

The Role of University Education towards Self-Reliant Development and SDGs - A Case Study of Africa (Engineering and Science) -

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Abstract

Jomo Kenyatta University of Agriculture and Technology (JKUAT) is one of the public universities in Kenya. It was established in 1981 as a middle level college with the financial and technical support of the Japanese government. Over time the University has grown to be a renowned University in the area of engineering and science in the African continent. JKUAT currently hosts the Pan African University Institute of Basic Science, Technology and Innovation (PAUISTI), one of the five nodes of the Pan Africa University, and was the first to graduate students in the year 2014. JKUAT plays a critical role in higher education with particular focus on the training of scientists and engineers. There are 12 campuses with one in Kigali, Rwanda and one in Arusha, Tanzania. There are also centers where JKUAT courses are offered in Nigeria, South Sudan and Somalia.

Africa is currently faced with a youthful population that presents opportunities and challenges at the same time. For sub-Saharan Africa it is projected that people aged between 15 and 29 will continue to constitute about half of the population of most countries for the next three to five decades. Currently, the estimated median age in sub-Saharan Africa is under 19. With the youthful population, coupled with abundant natural resources that has recently attracted foreign interests Africa stands at a crossroads in its development trajectory. Both education and training, buttressed by technological advancements, are necessary tools for the continent to unlock its potential, and to set free the “African giant”. With 277 Registered Consulting Engineers, 1341 Registered Engineers, 5387 Registered Graduate Engineers and 1145 Graduate Technicians, the human resource capacity remains low for effective exploitation of the resources and transformation of the continent. The other aspect of the development challenge is the gender disparity and under representation of women in the areas of science and engineering. There has been rapid transformation of engineering education in Africa over the last decade geared towards addressing: (i) the large number of young people graduating annually from the secondary school system, hence increased intake; (ii) the limited number of qualified and professionally registered faculty staff to handle the ever-increasing demand for engineering education; (iii) the need to match training of skills with the actual demands of industry and national aspirations; (iv) the need for upgrade of infrastructure and laboratories; (v) high levels of poverty and dilapidated infrastructure thus requiring hands-on graduates who are able to assimilate into the job market seamlessly; (vi) disaster mitigation, (vii) entrenching ICT in engineering education and training, and (viii) gender imbalance in engineering training. With regard to gender imbalance, it is reported that the overall percentage of young women pursuing higher education in Africa in the disciplines of science, technology, engineering and mathematics (STEM) is relatively low, for example only 10% of the engineering workforce is female in South Africa and 8% in Kenya. Taking note of the global impact of women in sustainable development, there is urgent need to address the issue of perception and encourage more women to study engineering since women are well positioned to integrate engineering practice in daily lives and chores of citizens. There is also the challenge of lack of policies to implement gender parity. There is also shortage of engineering technicians.

The Sustainable Development Goal 4 provides a framework for quality education which can contribute to the capacity needs of Africa. Major focus within the SDG 4 include enhancing access and completion rates of education leading to relevant and effective learning outcomes at all levels, increasing the number of youth and adults who have relevant skills, for employment, decent jobs and entrepreneurship, elimination of gender disparities in education and ensure equal access to all levels of education and training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations. They also seek to build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all, expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical,

engineering and scientific programs, in developed countries and other developing countries, Finally, increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States.

JKUAT has maintained close contacts with Japan since inception starting with a generous financial and technical assistance for establishment of the Jomo Kenyatta College of Agriculture and Technology (JKCAT). The support was in terms of infrastructure development such as construction of classrooms and offices, installation of modern equipment; technical cooperation in terms of capacity development of staff, joint research activities, in-country training; and other academic support such as Babaroa awards to excellent students now run by the university and networking with Japanese Universities. Japan is the thematic partner supporting the PAUSTI. It is also supporting both JKUAT and PAUSTI under the AFRICA-*ai*-JAPAN project that seeks to promote innovations for Africa development by harnessing African ideas and resources for development. The project aims at strengthening the knowledge and skills in the fields of agriculture, engineering, science, and biotechnology of both PAUSTI and JKUAT students. It is unique since it promotes the full utilization of local/indigenous knowledge, resources, experiences and wisdom generated and accumulated in Africa to solve Africa's problems. JKUAT is also involved in various initiatives with Japan to address various development challenges in Africa. These include training of scientists for Eritrea and collaboration with E-JUST University in Egypt. Through interaction with Japan, JKUAT embraces Japanese philosophies such as monozukuri, 5-S and kaizen. Monozukuri is the process of making (zukuri) things (mono) with the overtones of skill, spirit, pride, excellence and zest. It emphasizes practical approach and continuous improvement.

The University has placed emphasis on innovations and practical outputs from research for development. Such outputs include: tissue culture banana and aloe, mushrooms, value added and processed products from farm produce including juices, yoghurts; engineering products such as motorized press and improved manual press for block making, tricycle, plant mill, screw briquette machine, electrical discharge machine.

JKUAT deliberately collaborates with industry to facilitate technology transfer. In this regard, JKUAT partnered with NISSIN Limited of Japan on the development of customized noodles for the Kenyan market. Other initiatives to address various challenges include training of women to build their capacity through the in-country training with Japanese support, and assembly of laptops (Taifa laptop).

In conclusion, Sub-Saharan Africa is experiencing unprecedented economic growth and is attracting significant foreign investment especially capital development. However, the foreign investment projects are undertaken by foreign skilled labor due to the acute shortage of domestic skilled labor especially in the areas of engineering and technology. There is therefore dire need for more engineers in Africa. It is herein presented that concerted efforts need to be geared towards engineering and science education, training and practice. Universities in sub-Saharan Africa must markedly improve the standard of education if the region is to move beyond the stage of assembling products and achieve sustainable industrial growth. Engineering/science education and training, buttressed by technological advancements, are necessary tools for the continent to unlock its potential, and to set free the "African giant". JKUAT supported by Japanese partners has various initiatives that can play a critical role in building the required capacity. The uniqueness of Japan's International Education is "monozukuri spirit" including face to face cooperation, 5S-KAIZEN, Lab. Based Education and Capacity Development. With an estimated 2.5 million new engineers and technicians required in sub-Saharan Africa alone, the challenge requires more effort and therefore more African institutions need to take up the challenge and contribute to the transformation of Africa. Strategic decisions are required by African governments and universities to: invest in modern infrastructure and laboratories, update curricula to accommodate industry demands, while at the same time seeking to rationalize the requirements for accreditation of engineering/science programs by the regulating bodies and re-orient teaching styles in engineering/science faculty from the current magisterial or masterly mode to the Lab. Based Learning approach, Closely linked to improving teaching methodology in engineering/science faculty is the need for pedagogical training of engineering lecturers as well as short-term attachment in industry to keep pace with advancements in technology and design. The faculty and study also require extensive use of state-of-the-art ICT in engineering/science education and training. To keep pace with ongoing foreign investments in Africa, university-industry linkages is paramount.