SCIENCE GRANTING COUNCILS INITIATIVE IN SUB-SAHARAN AFRICA

STRENGTHENING PARTNERSHIPS AMONG AFRICA'S SCIENCE GRANTING COUNCILS AND THE PRIVATE SECTOR

A BASELINE ASSESSMENT OF PUBLIC – PRIVATE PARTNERSHIPS IN RESEARCH AND SCIENTIFIC COOPERATION IN TANZANIA

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1. Executive summary

The Commission for Science and Technology (COSTECH) is Tanzania's principal Science Granting Council and participant in the SGCI. It is the principal advisory organ of the government on matters relating to science, technology and innovation (STI). It also monitors and coordinates scientific research, technology development and transfer; distributes state funding for STI research; acquires, stores and disseminates scientific and technological information and fosters regional and international cooperation. It was established in 1986 (succeeding the National Scientific Research Council) with HQs in Dar es Salaam and a branch in Zanzibar.

COSTECH has a documented record of PPP collaborations, involving academia, R&D institutions and the private sector (as well private sector representative associations). Yet the potential for improved collaborations is apparent and the desire is expressed. Within sub-Saharan Africa, it has a significant record of collaboration with NRF, South Africa. Initiatives of co-learning have begun with Mozambique as well. Recently, the SGCs of the East Africa Community took steps to strengthen their collaborations on STI support in the region.

Tanzania's second national science and technology policy was issued in April 1996. To date, it is the policy in operation. However, the new, third policy is almost finalized and will be operational soon. The new one looks at STI instead of only science and technology (S&T). When it comes into operation, some changes are expected (relatively for the better).

Overall, COSTECH has a wealth of experience in promoting STI and industrial innovation that it is willing and able to build upon. Challenges of limited resources and constraints of institutional capacity and policy-legal frameworks are generally defined and expressed.

A small sample of COSTECH partners, from academia and the private sector (University of Dar es Salaam and Confederation of Tanzania Industries), were consulted for this baseline study. They highlighted their collaborations with the SGC, the strides made, challenges faced, and opportunities to explore. Generally, COSTECH is expected to facilitate PPP collaborations through research grants, facilitation of collaboration efforts, and influencing relevant policy. In Tanzania the communication channels between research and industry are still pre-mature and require SGC custodianship. Additionally, there is a collective task at hand of making the potential for mutual benefit and impact of research-industry collaboration abundantly clear. Some of its current local partners are willing to take on this task with COSTECH.

2. Introduction and objectives of the study

The Science Granting Councils Initiative (SGCI) is a 5-year initiative that seeks to strengthen the capacities of science granting councils (SGC) in sub-Saharan Africa (SSA) in order to support research and evidence-based policies that will contribute to economic and social development. The objectives of the SGCI are to strengthen the ability of Science Granting Councils to:

1. Manage research;
2. Design and monitor research programmes based on the use of robust science, technology and innovation (STI) indicators;
3. Support knowledge exchange with the private sector; and
4. Establish partnerships between Science Granting Councils and other science system actors.

The major aim of this baseline report is to evaluate the state of research collaborations (Public-Private partnerships, PPPs) amongst the Science Granting Council (SGC), researchers, the private sector and other SGCs and international collaborations of the Tanzanian SGC with other SGCs.

The specific objectives of the study were to:

i. Articulate the factors that constrain or promote PPPs, Scientific collaboration and Knowledge Transfer.
ii. Gather information on the SGC's capacity needs and skills gaps for collaboration with other organizations, especially the SGC; and supporting research - productive sectors linkages.
iii. Review the legal and policy frameworks and environment under which SGCs operate (Institutional and National) in so far as support to PPP and CP is concerned.

In the context of this baseline study PPP refers to a publicly-funded research collaboration among research and higher education organizations, such as universities, public funding agencies, such as Science Granting Councils (SGCs) and industry or private sector actors within a particular national context. International collaboration of an SGC refers to a formal research partnership agreement that an SGC under study has established or started negotiations with other SGCs or international actors at the time of this baseline study.

3. Methodology

A baseline survey was conducted in Tanzania from October 31, 2017 to November 3, 2017 to evaluate the state of collaborations amongst the Science Granting Council (SGC), researchers, the private sector and other SGCs. The survey team worked with the SGC of Tanzania, COSTECH, to conduct interviews. The team interviewed 3 key personnel from COSTECH as well as personnel from the University of Dar es Salaam (UDSM) and the Confederation of Tanzania Industries (CTI) (Annex 1). A review of secondary information is also carried out.

4. State of collaborations in Tanzania facilitated by COSTECH

The Tanzania Commission for Science and Technology (COSTECH) began operations in 1986 and since then, it has been the principal advisory organ of the government on all matters relating to science, technology and innovation (STI). It was established by Act of Parliament No. 7 in 1968 as a successor to the National Scientific Research Council (UTAFITI). COSTECH is entrusted with the advisory role of formulating policy on science and technology and its implementation; it monitors and coordinates scientific research, technology development and transfer; acquires, stores and disseminates scientific and technological information and fosters regional and international cooperation (COSTECH 2015a).

Table 1: Brief description of COSTECH

Organization	Brief Description	Established since…	Size	Notes
COSTECH – Commission for Science and Technology	Mandate: Principal advisory organ of the government on the use of Science and technology for National development. Promotes and coordinates research for STI improvement as well as popularizes STI in society. Represents the state in bilateral and multilateral national STI programs. Reports to Ministry of Education, Science and Technology.	1986	Nationwide; HQ in Dar es Salaam plus one branch in Zanzibar. 22 technical staff total (10 PhDs, 23 master's) (as of mid 2016).	Successor of the National Scientific Research Council (NSRC) that was established in 1972. Also the national distributor of the state funding for STI research (Science Granting Council).

COSTECH offers a number of activities and services to its clients which include (Diyamett and Risha 2015):

a. **Technology offering and services**: Intellectual Property Advisory Services, Financial Support for technology development, testing and scaling up. There is no specific marketing and engagement strategy, but institutions can approach the organization.
b. **Production and extension services** Advisory services. The marketing strategy involves: call for proposal, formal request from the research and technology development institution.
c. **Training programmes and services**: COSTECH only facilitates the process by providing funding and, in some cases, delivers training to beneficiaries of their projects in terms of funding. Innovative cluster business plan development; Evidence base policy making, research report writing skills, monitoring and evaluation.
d. **Market development services**: Exhibition organization and sponsorship to start ups. Pre-commercialization. The marketing strategy includes competitive calls for pre-commercialization. Startup sponsorship is for incubation program under COSTECH.
e. Financial services: Seed funding to innovative clusters under the SIDA funded program. Training of beneficiary clusters under SIDA funded program.

In terms of collaborations, the table below highlights major ones between COSTECH and the private sector, as well as between COSTECH and other SGCs:

Table 2: Some highlights on COSTECH Collaborations

With the private sector	With SGCs
COSTECH and Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA)	COSTECH and the Council of Scientific and Industrial Research (CSIR), India
COSTECH and Monsanto and KARI and CIMMYT	COSTECH's NFAST (National Fund for the Advancement

	of Science and Technology) and NRF (National Research Foundation) TIA (Technology Innovation Agency) of South Africa (The one with NRF and TIA: The project started with NRF and now, at the scale-up period, COSTECH is moving to work with TIA. It's about joint support for research (funding for calls for proposals), and for scaling up we will select 4 projects from the group and also co-support them.)
COSTECH and SELCOM and Higher Learning Institutions	
COSTECH and Microsoft and SELCOM Broadband Limited	
COSTECH and The Information Society and ICT Sector Development Project in Tanzania (TANZICT)	
Palladium International Limited (HDIF) and COSTECH	

Another program is planning to support innovation intermediaries (incubators). This program is supported by Finland (Southern African Innovation Support Program) and COSTECH is the Tanzania focal point (there are a few other African countries). Also, DTBi (Dar Teknohama Business Incubator - ICT business incubator) is a company limited by guarantee, with COSTECH being the guarantor. COSTECH are now trying to roll out the same approach with local governments (district level). Currently there are 6 teams (incubatees) supported by DTBI and COSTECH in Mwanza. COSTECH are now relegating local governments there to help these incubatees with mentoring and networks.

The NEEC (National Economic Empowerment Commission) now has coordinators in local governments, and COSTECH is currently in the process of making these same coordinators work them to help incubatees.

The University of Dar es Salaam (UDSM) works closely with COSTECH. Researchers from the university apply to calls from COSTECH. There was also the Technology Development and Transfer Centre, UDSM which collaborates with multiple agencies such as SIDO (Small Industries' Development Organization), TIRDO (Tanzania Industrial Research and Development Organization), CAMARTEC (Centre for Agricultural Mechanization and Rural Technology), INTERMEC (engineering firm), TTDC, NHPRI. All coordinated by COSTECH.

4.1 State of PPP collaborations

Public-Private Partnerships that COSTECH is likely to engage revolve around research interests between industries and research institutes. COSTECH collaborates with other institutions in research and innovation activities, prototype developments, and training. Some of these collaborations are institutionalized through MOUs.

According to Diyamett & Risha (2015), COSTECH partners are mostly local, small startup enterprises of industrial orientation that produce for the local market. "The most popular needs reported by the organizations are production/processing equipment's, land and tax incentives. Some of such cases are:

- Bio-Innovate Programme where researchers were able to install waste management plant to Banana Wine Investment Company in which the company invested 170,000USD for research and development
- Innovation Systems and Cluster Development Programme: supported by SIDA (Swedish International Development Cooperation Agency) within the Pan-African Competitiveness Forum (PACF). This particular case has more relevant details in Annex 2. (COSTECH 2015c)

COSTECH also partners with other international organizations, such as WIPO (World Intellectual Property Organization) to secure funding for research projects and to access databases etc. Partners of COSTECH from outside Tanzania receive relative diplomatic leverage to work within Tanzania with a national partner. For local partners (such as DTBI) they benefit differently: support in negotiation to enter the market, networks, etc.

The Confederation of Tanzania Industries (CTI) has been collaborating well with COSTECH and other relevant public institutions. Since the current Tanzanian government is focused on industrialization, CTI finds more access to engage with COSTECH, VETA (Vocational Education and Training Authority), TCCIA (The Tanzania Chamber of Commerce, Industry and Agriculture), TPSF (Tanzania Private Sector Foundation), etc. Such collaborations mainly involve seminars, workshops on relevant matters. These connections help in generating new ideas and knowledge. For example, when a member of CTI was invited to the governing board of COSTECH, he says he now sees how the two can work together on multiple issues.

COSTECH keeps in its board one member from CTI, TPSF or TCCIA (rotating every 3 years).

(Additionally, UDSM has been sending CTI engineering students for internships/attachments. UDSM gives CRI indication of what kind of industry they want the student to work in, and CTI finds placements for the students. According to CTI, it often happens that the students are later employed by the same industries. A similar arrangement existed between CTI and Dar es Salaam Institute of Technology.)

(Additionally, UDSM had a collaboration case with Acacia, the mining company. Acacia identifies problems that they want students from UDSM to work on. When the students go there they are guided. So, they get both the academic and the hands-on parts of learning. When the problem is bigger they go for research. For example, one problem becomes a graduate research problem. They also hold seminars here at UDSM.)

4.2 State of collaboration with other SGCs

Besides the list mentioned above (some details were not provided), there was a SADEC framework for the protection of indigenous knowledge, which included a form of collaboration between the SADEC countries' SGCs. Through the current initiative (SGCi) further steps on that direction are being taken. According to interviewees from COSTECH, recently an SGC from Mozambique visited them for co-learning purposes.

COSTECH personnel noted that SGCis are so diverse in terms of how they are situated within their national structures (i.e. which ministries they belong to and what size they have), as well as how they run their operations, etc. When they meet to collaborate, they have to accommodate such differences.

Personnel from COSTECH also informed us that, on November 2017, a meeting of East African SGCs took place in Kigali to work together on relevant issues.

5. Factors constraining and enabling collaboration and knowledge transfer between SGCs

Tanzania's second national science and technology policy was issued on April 1996 (United Republic of Tanzania 1996). To date, it is the policy in operation. However, the new, third policy is almost finalized and will be operational soon. The new one looks at STI instead of only science and technology (S&T). When it comes into operation, some changes are expected, (relatively for the better). Additionally,

> "achievements and the scope is limited by availability of resources… for COSTECH to further the impact of its operations. The Swedish Government has supported COSTECH since 2009 to strengthen its organizational capacity and capability to coordinate the promotion, generation, management, and commercialization of research and innovation. The basis of the support has been to address prevalent changes in the national research landscape and international research climate, and that identified the unexploited role of COSTECH in the landscape due to lack of capacity." (COSTECH 2015b, vii)

Sometimes COSTECH takes initiative to set things in motion despite constraints. For example, as a research coordinator COSTECH is not expected to house an innovation incubator, but they did it (DTBi), as said by one key personnel, "to prove something and set things in motion."

Other factors, mentioned by COSTECH key personnel:

- Lack of clear linkage between R&D and industries. Previously COSTECH included people from industries in its board of directors. According to COSTECH they assumed that this will help establish linkages, but so far it has not worked as expected. A frustration COSTECH has is the from observing that Tanzanian industries "just prefer to stick to the technologies they know, and when they want to upgrade they continue to rely on foreign technologies as they trust them more."
- Local governments don't have clear mechanisms, or supporting structures and policies, to help them understand the importance of technology adoption and renewal. They prefer the "business as usual" mode of operation. COSTECH says that they are trying to get local governments to move away from that stance.

5.1 SGC related policy frameworks

Depending on the available data to the author, it seems that there are no particular policy frameworks within which COSTECH operates regarding matters of PPPs as industry-research linkages.

5.2 SGC capacities and capabilities

COSTECH senior staff provided us with the following numbers.

Staff within COSTECH who work within the SGC on:

- Managing collaborations with the SGCs: 2
- Managing collaborations between researchers and the private sector: 3 staff within COSTECH who have the indicated capacities:
- Private sectors skills: none
- Technology transfer: 5
- Partnership management: 5
- Team building: 0
- Research Management: 3

5.3 External policy and legal frameworks

As for policies, the custodians of policies are the ministries. STI is cross-cutting however, so individual ministries are not capable of handling it themselves. Policies that clearly address collaboration with other SGCs are not yet well stipulated in Tanzania, but the most relevant policies are those related to STI. The current national policy on science and technology has been described as "very protective and highly regulated." The new, upcoming one is expected to be more dynamic, about STI broadly and will change the whole national ecosystem of STI (not just COSTECH).

According to key personnel, new policies are being prepared to make COSTECH more attached to either the prime minister's office or president's office, rather than one ministry.

In terms of acts of parliament – i.e. the legal framework – there is only have the act that established COSTECH, which is more functional and structural rather than about Science and Technology itself. Recently, an extensive research took place and covered all R&D institutions in Tanzania (funded by UNESCO), and it will be reflected in the upcoming national policy. So generally, there is still a weak legal framework, but work is undertaken to change that soon.

6. Factors constraining and enabling collaboration and knowledge transfer with the private sector

One significant enabling factor is the overt shift of government to give more attention and care to the private sector (URT 2015; URT 2016).

A big challenge, on the other hand, as expressed by COSTECH personnel, is to link researchers with good ideas to the private sector to pick up those ideas. Intellectual property rights should be protected to make this collaboration smooth, and COSTECH is now working to technology transfer offices within R&D institutions to register and commercialize patents (IPs). No apparent success yet but there is a need to take this idea further. Currently the policy environment is not effective in helping in this process. Integration between researchers and the private sector is not smooth. Furthermore, there is miscommunication about the impact of research on industry: many researchers tend to view the impact in scientific terms while others see the social and economic impact as paramount.

COSTECH's ability to transfer knowledge to the private sector is hindered by many external factors. For example, NFAST was mainly started to support research, but now it is receiving resources to also support innovation to turn good ideas into material impact. There are indications that COSTECH are now moving on that direction (e.g. recent initiatives and collaborations, such as the clusters initiative). At least now people understand that there is a need for commercialization of ideas, COSTECH personnel emphasize.

Another critique by COSTECH for the private sector is that it does not realize that it can become competitive in the market through STI research. Most local private industries are young and inexperienced. As for bigger private sector entities they have their own in-house R&D so they do not see value in engaging with COSTECH in research collaboration. Generally, there are challenges for private industries with internal resource allocation for STI research.

(For example, COSTECH supported a research in Arusha about a new type of water filter that uses cow bone. It has been difficult for the enterprise to operate the business when there are various partners with different roles involved. Additionally, the government requires all the money spent to return to it within a timeline. The technology seems promising – includes bone char, plastic column and others – but many constraints are faced on the road to fruition).

CTI and VETA have recently launched a 'dual apprenticeship program'. It has to do with vocational work training. There will be an agreement between VETA and industries whereby VETA students will be working in industries and studying at VETA back and forth (e.g. 3 months in industry, 3 months with VETA, back and forth). The pilot project was completed (3 patches of students, avg. 70 students in each patch, in 3 centres: one in Kilimanjaro and two Dar es Salaam). Currently the program's curriculum is being developed. According to CTI, this program will start with the construction industry (for the pilot project they used the electrical, hospitality and automotive industries).

The UDSM innovation and entrepreneurship unit relays that private industries complain that they do not have time to train students (which is not a revenue-generating activity). Some even reached the point where they said they do not want to take any students (from UDSM, for training). UDSM cannot do anything further in such situations. Financing is also a major constraint. For instance, student internships are not easy, as students have to be supervised and follow-ups have to take place. If UDSM has no resources to do that it cannot send its students to various parts of the country, for training, where they can learn more and contribute more. Another issue raised by UDSM's unit is that, when it comes to collaborative research with industry, most of the time it is a one-way relationship. It means that the UDSM researcher has to think of a problem and convince a relevant industry of its significance. Tanzanian industries do not seem to take initiative to find solutions to their industrial problems.

6.1 SGC related policy frameworks

Academia and private sector industries both expect that national research agenda are prepared by COSTECH. Such agenda have to express the priority areas of the country. While the national development plans (usually 5-year bound) set the national priorities in general, COSTECH sets the research priorities that go along with them.

6.2 SGC capacities and capabilities

(See 'SGC capacities and capabilities' of previous section)

6.3 External policy and legal frameworks

Relevant policies and frameworks are not yet clear. Some policies have changed at the institutional level, but COSTECH is an advisory entity more than dictating national policy, so they hope to have impact but not directly.

Intellectual property regulations are not yet clear as well.

Collaborative research between researchers and private sector is currently not common. COSTECH claims that they are trying to make the private sector understand the importance of research. (Most of such collaborative research currently exist under international projects (funded from outside), led and guided by foreign entities. For example, a foreign donor/investor may contract local private sector to mass produce new products that were done by local research under their guidance)

7. Recommendations for SGCs

- Academia and the private sector cannot work together well without the right involvement of the state, through its relevant agencies. The state is required for 'the triple helix' to work. For example, one interviewee said that TPSF (Tanzania Private Sector Foundation) talks more with the government than with academia, so the government can push the private sector to engage with academic in solving industrial problems.
- Although some collaboration seems to take place already, it is still not quite to that level that is expected or hoped for. Most collaborations have been through key personnel between the organizations. COSTECH may become more active in engaging industries to understand their needs.

  For academics, publicity and publications are rewards for thier research work. Not many patents are produced so far. Attitude towards patents has been looked upon, by academics, as business-oriented and not scholarly interesting. The other thing is that patenting costs money. Only when there is clear directive for producing more patents can this atmosphere change.

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Annexes

Annex 1: List of key personnel interviewed

Name	Organization and position	Contact
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Annex 2: COSTECH Cluster Initiative (with SIDA)[*]

COSTECH is using industrial clusters to promote STI. About 5 of COSTECH staff are working with 6-7 clusters all over the country (with challenges of efficiency). Partners to COSTECH in this initiative are TCCIA, Tanzania Entrepreneurship and Competitive Centre (TECC), and, previously, TPSF.

Cluster facilitators are recruited locally (where the cluster is) based on competency and passion for their work. After identifying candidates they are provided with training. Facilitators are the focal people to connect the clusters with government and networks. After they identify the potential of each cluster COSTECH launches the support program, by providing 5000$ USD, inviting local government and regional officers to attend the launch and making them understand the concept of the project and the importance of the cluster that will need their support later on.

Clusters are evaluated based on areas of need for improvement. The fund only lasts for the short-term of the action plan. There are also national facilitators who receive 9-months training abroad and are the ones who review the potential of each cluster for support and identify the clusters. The cluster facilitators then communicate with clusters to help them prepare a business plan to submit to COSTECH for support. (The model of the cluster initiative is illustrated below).

One case is the Magugu rice farming cluster. Their problem was that yields of rice were decreasing. COSTECH started with looking for an institution that has rice expertise. Dakawa Agricultural Institute was chosen, and they went to Magugu to examine the situation as commissioned. The results were then communicated to the Magugu cluster, as the seed was identified the issue. Then some of the cluster farmers visited Dakawa and attended a demonstration. They bought new seeds and used them. From 2 tons per acre, they are now producing 6-7 tons per acre (according to COSTECH personnel). They also managed to cut water use by 50%, and they managed to restore the flavour and aroma of their rice which has been the signature of Magugu rice.

COSTECH is able to link clusters with proper R&D institutions that can solve their problems. For example, they managed to link wood carvers from Mwenge to researchers from UDSM (Entrepreneurship Centre). At UDSM they assessed the situation and came up with training for this cluster. The results of the training, by the 3rd year, is that the carvers are now promoting their work in offices, hotels, etc. (while before that they used to wait for customers to come to them). They also changed the variety of woods (raw material) which reduced pressure on the Mpinga wood that they used to use solely (and was being protected by the government) plus they were able to capture new markets of clients that were interested in different colours of wood (since Mpinga is mostly dark). Currently the carvers are also working with Mekono Arts (a government office for facilitating arts) to provide to the export market. Mekono is also partner with the cluster.

Another example is the discovery of additional uses of seaweed from Zanzibar. Now there are almost 10 value-added operations from seaweed (including local use for food, cosmetics, household items, etc.). According to COSTECH, the local seaweed industry is now released from the control of direct export market alone.

[*] Based mainly on interview with COSTECH personnel as well as report of COSTECH (2015c) and paper of Diyamett (2009) in References.

COSTECH used the clusters to promote demand-driven research. Because of the cluster, and allowing researchers to interact with the clusters, some researchers are now conducting research that addresses practical problems with socioeconomic impacts. Currently, COSTECH is working SIDA to establish a 'cluster research model'. In addition to the triple helix model, they added one pillar which is the community (making it a 'quadruple helix model').

Model of the Cluster Initiative (source: COSTECH 2015c)