment rate in primary education has reached nearly 100% (Economic Planning Agency of Japan 2000). Regarding higher education, establishment of the Imperial College of Engineering in 1871 (subsequently merged into the University of Tokyo in 1886) contributed significantly to the field of engineering in Japan (Economic Planning Agency of Japan 2000). Furthermore, University enrolment rate has grown significantly from the 1960s and this has led to advanced industrialization in post-Second World War Japan (Toyoda 1984). Establishment and enforcement of relevant laws and regulations such as Industrial Education Promotion Law in 1951 and Science Education Promotion Law in 1953 also promoted a rapid recovery from devastation of the war and revitalization of Japanese Industry through the provision of guidance to determining and developing educational facilities, experiments and practical learning with support from the Government of Japan (Saitoh 2007). Such experiences underscore the importance of roles of education in accelerating development.

Given the recognition of education as a key factor in the development process, it is no wonder that the number of universities has grown explosively in contemporary times in Africa. From an estimated less than 60 before the year 1960, the total number of universities, analogous higher educational institutions and their affiliated colleges has mushroomed to well over 700 presently. Student enrolment has shown a similar growth (International Association of Universities and Association of African Universities 2010; World Bank 2010; Kavuma 2011; International Colleges & Universities 2013). But, a growing concern about the 'massification' or explosive growth of the number of higher institutions and their student population in Africa, as stated by Mohamedbhai, former Secretary-General of the Association of African Universities (AAU), is that it "has occurred without accompanying increase in financial, physical and human resources which has had a direct impact on the physical infrastructure, the quality of teaching and learning, research, quality of life of the students etc" (Mohamedbhai 2008: vii). Kavuma (2011) has, noted similarly, and cites the 2010 World Bank report referred to above (World Bank 2010) to reinforce his position (See also: UNESCO Forum and Association of African Universities 2007; Gyasi 2008; International Association of Universities and the Association of African Universities 2010; Economic Commission for Africa 2011, 2013).

We agree with the call for substantial improvement in the resource base of the universities. However, at the same time, we recognize that there are additional needs that also require priority attention if the universities are to register greater impact on poverty reduction towards sustainable development. They include, above all, greater applied orientation of the teaching and research programmes of the universities. Mainly our ideas are inspired by a theoretical model of knowledge production formulated by Gibbons (2002).

Theoretical Underpinning of Our Idea of Needs of African Universities

In the Aggrey-Fraser-Guggisberg lecture, *'Beyond the Market: Universities and Society in the 21st century'*, delivered in 1999 by Gibbons on the occasion of the 50th anniversary of the founding of the University of Ghana, Gibbons noted that science, as a system of understanding the universe has, over the centuries, been characterised by major discontinuous shifts in ways of thinking about the structure and functioning of that universe, in what are collectively called 'Scientific Revolutions' (Gibbons 2002). Gibbons draws a distinction between a scientific revolution and a 'research revolution', which involves "a shift of research practices and methods or techniques, rather than a change in how we think about the physical universe" (Gibbons 2002: 1). He posits that we are in the midst of a research revolution, which involves a transition from one form of knowledge production that he labels, Mode 1, to a second one, Mode 2.

Mode 1 refers to the currently institutionalized mode of knowledge production, which has basic or pure research as its central concern. Its hallmark may be said to include the quest for basic knowledge; a set of research practices or system of behavioural and institutional norms, which ensures that results are sound; organisation of knowledge into strict disciplinary structures and its pursuit along those lines, which implies that, "Whether in sciences, the social sciences, or the humanities, specialism has been seen as a secure way to advance knowledge" Gibbons 2002: 6); setting and solving problems in a context governed by the largely academic interest of a particular discipline.

By contrast, the Mode 2 knowledge production is characterised by: knowledge produced in the context of application, i.e., knowledge produced in attempts at problem-solving in an applied manner; transdisciplinarity, which involves joint research work by different

specialists because the nature of problems requires such joint approach; heterogeneity and organizational diversity; enhanced social accountability; more broadly-based quality control (Gibbons 2002). In Gibbons view, growing public concern about the environment, health and other seething problems that confront human kind, underlies the growth of knowledge production in Mode 2, and that increased awareness of the diverse ways in which the advancing science and technology can affect research outcomes in positive synergistic ways, is encouraging interdisciplinary work. To quote Gibbons, *in extenso*:

“Operating in Mode 2 makes all participants more reflexive. This is because the issues which forward the development of Mode 2 research cannot be specified in scientific and technical terms alone. The research towards the solution of these types of problems has to incorporate options for the implementation of solutions, and these are bound to touch the values and preferences of different individuals and groups which have been seen traditionally outside the scientific and technological system. They can now become active agents in the definition and solution of problems as well as in the evaluation of performance” (Gibbons 2000:14).

It appears that Mode 2 is more pragmatic, more socially-oriented and, therefore, more oriented to human development. Moreover, by its very nature, Mode 2 knowledge production compels the direct involvement of academics in a joint effort with other stakeholders to effect social change and development, in tune with the UNESCO’ statement that:

“In considering the roles and functions of higher education institutions in promoting sustainable development, issues to be particularly addressed include: increasing the relevance of teaching and research for the societal processes leading to more sustainable and discouraging unsustainable patterns of life; improving the quality and efficiency of teaching and research; bridging the gap between science and education, and traditional knowledge and education; strengthening interactions with actors outside the university, in particular with local communities and businesses; introducing decentralized and flexible management concepts; offering access to scientific knowledge of good quality; enabling students to obtain the competences needed to work together in multi-disciplinary and multi-cultural teams in participatory processes; bringing the global dimension into individual learning environments” (UNESCO website).

If this is the case, then higher education in Africa has no option than to focus more on applied research if it hopes to register a greater impact upon development in the continent, as implied in the paper, “Academics among farmers: Linking interventions to research” by Brookfield and Gyasi (2009).

Knowledge and Capacity to Apply Knowledge in the Practical Context

As Gibbons (2002) has underscored in his second model referred to above, knowledge becomes powerful when it is produced in the context of application. Various theories and practices have suggested that education which encourages people to think, apply knowledge and practice can enhance capacity and bring out concrete outcomes towards effective poverty reduction and sustainable development. Such theories include Paulo Freire’s critical pedagogy (Freire 1970) as well as Gibbons’. Relevant experiences can be found from a wide range of practices such as the Livelihoods Improvement Programme in Post-War rural Japan, Shire Highlands Sustainable Livelihoods Programme in Malawi, Sustainable Rural Livelihoods Project in Ghana and other successful participatory development processes (JICA 2002; Joint Oxfam Programme in Malawi 2003; Kusakari 2004; UNDP 2009). For the sake of effective application of knowledge, practical capacity is a requisite. Human capital assets or human capacity is often considered as one of the most critical assets, along with natural resources, which can be harnessed for sustainable development in Africa. In order to optimize opportunities to promote sustainable development in Africa, capacity to harness such precious assets is essential. It is considered that higher education can contribute to enhancing such capacity to apply knowledge in the practical context, leading to the goal of sustainable development in Africa.

Relevance to African Context

Each region, country or community has its own unique context; it is quite obvious that the African context is different from the ones in other regions of the world. Thus, university education in Africa ought to be developed in the context of Africa, with a strong and explicit intention that education contributes to improving living conditions as well as reducing poverty, which is multifaceted. Dahms and Stentoft (2008) also argue that African curricula should be developed by Africans in a manner that is responsive to problems in the African society with a problem-based learning perspective so as to deliver solutions useful in the African context.

This requires African Universities to be capable of identifying gaps and to train its people in developing knowledge and skills in multi-dimensional aspects through both theory and practice, so as to increase the mass of the educated population which can apply their knowledge and skills for tackling the complex development issues.

Education Leading to Employment and Entrepreneurship

Today, many of the youths in Africa, who are potential future leaders and catalysts of sustainable development, encounter unemployment challenges (Economic Commission for Africa 2011, 2013). According to Baah-Boateng, 23% of youth between the ages of 15 and 24 and 28.8% of graduates between the ages of 25 to 35 wait for two years or more before they get employed in Ghana (Institute of Social, Statistical and Economic Research 2012). This situation often creates unemployment particularly among the educated youth, while generating employment for the youth is the only way to ensure a reduction of poverty levels in Ghana (ibid). While it is widely believed that the majority of the unemployed are those who have never had an opportunity to access education, it is worrisome to learn that a large number of university graduates in Africa are also unemployed in spite of their educational attainments. The same issue has been observed in other parts of Africa as a critical challenge. It is therefore necessary to seek feasible solutions to this challenge.

Two possible solutions, which are not exhaustive, are to: enhance content of training, by reflecting the needs of the demand side (i.e., the job market) including entrepreneurship; improve methodology, by combining practical and theoretical perspectives for application. Such University education can potentially increase chances of producing employable and entrepreneurial graduates, who are well prepared to solve the challenges in their societies and make a living for themselves either through self-employment or being employed by others. Consequently, attainment of such outcomes can also lead to poverty reduction, greater social stability, and sustainable development.

ESDA: A Solution to Innovative, Practical and Job-Oriented Education for Africa

In respect of innovative, practical and job-oriented pedagogic approaches, it is considered that the UNU's project on Education for Sustainable Development in Africa (ESDA) can serve as one of possible

solutions. Under ESDA, the programme, Sustainable Integrated Rural Development in Africa (SIRDA), is on the threshold of introduction by four West African universities (University of Ghana, University for Development Studies, Kwame Nkrumah University of Science and Technology – all in Ghana, and University of Ibadan in Nigeria) in close collaboration with UNU-INRA in Ghana to address various challenges in rural Africa through higher education at African Universities. Also, external partners of Africa, such as Nagoya University (Japan), University of Agder (Norway), and Karlstad University (Sweden), have contributed to the process of programme development by sharing their experiences and ideas.

SIRDA's basic aim is to enhance knowledge and skills for reducing poverty and improving the human living conditions in rural Africa. It is innovative, demand-driven, practice-oriented, and underpinned by a philosophy of human capacity development through training of trainers of rural development practitioners. Field demonstrations and other practical aspects of this programme take place through hands-on training in selected rural communities. Appropriate theories and models inform them. The uniqueness of the programme lies in its innovative combination of the following into a common strategy of rural development: holistic perspective; integrated multidisciplinary methodology; endogenous approaches; participatory community-based field-oriented work; built-in capacity to generate employment for university graduates and rural youth.

Realizing the heuristic and analytical value of theory, the course components integrate relevant theories. In recognition of the compelling need to address the endemic poverty and underdevelopment in practical ways in rural Africa, the course instructions place emphasis upon training in the application of relevant theories and technological skills for overcoming the causes of the poverty and underdevelopment. Expectedly this emphasis on training in practical skills through the application of appropriate theories of development will eventually achieve the following objectives.

1. Generate positive synergies between the theories and practical experiences in the unending search for optimal ways of achieving sustainable development and, in this way, contribute to the scientific mission of knowledge production for the betterment of humankind; and

2. Enhance the capacity of graduates and the rural communities for self-employment and engagement in the public sector to tackle the many rural environmental, economic and social problems and, thereby, help to reduce the growing joblessness particularly among these social categories. It is believed that challenges in rural Africa can be better addressed once ESDA-SIRDA is fully operated to develop capacities of key stakeholders in the area of sustainable integrated rural development in Africa.

Linkages between Academics and Farmers towards Enhancing Locally Adapted Traditional Knowledge for Managing Natural Resources

Africa harbours some of the richest biotic and abiotic resources in the world. The biotic resources include biodiversity (United Nations Environment Programme, 1994; Secretariat of the Convention on Biological Diversity, 2000). Biodiversity has a crucially important value to humanity as a source of food, fibre, medicine, and constructional materials, whose production forms a fundamental livelihood, especially in rural communities. Furthermore, it performs vital ecological services including carbon sequestration, provision of oxygen, cycling of soil-plant nutrients, and functioning of the hydrological cycle. As such, biodiversity is a crucially important human life-support resource.

The richness of biodiversity in Africa derives from the natural geographical conditions, which favour life-forms, especially in the humid zones. A second major factor lies in the many locally diverse adapted traditional or indigenous systems developed over long periods by the local people for managing the biota within and without agriculturally used areas (United Nations Environment Programme, 1994). They include those that promote forests in forest-savanna landscapes and enhance crop and livestock diversity in the following areas of Africa: Guinea; savannah landscapes in East Africa; Benue plains of central Nigeria; Sierra Leone; Casamance in Senegal, as published in a special issue of the journal, 'West Africa' (Last, 1996). Others include management practices discovered in Ghana under three mainly GEF-funded projects. The first are management practices that favour the conservation of biodiversity on-farm, and which yield various biotic, edaphic and food security advantages (Table 1). The second set involves practices that favour on-farm conservation of farmer varieties or landraces of yam (*Dioscorea*), and rice (*Oryzaglaberrima*), both favoured crops (Gyasi et al, 2005; Grum et al, 2008). The third involved the generally successful application of practices identified as good for

rehabilitating degraded lands. Among them are very nearly all those identified as favouring biodiversity conservation in agricultural landscapes (Table 1; Plates 1, 2, 3). Others would seem to favour climate change adaptation.

A great diversity of crops have been conserved through the diverse traditional agricultural management systems in what is widely called 'agrodiversity' (Brookfield, 2001; Brookfield et al, 2002, 2003; Gyasi et al, 2004). Guyer sees as "one of the great achievements in African agricultural history... the diversification of the cultigens" (Guyer, 1996:71). He continues, "Over several centuries of crop and varietal innovation, both by internal development and by local adaptation of outside elements, the spectrum of crops available for cultivation has been greatly extended: plantain and groundnuts from Asia; maize, cassava, tomatoes, pineapples and West Indian mangoes from New World; commercial crops such as cacao, coffee and commercial tobacco" (Guyer, 1996:71). He further quoted Richards as describing the assimilation of those crops into combinations within production systems as "one of the great glories of African science" (Guyer, 1996: 71, quoting Paul Richard, 1983).

Yet, the agro diversity "which is fundamentally important for the ecological stability and genetic pool of plants and animal needed for security, has come under threat mainly because official policy and modern development planners and practitioners alike largely ignore it. A lack of emphasis on traditional knowledge in education curricula associated with exotic values and the absence of relevant textbooks are contributory factors" (Gyasi et al 2004). To stem the threat, a sensible approach appears to be to further develop as a pedagogic model the collaborative participatory academics-farmer approach success for identifying good management practices for conserving biodiversity and rehabilitating degraded lands (Brookfield and Gyasi 2008).

Thus, without emphasis on linkages between the academia and farmers towards enhancing locally adapted traditional knowledge for managing the natural resources, including biodiversity, Africa risks the further loss of its cultural identity through the erosion of the traditional resource management knowledge, and great potential source of financial wealth from export and tourism.

Table 1: Essentially traditional management practices/regimes and their advantage in PLEC demonstration sites in Ghana

Practice/regime	Major advantage
1. Minimal tillage and controlled use of fire for vegetation clearance	Minimal disturbance of soil and biota
2. Mixed cropping, crop rotation and mixed farming	Maximizes soil nutrient usage; maintain crop biodiversity; spread risk of complete crop loss; enhance a diversity of food types and nutrition; favour soil regeneration
3. Traditional agroforestry: cultivating crops among trees left <i>in situ</i>	Conserves trees; regenerates soil fertility through biomass litter. Some trees add to productive capacity of soil by nitrogen fixation
4. <i>Prokaor Oprowka</i> , a no-burn farming practice that involves mulching by leaving slashed vegetation to decompose <i>in situ</i>	Maintains soil fertility by conserving and stimulating microbes and by humus addition of decomposing vegetation; conserves plant propagates including those in the soil by the avoidance of fire A means of regenerating soil fertility and conserving plants in the wild sustains soil productivity
5. Bush fallow/land rotation	A means of regenerating soil fertility and conserving plants in the wild
6. Usage of household refuse and manure in home gardens and compound farms	Sustains soil productivity
7. Use of <i>nyabatso</i> (<i>Neuboudialaeviois</i>), as live stake for yams, and as an agroforestry species	The basically vertical rooting system of <i>nyabatso</i> favours expansion of yam tubers, while the canopy provides shade and the leaf litter mulch and humus. It also is suspected that <i>nyabatso</i> fixes nitrogen
8. Staggered harvesting of crops	Ensure food availability over the long haul
9. Storage of crops notably yams, <i>in situ</i> , in the soil for future harvesting	Enhances food security and secures seed stock
10. Conservation of forest in the backyard	Conserves forest species; source of medicinal plants at short notice; favours apiculture, snail farming and shade loving crops such as yams

Source: Gyasi *et al.* (2004)



Plate 1: Oprowka/proka



Plate 2: Mixed cropping



Plate 3: Traditional agroforestry



Plate 4: Farmer - scientist collaboration

Plates 1- 4: Practices that favour biodiversity conservation in agricultural landscapes

Linkages between Academia and the Manufacturing Industry

The phenomenal growth of the economy and associated improvements in human living conditions in developed countries is attributable largely to the development of manufacturing industries, which add value and generate employment, services, and incomes in the production chain. This process is facilitated by mutually beneficial linkages between academia and the industries, which are founded especially on science and technology research of an applied kind. It is being replicated with remarkable results in South East Asia, but not in a generally significant manner in Africa (Barry and Sawyerr 2008; See also Gyasi 1992).

Therefore, in Africa, a developmental imperative is to strengthen the impact of applied science and technology through greater collaboration between academic research and the manufacturing sector. A critical area in this respect would seem to be the processing of agricultural produce to minimize the high post-harvest losses in agriculture, the mainstay of African economies. Small-scale processing deserves primary attention because of its potential for reducing poverty and stimulating sustainable development in the marginalized rural sector.

Relevant issues that need to be addressed as priority in a collaborative manner would include what processing industries to focus on, and where to locate them? How to source capital for them? How may Africa integrate into the curricular of its universities lessons from the successful transfer of appropriate technologies from private companies for the development of manufacturing industries in Japan and other developed countries? How might the universities integrate more effectively into their curricular training programmes in industrial processing and produce storage for entrepreneurs both in the rural and urban sectors?

In the case of Japan, "sangakurenkei", literally meaning "Industry-University collaboration", is an example of strategic measures which policymakers in Japan have instituted to encourage universities to contribute more directly to industrial innovation, and, hopefully, economic development (Walsh et al. 2003). Examples of the approaches are the following: joint research; contract research; and provision of scholarships/fellowships and advanced skills training (MEXT 2013). Also, On-the-Job Training (OJT) is another common strategy at various Japanese companies in order to enhance their performance, outputs and contributions as well as synergies, leading to successful economic activities; and universities have also made significant contributions to OJT processes.

External Collaboration in Knowledge Sharing and Financing

In order to accomplish the afore-mentioned directions, some critical resources, especially theoretical, empirical and financial ones, are indispensable. Considering the challenging circumstances which many African universities encounter, collaboration and partnerships could be another strategy which can enrich the quality of higher education in Africa.

Knowledge: Theoretical and Empirical Resources

Knowledge and wisdom can be generated based on intellectual resources, both theoretical and empirical, coming from either internal or external societies. Baud (2002) underscores that, in order to challenge the global 'knowledge divide', knowledge-producing systems in the South need to become more integrally linked to international research networks as full partners in knowledge accumulation and international exchanges. The critical steps include: collection and identification of various ideas; examination of all potential options; and selection of a set of suitable, relevant, and feasible options for society. In order to come up with such options, universities need to have a wide range of intellectual resources. A single university cannot generate all knowledge required for its education; thus promotion of exchanges and cooperation is critical. Baud (2002) also addressed that, through empirical evidence and observations, joint North-South programmatic research builds up more cumulative patterns of capacity enhancement and international networks. Furthermore, partnerships are not necessarily confined to North-South cooperation, but partnerships have been increasingly expanded to various levels. Huijsman *et al.* (2009) address the emergence of South-South research partnerships as one of the changing patterns of collaboration. Knowledge exchange and partnerships among African universities have been increasingly considered as an important means for improving quality of higher education in Africa. UNU (2009) also highlighted inter-university exchange of knowledge and experiences as one of key concepts applied in the ESDA project for supporting efforts to strengthen the Africa-wide intellectual infrastructure to promote education for sustainable development. Local driven initiatives and external contributions need to be carefully balanced and harmonized in such processes.

Financial Resources

It is increasingly recognized that higher education is a valid means for contributing to sustainable development in Africa. Foreign aid cannot continue indefinitely, and all kinds of cooperation should be meant for enhancing capacity so that African countries (and African Universities in this discussion) do not need to depend on external support forever. They rather need to sustain various initiatives and programmes by themselves. However, it is also a reality that most African universities face financial constraints which make them difficult to design, develop and implement educational programmes which are critically needed. Kariuki (2009)

pointed out general challenges in funding higher education in Africa including: other demanding needs in the economy of their countries; decreasing disbursement to higher education per capita because of the increasing enrolment of students in such education; university being too budget-dependent with limited fund-raising (See also World Bank 2010).

With an increasing recognition of the importance of practical, relevant and innovative education in Africa, there are potential partners which could support self-help initiatives, contributing to poverty reduction and sustainable development. Identification, networking and match-making, which has been promoted in ESDA throughout the project period, is a good example for promoting partnerships within the African continent and with various partners in other parts of the world. Concrete procedures to concretize potential partnerships are imperative to move the important agenda forward.

While it is indispensable to mobilize external resources for African universities to initiate and undertake these educational programmes at this stage, those universities could start internal revenue generation by both African Governments and universities gradually and strategically. As for internal revenue generation, establishment of an innovative, practical and job-oriented educational programme itself can become a feasible plan. It can draw more students, from both within and outside of the country, as it can be seen as attractive. Conventionally, African students travel to developed countries, mainly Europe, North America and Japan, to pursue their higher education, and there has been few from the countries in the North to Africa. However, many students in the northern hemisphere have started coming to African universities to study, expose themselves to a variety of cultures in Africa and gain insights into development. Such interactions can also contribute to furthering mutual learning, experience exchanges as well as financial resource mobilization with greater amount of tuition fees coming to African universities, leading to self-sustained institutions in the near future.

Conclusion

Within the framework of Gibbon's notion of knowledge production, this paper has highlighted that in order for the growing number of African universities to register a greater impact on poverty reduction and sustainable development, their academic programmes need a more applied orientation. A way of achieving this orientation, which stands to enhance

the universities' own sustainability through their demonstrated relevance to social welfare in the African continent, is for their academic programmes to place more emphasis on linkages between university researchers/ academics and farmers, particularly for the purpose of enhancing locally adapted traditional knowledge systems for managing the continent's rich biodiverse natural resources, and upon linkages between researchers and manufacturers toward improving the underdeveloped industrial sector through value addition by processing. Other needs are greater external collaboration in knowledge sharing, and more imaginative internal revenue generation towards financially self-sustaining universities. An inspiration for this perspective derives from our own academic work in Africa, and from Gibbons' (Gibbons 2002) pragmatic model of knowledge production.

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