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Developing an Enabling Scientific Equipment Policy in Africa

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Contents

Acronyms	i
Background and Objectives	1
Methodology	1
Research and Policy Landscape in Kenya	2
Policies at Universities	2
University of Nairobi	2
Other Universities	3
Policies at Research Institutes	4
ILRI	5
KEFRI	5
KEMRI	5
KMFRI	6
Policies at Public Laboratories	7
Government Chemist Division	7
Kenya Bureau of Standards	7
Policies at Education Institutions	7
CEMASTEPA	8
School Equipment Production Unit	8
Secondary Schools	8
Effectiveness of Science Equipment Policies of Key Organizations in Relation to Organizational Structures and Systems in Kenya	8

Acronyms

AAS	African Academy of Sciences
AAS	Atomic Absorption Spectroscopy
CEMASTEА	Centre for Mathematics, Science and Technology Education in Africa
IFS	International Foundation for Science
ILRI	International Livestock Research Institute
JICA	Japan International Cooperation Agency
KARI	Kenya Agricultural Research Institute
KEBS	Kenya Bureau of Standards
KEFRI	Kenya Forest Research Institute
KEMRI	Kenya Medical Research Institute
KICD	Kenya Institute of Curriculum Development
KMFRI	Kenya Marine and Fisheries Research Institute
KNAS	Kenya National Academy of Sciences
KRA	Kenya Revenue Authority
MKU	Mount Kenya University
NACOSTI	National Commission for Science, Technology and Innovation
SEPU	School Equipment Production Unit
TOR	Terms of Reference
UoN	University of Nairobi

Background and Objectives

The history of this project can be traced to the “Conference on Getting and Using Equipment for Scientific Research” held in Nairobi in May 2012. A further workshop was held in Kenya at the AAS from November 6-7, 2013, called “Developing an Enabling Scientific Equipment Policy in Africa.” At this workshop the Country Study groups for Ethiopia, Ghana and Kenya were identified. The Kenya group members were:

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2. L Kerubo Omosa, Dept of Chemistry, UoN
3. James I Kanya, School of Biological Sciences, UoN
4. Luna Kamau, Kenya Medical Research Institute (KEMRI)
5. Ursulla Okoth, Kikuyu Campus, UoN
6. Noel Abuodha, Kenya National Academy of Sciences
7. Perpetua Wanaswa, SEPU
8. Daniel Nyaamba, Dept of Physics, UoN
9. Justus Inyega, Kenya Science Campus, UoN
10. Ibrahim Khatete, Kikuyu Campus, UoN

The objectives for the Kenya Country Study were to:

- Review the effectiveness of science equipment policies of key organizations in relation to organizational structures and systems in Kenya
- Map the national and regional and research and policy landscape in Kenya

Methodology

To carry out the study, the following organizations and institutions were identified by the study team to be surveyed through open-ended interviews, with each team member then summarising the results presented in this report.

1. Universities: University of Nairobi (UoN), Egerton University, Mount Kenya University (MKU), Kenya Methodist University, and Strathmore University, representing two public and three private universities.
2. Research institutes: International Livestock Research Institute (ILRI), Kenya Forest Research Institute (KEFRI), Kenya Medical Research Institute (KEMRI), and Kenya Marine and Fisheries Research Institute (KMFRI).
3. Public laboratories: Government Chemist and Kenya Bureau of Standards (KEBS).
4. Education institutions: CEMASTEPA, School Equipment Production Unit (SEPU), Lenana School, Makini School, Precious Blood High School, and Sunshine School.
5. Government institutions: Ministry of Finance, Kenyatta National Hospital Laboratory, Kenya National Academy of Sciences (KNAS), and the National Commission for Science Technology and innovation (NACOSTI).

Research and Policy Landscape in Kenya

Policies at Universities

The higher education institutions visited were the University of Nairobi, Egerton University, Mount Kenya University, Kenya Methodist University and Strathmore College.

All the universities claimed to have research policies but only the ones for UoN, Egerton and MKU could be seen. (Scientific equipment policy documents for Kenya Methodist University and Strathmore College were not found.)

University of Nairobi

The University of Nairobi policy covers the following areas.

In the section on the national context, the necessity of the policy is assessed in the context of the Kenyan Constitution and Vision 2030. It states in the preamble what the policy shall do: espouse the virtues of truth, integrity, honesty, tolerance, professionalism, teamwork and meritocracy. It will uphold the ethics and etiquette of teaching, learning and research; promote and defend freedom of thought and academic enquiry as well as freedom of association; ensure openness and transparency in all its dealings and operations; nurture responsible corporate citizenship and strong social responsibility; respect the belief and values of others; respect and protect the environment; and have the courage to initiate and adapt to change.

The UoN policy says that a university research policy should have the purpose to help the institution to fully contribute to development of the nation of Kenya and the world by providing a framework to facilitate research policy development and review, plan and implement research activities within a university. It should make sure that all research has a clear purpose and underpins all educational activities and therefore helps in development of sufficient numbers of highly skilled individuals at a university for national development.

The scope of the policy is for a university to facilitate, host and conduct research in areas where latest developments promise to offer new knowledge or address problems constraining development initiatives in Kenya, Africa and the world. It should be in place to help build capacity and to facilitate sharing of information through conferences, workshop, seminars, and other modes of international exposure, including broad areas such as cultural, social, health, agriculture, industry, environment, education and legal issues.

Thus the research policy covers guiding principles of key policy areas such as creating an enabling environment; research governance structure; academic policies such as academic freedom and research; objectivity of research; research approval process; ethical practice; sponsored research services; consultancy; undergraduate and post-

graduate research; research supervision and research risk compliance; environmental health and safety; Dean's Committee Research Development Fund; protecting human research subjects and experimental animals; research quality and research assessment; intellectual property rights; incubation, fabrication and mentoring laboratories; science park; plagiarism; and utilization of research results.

The last part of the policy discusses how the institution strategizes to enhance research capacity, inventions, and information and communication technologies infrastructure. In order to realize the goals of the research policy, the university has identified a number of areas which are key to enhancing the research capacity: university research fund, human resource and capacity building, research systems and value addition, linkages with industry, research management structure, communication, sensitization of the research process, and commercialization of innovations.

It is worth noting that UoN has been well served by its research policy since in the latest webometric rating it has been ranked 9th in Africa after seven universities in South Africa and one in Egypt. This rating measures web presence and research productivity as the major contributor to this presence. Globally, the University is ranked 1,100 out of 22,000 universities worldwide. Against this background, there is still room for Kenyan universities to improve in order to attain world class distinction.

There is no stand-alone policy on scientific equipment at the UoN.

Other Universities

Policies of the other four universities visited cover the same areas albeit with different styles and formats. So basically research policies in our institutions of higher learning are focused to generate knowledge for wealth creation and knowledge for the sake for our country and the world.

Egerton University

Egerton University usually has little formal institutional involvement in equipment acquisition which is done at department level and purchased mostly by different grants within the institution. The instruments within the university were repaired from time to time on an as-needed basis by sourcing from outside using the public procurement procedures (three quotations from pre-qualified companies are sourced and the lowest bidder is given the job). It was noted that the personnel (technologists) manning the equipment have national diploma and certificate training. The technologists are also normally trained by the supplier on how to maintain the equipment. It was noted that the Atomic Absorption Spectroscopy (AAS) machine is extensively used in the Department of Chemistry because it also serves the Department of Food Science and Technology, Department of the Environment and other institutions such as Laikipia University and Kenya Agricultural Research Institute (KARI). It was observed that external institutions pay minimal charges towards maintenance of the AAS. However, the repair of a broken instrument takes a long time because of the extended procurement process.

Acquisition, maintenance, calibration and disposal of equipment are all done according to the Public Procurement and Maintenance Act, which sometimes takes as long as three months. Egerton University has a disposal committee which follows these procedures in disposing of obsolete equipment.

Mount Kenya University

Mount Kenya University has an addition in the preamble where the policy also states the research priority areas and groups them according to their thematic areas: Health, Water and Sanitation; Building and Planning; Infrastructure; Agriculture and Food; Environmental Science; Biotechnology; Mathematics; Information and Communication Technology (ICT) Research; and Socio-economic Research. The policy document concentrates on management issues of research rather than the philosophy of research.

None of the institutions sampled provided their equipment policy to accompany the research policy except for Mount Kenya University. However, they might have them since they have regulations on equipment for research.

The MKU equipment policy provides a framework for the acquisition, deployment, maintenance, audit, loan, hire renewal and disposal of items of equipment that are on the University's equipment register. It starts by stating that equipment purchased using university funds should be for university use and should be regarded as a general university resource and should not be personalized by a researcher. The policy then talks about acquisition of equipment on permission of the Deputy Vice Chancellor for Finance, Administration and Planning. It also gives an idea on what to do with donated equipment (which is that capital equipment will be properly valued and a University gift receipt issued to the donor), safety of equipment, security, audit and record keeping. The policy also has a brief mention of maintenance, disposal (to be done by the stores department) and how equipment can be hired or loaned out.

Policies at Research Institutes

The research institutes visited were International Livestock Research Institute (ILRI), Kenya Forest Research Institute (KEFRI), Kenya Medical Research Institute (KEMRI), and Kenya Marine Fisheries Research Institute (KMFRI).

Kenya has several research institutes with different mandates which conduct research according to those mandates. It is interesting that only one of them, KMFRI, has a research policy.

ILRI

During an interview at ILRI, no response was recorded on whether they have a research policy or equipment policy. Currently, ILRI is researching on animal health and crop improvement areas. As far as importing equipment is concerned, ILRI is a duty exempt institution as per the hosting agreement with the Kenya Government. The equipment at ILRI is shared freely by other researchers on request. The equipment is maintained regularly and calibrated by external bodies annually.

KEFRI

KEFRI's mandate is to carry out research in forestry, allied resources and the environment under thematic areas: Forest Products Development, Forest Productivity and Improvement, Biodiversity and Natural Resource Management, Socio-economic Policy and Governance, and Technical Support Services. KEFRI has modern laboratory facilities equipped with state-of-the-art scientific equipment (e.g., gene sequencer, high precision microscopes, GC and HPLC) through collaboration with the Japanese Government represented by JICA at KEFRI. KEFRI reports that they do not have problems in obtaining duty exemptions from the Ministry of Finance for their scientific equipment. The institute has highly qualified officers who deal with acquisition, installation and maintenance of the scientific equipment.

Internally, KEFRI has rules and guidelines that govern how the scientific equipment is used for the benefit of Kenyans within KEFRI's six regional centers including the headquarters. Recently, KEFRI drafted a calibration and maintenance protocol for scientific equipment at its institutes. Externally, KEFRI operates under Memoranda of Agreement with various organizations that may want to use or lease the scientific equipment for a period of time. KEFRI has linkages with institutions of higher learning in which students are attached to the institute to carry out research studies using KEFRI research facilities with prior authorization from KEFRI.

KEMRI

KEMRI has the mandate to carry out health research in the country. Current research priorities are biotechnology; traditional medicine and drug development; infectious and parasitic diseases; public health and health systems; non-communicable diseases; sexual, reproductive, adolescent and child health. Although KEMRI does not have a research or equipment policy, it has *Guidelines on the Conduct of Research*, which state:

- Who should conduct research
- Guidelines for writing proposals
- Procedures for submission of proposal for institutional review
- Intellectual property issues

Equipment sharing at KEMRI is not ideal since equipment is acquired per project but this is changing since thematic areas are being identified for the new institutional equipment sharing policy. Equipment maintenance is charged to project principal investigators. Acquisition of equipment is done on payment of duty even though the institution may apply for exemption through the Principal Secretary, Ministry of Health, who makes an application to the Cabinet Secretary, Ministry of Finance, in a convoluted system which is frustrating and leads to heavy accumulation of demurrages. Again exemption from demurrage payment can also be sought but there is no guarantee that it may be granted. Sometimes equipment from donors accompanied by a gift certificate may be exempted from duty. So there is really no proper policy in place to help in clearing goods for the Institute.

KMFRI

In the words of the Deputy Director of the Institute, Dr Ruwa, a research policy creates harmony in their activities. The policy guides research formulation, conduct, collaboration, publication and patenting. It has driven KMFRI to conduct surveys that have yielded useful environmental information. They also have made innovations in natural products and have two patents being processed by KIPI. KMFRI's work is concentrated in two major centers, Mombasa and Kisumu, but they have branches in several other centers near major water bodies such as Sanguro, Sagana and Kegati.

KMFRI has advanced equipment in Mombasa and Kisumu even though there was no scientific equipment policy. There are two types of equipment acquired by KMFRI: those for partner studies, i.e., from EU and World Bank projects, and those for small projects. For major projects, duty waiver is sought from the Government through NACOSTI and is usually granted. There is usually no problem with clearing such equipment. However, KMFRI has problems with small project equipment for which duty must be paid or a letter written accepting that the equipment will be returned to the collaborators or donors after the end of the project.

KMFRI's equipment is well maintained through strict adherence to procedures certified in accordance with ISO 9001/2005. There is a schedule of maintenance inspection, which is registered in equipment logbooks. Calibrations are externally sourced once a year from the Kenya Bureau of Standards (KEBS). Disposal of old equipment appeared to be a challenge as there was no evidence of exact procedures to be followed. At the moment of data collection, KMFRI had obsolete AAS and GC machines.

KMFRI has highly qualified staff with 58 project leaders having PhDs and MSCs. The activities at KMFRI have been highly enhanced since the arrival of two research vessels, especially R V Mtafiti, which has enabled deep sea fishing, including for tuna.

Policies at Public Laboratories

Agencies selected for visitation include the Government Chemist Division and Kenya Bureau of Standards.

Government Chemist Division

The Government Chemist Division provides laboratory services in the fields of public and environmental health and in administration of justice. The Division has an analytical wing and a forensic wing. The analytical wing has three sections: food and drug; clinical toxicology; and water and environment. The forensic wing has the forensic DNA/serology section; criminalistics section; forensic toxicology section; and bhangji section.

The Government Chemist Division has had a challenge in acquiring equipment due to underfunding from the exchequer. However, the situation improved a little during the 2013/2014 financial year. In addition, the Government Chemist Division has an operation norm that ensures management of equipment in the two wings. Instrument acquisition is done through open tendering and the lowest evaluated bidder who meets all the listed specifications is awarded the tender to supply the equipment. A challenge in receiving donated equipment exists because the duration for getting duty waiver from the Ministry of Finance is long and tedious. It was also observed that old equipment is left to rot in stores or sections of the Government Chemist Division building.

Kenya Bureau of Standards

The Kenya Bureau of Standards (KEBS) claimed that they have a research policy document even though this was not availed. The KEBS also answered in the positive to the question on equipment policy, which was not provided. The KEBS follows the Government of Kenya's procurement procedures in acquiring equipment. The KEBS has an open tender system in sourcing equipment and contracts agents to clear equipment at the port of entry.

Policies at Education Institutions

The following educational institutions were visited: CEMASTEА, School Equipment Program Unit (SEPU) and four secondary schools (Sunshine, Makini, Lenana, and Precious Blood)

CEMASTEА

CEMASTEА is a center for in-service training of mathematics and science educators and administrators with emphasis on small-scale school experiments. CEMASTEА's scientific equipment is available to science educators in Kenya and 34 other African countries. The laboratories are built and equipped by JICA. The institution applies in

time, through the Ministry of Education, Science and Technology, for duty exemption and other privileges on educational and scientific research equipment to avoid any delays in clearance of goods through the port of entry. It does not have a written policy on equipment as yet but it adheres to laid down directives of the Kenya government, that is, the Public Procurement and Disposal Act of 2005.

School Equipment Production Unit

The School Equipment Production Unit (SEPU) has the mandate to design, fabricate, manufacture and distribute science materials and apparatus to schools. SEPU applies the Public Procurement and Disposal Act of 2005 to manage equipment. It acquires duty-exempt equipment from overseas by applying to the Kenya Revenue Authority (KRA) through the Ministry of Education, Science and Technology. SEPU's equipment is regularly calibrated by the Kenya Bureau of Standards. However, SEPU does not have regulations on training of personnel on equipment use and acquisition. For example, it was observed that SEPU has machines that were donated by JICA but have never been commissioned for several years since their arrival.

Secondary Schools

The four sampled secondary schools (Lenana, Makini, Precious Blood, and Sunshine) are all relatively well-resourced private institutions located in Nairobi. The study found that all the schools appeared not to have school science equipment policies or regulations. In addition, the schools have rules and safety precautions to be observed by students when conducting scientific experiments in the school laboratories. Most of the school science equipment is sourced from the local market using tuition fees.

Effectiveness of Science Equipment Policies of Key Organizations in Relation to Organizational Structures and Systems in Kenya

The policy landscape for research and equipment is almost as varied as the type of institution surveyed. Most of the institutions surveyed have no written policies even though it is clear that their availability would be quite useful to the operations of the institutions. It looks like such realization is there but there is also procrastination which is hampering their development. Some institutions actually had policies and when others were questioned about them, they said that they are on the way to producing them. Some institutions have strong research policies but there are no accompanying equipment policies, with the exception of Mount Kenya University.

It is our opinion that good scientific research can only be driven by good management of equipment in terms of acquisition, maintenance and disposal. It is clear that the equipment policies and regulations that are there are at best weak and need to be strengthened. Whereas a few of the institutions have reasonable research success stories, their productivity can be enhanced with well-thought-out equipment policies.