



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 MOZAMBIQUE

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Executive summary

The Republic of Mozambique established the Fundo Nacional de Investigação (FNI) in 2005 to manage national research fund and technology transfer. A recent assessment suggested that FNI faces internal capacity challenges. Theme 3 of the Science Granting Councils Initiative (SGCI) aims to address some of such challenges, which FNI and other 14 Science Granting Councils (SGCs) in sub-Saharan Africa are dealing with, with a focus on strengthening SGCs' capabilities of facilitating and managing public-private partnerships (PPPs) and cooperation between SGCs. The major purpose of this baseline study is to provide some baseline characteristics of PPPs and FNI's collaborative partnerships with other SGCs and international actors, drawing on insights from interviews with eight key informants from FNI, academia and the private sector in Mozambique and desk research.

Results show that the major responsibility of FNI is promoting scientific research and technological innovation by providing financial support to public or private agencies and individuals. So far it has funded more than 1,233 collaborative projects, with an emphasis on agricultural and health areas. Interviewees and desk research suggest that FNI is playing a crucial role in promoting scientific PPPs in Mozambique. As a result of this, perhaps, interviewees reported that collaborative research among university researchers has been continuously improving since 2010. However, interviewees from FNI stated that despite the interest and efforts in promoting PPP in Mozambique, such initiatives involving the private sector have been limited.

Interviewees identified PPP enabling and constraining factors. A crucial factor that is driving PPPs is the benefits of research partnership. Such benefits for FNI include: capacity development, access to skilled personnel for proposal reviews, ICT services, and knowledge for better processes and procedures of grants management. For academia, additional collaboration benefits are mentioned, which include joint publications, better opportunities for joint projects and scientific recognition. The enabling factors of PPP with respect to FNI were briefly examined from three overarching angles. (a) FNI internal policy: In this regard, interviewees from FNI mentioned about the 'General rules and regulations for funding activities' of FNI and a 'new regulatory framework' recently developed. While they stressed that the major focus of these regulations is providing a framework for procedures of funding and disbursing research grant, they also have elements that facilitate collaborations and human resource capacity development. (b) FNI capacities and capabilities: As of October 2017, FNI has 16 permanent and 14 contracted staff, of which some of them are viewed to possess expertise in private sector engagement, technology transfer and partnerships management. (c) External policy and legal frameworks: Interviewees mentioned the Mozambique Government's vision of putting science and technology as an engine of poverty reduction and economic development in Mozambique, which is reflected in the Science, Technology and Innovation Strategy (MOSTIS). Others mentioned the National Research Agenda of Mozambique and the ICT Policy Implementation Strategy.

With regard to constraints, private sector interviewees mentioned that PPPs are constrained by lack of 'quick' incentives and enabling policies and platforms. Interviewees from academia mentioned lack of appropriate educational and training curricula and research infrastructure, lack of appropriate reward and incentive mechanisms for academics and researchers, knowledge gap among private sector actors and decision makers, lack of resources, lack of technical support for needs assessment and technology appraisal, and conflict of interest.

With regard to FNI's collaborations with other SGCs, interviewees from FNI indicated that FNI has bi-lateral collaborative agreements with the National Research Foundation of South Africa, National Commission on Research, Science and Technology of Namibia, Fundação para a Ciência e a Tecnologia (FCT) of

Portugal, and National Science, Technology Council (NSTC) of Zambia and Deutsche Forschungsgemeinschaft (DFG) of Germany. As of October 2017, discussions with others are ongoing.

According to interviewees from FNI, the key driver of inter-SGC collaboration is the positive advantages that result from such collaborations. They, for example, stated that international collaborations often bring with knowledge and experience sharing opportunities, which are crucial for capacity development. The key enablers of inter-SGC collaboration with respect to FNI were assessed from two overarching angles: (a) FNI's capacities and capabilities: With respect to this, FNI is reported to have two staff dedicated to partnerships management, which need to have the required skills in negotiation and leadership to facilitate international collaborations. (b) External policy and legal frameworks: MOSTIS is considered to be a key policy framework that can facilitate international research collaboration between FNI and other actors. This strategy is under revision and whereas FNI is developing its own internal strategy.

With regard to constraints for international collaboration, differences in the internal grant management policies and procedures of SGCs, language barriers, differences in government commitment for STI research funding, lack of political frameworks for bilateral and trilateral or regional research collaborations, differences in the level of development between countries, differences in research thematic priorities, lack of common template of Memorandum of Understanding (MoU) between SGCs, level of autonomy of SGCs to make decisions, bureaucracy and differences in fiscal cycles and periods, were mentioned by interviewees.

Based on insights from the interviewees, it is recommended that FNI may strengthen its current performance, improve proposal submission procedures, and increase transparency on proposal evaluation outcomes to achieve its objectives efficiently.

1. Introduction and objectives of the baseline survey

Collaborative research among higher education, industry and the private sector has a potential to lead to economic growth and improved living standards (Edmondson et al., 2012). Facilitating research linkages among public-private research actors has therefore been a crucial undertaking for many African countries. The Republic of Mozambique established the National Research Fund (commonly called Fundo Nacional de Investigação, FNI, in Portuguese) in 2005 for this purpose. In addition to promoting collaborative research, FNI manages a national research fund and facilitates technology transfer and supports scholarships.

An institutional assessment of FNI and its management system conducted in 2014 reveals that FNI faces several institutional challenges, such as ‘inadequate’ internal institutional mechanisms to manage grant processes, as well as monitoring and evaluation of funded projects¹. A recent study on the political economy of Science Granting Councils (SGCs) in Africa also suggests that similar challenges are pervasive, influencing the performance of SGCs in sub-Saharan Africa (Chataway et al., 2017). Theme 3 of the Science Granting Councils Initiative (SGCI) aims to address some of such challenges, which FNI and other 14 Science Granting Councils (SGCs) grapple with, with a focus on strengthening SGCs’ capabilities of facilitating and managing public-private partnerships (PPPs) and cooperation between SGCs.

This case study aims to provide some baseline characteristics of PPP and international collaboration initiatives of FNI with other SGCs. In particular, the survey was conducted to:

1. identify the factors that constrain or promote public-private partnerships (PPP), scientific collaboration and knowledge transfer in Mozambique,
2. take inventory of the SGC’s capacity needs and skills gaps for collaboration with other organizations, especially the SGC; and supporting research - productive sectors linkages,
3. 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.

This baseline study report is structured as follows. The subsequent Section briefly introduces FNI, with a special focus on its research-funding and managing activities. Section 3 briefly presents the status of PPP and international collaborations facilitated or managed by FNI. Section 4 and 5 attempt to highlight the factors enabling and constraining collaboration and knowledge transfer between FNI and other stakeholders in Mozambique and collaboration and knowledge transfer between FNI and other SGCs, respectively. Finally, Section 6 provides a succinct recommendation for FNI based on insights from interviewees.

2. Methodology

¹ <https://openaid.se/activity/SE-0-SE-6-5114008001-MOZ-32182/>

This baseline study mainly draws insights from interviews with eight key informants from FNI, academia, public institution and the private sector in Mozambique and desk research undertaken in October 2017 (See Table A1 in Annex). Additional reviews of reports, websites, and published and unpublished literature is also conducted November 2017.

3. Fundo Nacional de Investigação (FNI)

Fundo Nacional de Investigação FNI was created as a national public institution in 2005 through a Cabinet's Decree no. 12/2005 (updated Decree no. 50/2015) with the goal of promoting and funding science, technology and innovation initiatives in Mozambique. It operates under a mandate provided by the Minister of Science and Technology, Higher and Technical Vocational Education. However, it has operational independence, which allows it to develop and implement its strategic plans as well as pursue cooperation agreements with other national or international stakeholders (Elming and Abrahamsson, 2010). FNI is governed by a Board of Directors, which approves its financial and strategic plans. It also has 15 member Advisory Committee, representing higher education and research institutions in Mozambique. The committee members are selected by public announcement and hold office for a term of three years. The priority areas are defined by the Government, the Committee is mandated to deliberate on FNI under priority areas and their implementation. They are also involved in the project monitoring and impact assessment process. As of September 2017, the advisory committee also performs oversight on scientific peer-review process of submitted proposals². At secretariat level, FNI is headed by an Executive Director.

The overarching responsibility of FNI is promoting scientific research and technological innovation by providing financial support to public or private agencies and individuals³. According to the Mozambique Science, Technology and Innovation Strategy (MOSTIS) (MOSTIS, 2006), FNI employs at least 5 funding instruments. These include: (a) funding research projects of public or privately employed researchers on a competitive basis, (b) Funding institutional development of research institutions, (c) Funding government-commissioned research projects in areas that need urgent and national attention. (d) Funding high-risk phases of innovation and product commercialization, and (e) Funding awareness activities about science and technology in Mozambique.

FNI advertises call for proposals in key priority areas identified by MOSTIS. The priority areas include: human resources development, education, agriculture, health, energy, infrastructure, marine sciences and fisheries, construction, water, and mineral resources. Other crosscutting priority areas include: social and human sciences and culture, HIV/AIDS, ethno-botany, gender equity, environmental sustainability, biotechnology and information and communication technologies (see MOSTIS, 2006).

Seven call for proposals have gone out between 2006 and 2015. These have attracted a total of 1233 proposals, of which 337 (27%) have been funded, and 103 are ongoing whilst 234 have been completed.

² FNI is at advanced stages of forming a Scientific Committee. As of October 2017, it is developing terms of reference for scientific committees. These committees will take over the technical role currently undertaken by the advisory committee. It is envisaged that the scientific committees, once set in place and appropriately trained and supported, will improve the scientific review and quality of project proposals.

³ In accordance with its mandate, the key objectives of FNI are: (a) to guide scientific research according to the strategic priorities of the Government; (b) To ensure the promotion and coordination of initiatives and activities in its mandated area; (c) To finance scientific research and technological development projects; and (d) To mobilize funds from public and private entities, necessary for the achievement of its objectives.

In the first call for proposal (year 2006), for example, applications for funding were largely in agriculture, health and education related areas and were mainly from Maputo based institutions. In the second call (year 2008), a similar pattern of types of projects was observed among the submitted proposals. To encourage diversity of projects, another call for proposal was made in the same year, strategically focused on development, transfer and implementation of technology projects in districts. The latter leaned more on applied research targeting knowledge implementation (i.e. innovation) as opposed to knowledge creation (i.e. research). Post-2010, FNI has consistently financed research and innovation projects, including collaborative research projects between Mozambique and South Africa and Mozambique and Zambia.

The majority of proposals submitted (about 73%) were rejected on grounds, among others, being non-priority, limited potential for fast results, limited potential for poverty reduction, unrealistic project duration and ineligible applicants. More importantly, however at least 15% of the proposal were not funded due to FNI's financial shortcomings.

According to interviewees, FNI aims to fund a diverse type of stakeholders, including researchers, industry and grassroots innovators. While there is an increasing effort to include fundamental research, much of the earlier focus of funding was on applied research, with the objective of contributing to poverty reduction (Elming and Abrahamsson, 2010 provides an overview of example projects funded by FNI, which are ongoing as of October 2017.

Table 1: Some of the FNI-funded projects as of October 2017.

Title of project	Partner research institutions and private sector actors	Year of project launch	Key focus of the project
Response of juveniles of Tilapia Mossambicus (<i>Oreochromis Mossambicus</i>) submitted to diets containing different levels of Moringa Oleifera leaf meal and fillet of African Catfish (<i>Clarias gariepinus</i>) as a source of protein.	<ul style="list-style-type: none"> • Instituto Superior Politécnico de Gaza (ISPG); • Instituto de Investigação Agrária de Moçambique; • Instituto Nacional de Investigação Pesqueira – Delegação de Gaza 	2017, currently ongoing	To evaluate the response of juveniles of tilapias submitted to diets containing different levels of Moringa leaf meal
Hygienic Quality - Clams Sanitary and Other Bivalve Molluscs Marketed in Major Markets in Southern and Central Mozambique	<ul style="list-style-type: none"> • Centro de Biotecnologia; • Faculdade de Engenharia da UEM 	2017, currently ongoing	To evaluate the hygienic-sanitary quality of the amejoas and other bivalve molluscs marketed in the southern and central markets of Mozambique
Studies of native plants with food potential in the districts of Ribuae, Nampula	<ul style="list-style-type: none"> • Instituto de Investigação Agrária de Moçambique; • Instituto de desenvolvimento do Cajú 	2017, currently ongoing	To know the diversity of native plant foods and integrate them into the system of agricultural production of the rural populations of the Districts of Ribuae

Study of the Rickettsias of zoonotic importance in the National Park of the District of Massingir	<ul style="list-style-type: none"> • Centro de Biotecnologia • Parque Nacional do Limpopo 	2017, currently ongoing	To study the occurrence and distribution of Rickettsia of zoonotic importance in the Limpopo park in domestic and human carcasses using serological approaches

4. State of collaborations in Mozambique

4.1 State of PPP collaborations facilitated by FNI

Most respondents (75%, n=8) stated that collaboration between FNI and the private sector as well as collaboration between researchers and the private sector in Mozambique are continuously improving since 2010. Respondents from FNI rated, on average, the degree of FNI’s collaboration with both academia and the private sector at 3 in a scale of five (where 5 represents ‘excellent collaboration’ and 1 stands for ‘no collaboration’). The overall level of collaboration among FNI, academia and the private sector in Mozambique is also equally rated at 3 by respondents from academia and at 2 by respondents from the private sector. According to interviewees from FNI, promoting research collaboration is part of the key mandates of FNI; and collaborative research projects are highly encouraged. Tables 2 and 3 provide an overview of some of the ongoing PPP and university research projects facilitated and funded by FNI. The two Tables in general suggest that the focus of funded projects is on agriculture and health areas. Interviewees from academia stated that universities and research institutes often engage their partners in training workshops, sharing research infrastructure, such as labs, skilled personnel and data, as well as experience-sharing programs. Asked about FNI’s specific contributions in scientific PPP engagements, interviewees from FNI, academia and private sector stated that the major contributions are funding to projects, technical assistance in proposal development, capacity development through targeted training, and linking private sector actors with public research institutes and other stakeholders. However, interviewees from FNI stated that despite the interest and effort in promoting scientific PPP in Mozambique, there are not too many scientific PPP initiatives involving the private sector in Mozambique.

One interviewee from academia mentioned a successful development project implemented by Universidade Pedagógica, Instituto Nacional de Inspeção do Pescado (Fisheries Research Institute) and local artisanal fishermen. The project entitled ‘Artisanal fishing and local knowledge’ was initiated in 2013 and funded by FNI with the objective of contributing new knowledge to a fishing museum in Mozambique. As a direct result of the research, Mozambique has now designed a curriculum for elementary school education through which students are taught about ‘local content’ on artisanal fishing in Mozambique. It also resulted in a number of reports and policy briefs, some of which are being utilized by the Fisheries Museum (Museu das Pescas).

Table 2: Overviews of ongoing PPP projects facilitated or funded by FNI

Title of project	Partner institutions and private sector actors	Year of project launch	Key focus of the project	Key outputs as of October 2017
Fish farming integrated into agro-livestock	<ul style="list-style-type: none"> • AGROPECUS (Private) • Instituto Superior Politécnico de Gaza (Public) 	2015	To produce tilapia (<i>Tilapia moçambica</i> , <i>T. rendalis</i> and <i>T. nilotica</i>) fingerlings to supply communities and serve as research material for university students and technical schools	Water boreholes and fish farm tanks with capacity of 20,000 liters were built. A local drinking water supply system is built. About 60 students and 7 teachers were involved in project activities.
Improvement of Landim Goat to increase family income and food security in the Angonia plateau province of Tete	<ul style="list-style-type: none"> • Insituto de Investigação Agrária de Moçambique (Public) • Moz-Agri, Lda (Private) 	2016	Increase the production of goat meat from crossing of Landim Goat and Red Goat Kalahari breed. Improve diet and family income based on pasture and forage management and training of producers on technologies of nutrition, production and animal health	Approximately 25 families were trained in the promotion of goats and animal production technologies. In the first phase, 735 kg of goat meat was produced.

Table 3: Overviews of ongoing University research projects facilitated or funded by FNI

Title of project	Partner institutions and private sector actors	Year of project launch	Key focus of the project	Key outputs as of October 2017
Production and crop protection techniques using organic fertilizers and bionecticides in the provinces of Gaza and Inhambane	<ul style="list-style-type: none"> • Nucleus of Professional Technical Education; • Center for Educational Policy Studies 	2015	Train and disseminate alternative technologies of agricultural production to increase productivity in rural communities	The communities of the provinces of Gaza and Inhambane were trained, demonstration fields were established where garlic, corn and peanut crops were cultivated
Local knowledge and valorization of the <i>adansonia digitata</i> by the rural populations of Nacaroa and	<ul style="list-style-type: none"> • Institute of Agricultural Research of Mozambique, • Lurio University and District Governments 	2015	To know, validate and improve the use of the baobab fruit and encourage the production and marketing of fruit derivatives	NA

Erati in the Nampula province				
Implementation of a demographic and health surveillance system in the Polana Caniço hospital	<ul style="list-style-type: none"> • National Institute of Traditional Medicine, • Maputo Municipality, • Manhica Health Research Center, • National Institute of Statistics, • UEM School of Medicine, • Center for African Studies 	2015	Monitor demographic trends in order to allow the evaluation of health interventions as well as provide a platform for high quality data collection and analysis for health planning and health surveillance	The project was presented to the communities where the project will be implemented. Mapping the geographic boundaries of the study area was done
Evaluation of agronomic performance and intensification of Alliaceae production in Mozambique	<ul style="list-style-type: none"> • Institute of Agricultural Research of Mozambique • EMBRAPA - Brazil 	2016	Evaluate onion and garlic agronomy and seed production opportunities	Onion and garlic varieties were identified in different agro-ecological conditions of Mozambique, improving the production and productivity levels of these crops throughout the country, constructed and improved the system of research and promotion of garlic and onion crops and published 2 articles

4.2 State of FNI's collaboration with other SGCs

Interviewees from FNI have been requested to highlight bi-lateral, tri-lateral, regional and international research collaboration agreements, which FNI has recently entered with other SGCs and international partners. Results indicate that FNI has entered into several formal collaboration agreements with other SGCs and international partners while a number of other prospective collaborations are under negotiation at the time of field visit of this study. Table 4 provides the list of some of these collaborations. It indicates that FNI has entered into a collaborative agreement with Namibia's National Commission on Research, Science and Technology (NCRST), facilitated by the SGCI Theme 3 project team. Interviewees stated that the two parties have signed an MoU on several cooperative areas in Windhoek, Namibia on September 15, 2017. The key themes of collaborations between the two SGCs, among others, include agriculture, biotechnology, energy, tourism, infrastructure, ICT, and indigenous knowledge systems. These priority areas were aligned to the focal areas within the National Programme

on Research, Science, Technology and Innovation 2014/15 – 2016/17. It also shows, among others, FNI's ongoing discussions with Deutsche Forschungsgemeinschaft (DFG) to have a collaborative agreement for research in agriculture, biotechnology, energy, tourism, infrastructure, information and communication technology, ethnobotany, environmental and climate change, social and humanities sciences, health and education. Another collaboration is with the South African National Research Fund (NRF). An MoU was signed in November 2017, the two SGCs have already implemented three joint research projects and are planning to have a fourth joint call for proposal in 2018.

Table 4: Overviews of international institutions and SGCs with formal collaboration agreements with FNI as of October 2017

Partner country	Institution	Status of agreement	Year of agreement signed	Key areas of partnership	Key outputs as of October 2017
Namibia	The National Commission on Research, Science and Technology	MoU signed	September 15, 2017	Agriculture, biotechnology, energy, tourism, infrastructure, ICT, and indigenous knowledge systems, ethnobotany, environmental and climate change, social and human sciences, health, education and mineral resources.	Not available yet
Germany	Deutsche Forschungsgemeinschaft (DFG)	Discussions finalised	November 24th	Agriculture; Biotechnology; Energy; Tourism; Infrastructure; Information and Communication Technology; Ethnobotany; Environmental and Climate Change; social and Humanities Sciences; Health; Education	A workshop was held between German, Mozambican and Zambian researchers to discuss on modalities to fund trilateral projects. A discussion is undergoing for a call for proposal. Trilateral call is ongoing (Moz-DFG and Zambia) in agriculture to end on March 15.
Portugal	Fundação para a Ciência e a Tecnologia (FCT)	MoU signed	July 12, 2016	Science, technology and innovation, taking into account the needs of each country.	Workshops between Mozambican and Portuguese researchers for funding joint projects have been held. FNI has started using FCTs database of expert reviewers for proposal evaluations.

South Africa	National Research Foundation (NRF)	Discussions finalised	November 16/17, 2017	Management of joint calls for research projects; Exchange of staff and experts to support the development of science, technology and innovation in both countries through the Science Granting Councils in Sub-Saharan Africa Initiative (SGCI); Exchange of scientific and technological information and documentation; Holding of Joint Science, Technology and Innovation awareness activities including Joint scientific conferences, symposia, workshops and other meetings; Facilitation of scientific cooperation between research institutions.	Three calls of joint projects were implemented. A fourth joint call is planned to be carried out in 2018. One of the joint funded projects has resulted in the development of a novel mosquito replant.... Discussion ongoing in trilateral call Moz-SA and Zambia
Zambia	National Science and Technology Council (NSTC)	MoU Signed	July 11, 2017	Biosciences, agriculture, biotechnology and health sciences, Ethnobotany, Environment and Climate change, Mathematical sciences, Energy, Mineral Resources, Social Sciences, Information and Communication Technology (ICT), Research management, Grants Administration and Management, Human Resource Capacity Development, Tours, Marine Science	A workshop was held between German, Mozambican and Zambian researchers to fund trilateral projects. A joint project has been implemented discussion ongoing in trilateral call Moz-SA and Zambia
India	The Indian Science Congress Association (ISCA)	Discussions underway	-	Science, Technology and innovation areas	Not available yet
Argentina	Conselho Federal da Ciência e Tecnologia (COFECYT)	Discussions underway	-	Science, Technology and innovation areas	Experience visits

Zimbabwe	Research Council of Zimbabwe	Discussions underway	February 08, 2018	-	Not available yet
Turkey	Tubitak	Discussions underway	Agreement to be signed in 2018	Natural Sciences, Industrial Research, Development and Innovation, Engineering and Technology, Medical and Health Sciences, Agricultural Sciences, Food Processing Technology, Social Sciences and Humanities	Not available yet

5. Factors enabling and constraining research collaboration and knowledge transfer between FNI and other stakeholders in Mozambique

In the previous sections, the state of scientific PPP collaborations has been briefly highlighted. In this section, I will highlight factors, which enable or hinder PPP collaborations in Mozambique based on interview insights.

A key driver of scientific PPP in Mozambique, according to interviewees, is the benefit of partnership itself. Asked about the major benefits FNI gains from scientific PPP, interviewees from FNI, for instance, responded that capacity development, access to skilled personnel for proposal reviews, ICT services, knowledge for better processes and procedures of grants management are some of the advantages. They also mentioned that collaboration helps to achieve FNI’s organizational objectives. Interviewees from academia also concurred with most of these suggested benefits of research collaboration between different stakeholders. However, they added that joint publications, better opportunities for joint projects and scientific recognition are key for academics to collaborate with other researchers. Some of the suggested benefits of collaboration seemed to differ, depending on the type of collaborative engagement that an organization has with other stakeholders. Research collaboration between academic organizations can, for instance, help academic researchers access to laboratories, ICT facilities and databases and tap into specific expertise that is not available at their host universities. For example, Rose et al. (2015) reported that Universidade Eduardo Mondlane (UEM) in Mozambique and the University of California, San Diego (UCSD) managed to develop research partnership in 2010 to find solutions for Mozambique’s surgical care problems, especially in rural areas. In this regard, an interviewee from academia mentioned the important role that international donors, such as Sida and IDRC, are playing in facilitating research collaborations among regional education and research institutions. The interviewee, for instance, mentioned Sida’s recent effort to facilitate research collaboration between Eduardo Mondlane University (UEM) in Mozambique, South African and Swedish research organizations. Additionally, the financial and technical support of Sida was instrumental in the development of MOSTIS in 2006, which laid the foundation for the creation of FNI (Elming and Abrahamsson, 2010).

On the other hand, the collaboration of the private sector with FNI and other stakeholders largely focused on business startups in productive sectors. This had helped some private businesses access

public funds and other resources. One example of this type of collaboration is a partnership between FNI and a fruit processing private company called Agro Services Ltd. Agro Services Ltd was established in 2004 (and became fully operational in 2007) through a grant and technical support from FNI (about \$80,000 to establish a fruit processing factory). Through active support of FNI and collaborations with other higher education institutes and international organizations, Agro Services Ltd has established itself as a leading company in producing and marketing a variety of alcoholic fruit beverages, fruit bread spreads produced from wild fruits and other products. Indeed, it has been selected as 'the best innovative SME [Small and Medium Enterprise]' out of 202 companies. In 2014, one of its alcoholic fruit drinks, named 'Malambe', was named 'the best national product of the year' by the Government.

Despite the successful collaboration described above, private sector interviewees stated that the overall collaborative engagement between research and academic institutions and the private sector in Mozambique is unsatisfactory. In fact, one interviewee stated that most of the private sector actors do not have "sufficient awareness to appreciate the value of knowledge and knowledge transfer to local practices and businesses from research organizations". The interviewee stated that FNI should play a major role in raising awareness of the private sector on the value of research and collaboration with research organizations by bridging the gap between researchers and entrepreneurs. Asked about why is collaboration between the research organizations and the private sector weak, private sector respondents stated that lack of 'quick' incentives for both parties and supportive policy frameworks are the major obstacles. Another interviewee from the private sector stated that the problem is lack of sufficient platforms that connect public research organizations and the private sector. He stated that in this regard, the role of FNI is key and its capacity should be strengthened through sufficient financial support from the Government and donors. He also suggested that a 'win-win' relationship between private sector and public institutions is more sustainable. He stated that "students from higher education systems could come to my factory to have practical lessons. At the same time, I should have access to knowledge a university produces to solve some of the challenges that I daily face". Other factors mentioned by interviewees included payments needed to access technical training, and lack of communication and information on knowledge relevant to the private sector.

Interviewees from academia also shared challenges, which are negatively impacting collaboration of researchers with the private sector in Mozambique. These include: lack of appropriate educational and training curricula and research infrastructure, which respond to the needs of the private sector; lack of appropriate reward and incentive mechanisms for academics and researchers to collaborate with the private sector; knowledge gap, i.e. lack of competence and awareness about the importance of collaborative research among private sector actors and decision makers; lack of resources (insufficient financial and human resources and logistics, such as loans, venture capital and tax incentives); lack of technical support for needs assessment and technology appraisal; and conflict of interest. An interviewee stated that interpersonal relationships, mutual respect and trust are key to enter to a research collaboration and sustain it.

These assessments are in general in line with the obstacles, which prevent industry-university collaboration in Mozambique within the context of education in computer science, reported by Juvane et al. (2016). These authors, in particular, identified that lack of internet services, ICT systems, computational resources, lack of project management skills and limited available funds are affecting both the government and universities to undertake collaboration with the private sector.

In the following sub-sections the presence and strength of SGC-related policies, SGCI capacities and capabilities as well as external policy frameworks that enable knowledge transfer between FNI and other stakeholders in Mozambique are briefly assessed based on insights from interviewees⁴.

5.1 FNI-related policy

Interviewees were asked to identify policy frameworks specific to FNI’s operations e.g. HR policies, strategic plans etc., which enable how knowledge is transferred internally and priorities for collaboration are set. Interviewees from FNI mentioned that funding, technology transfer and partnerships are governed by the ‘General rules and regulations for funding activities of FNI’. They stressed that the major focus of the regulations is providing a framework for funding and disbursing research grants. However, they also indicated that a ‘new regulatory framework’ has been enacted, which claims international collaboration being vital for FNI to perform at the level of international standards. This has resulted in active experience exchange programs between FNI and international collaborators, such as the NRF of South Africa as well as Swedish institutions. Interviewees also mentioned legal documents, such as terms of references of contracts signed with stakeholders, as key internal ‘policies’ determining collaboration. Other interviewees from academia and the private sector however were not aware of the existence of policy frameworks internal to FNI.

5.2 FNI capacities and capabilities

As of October 2017, FNI has 16 permanent, 14 contracted and 5 intern staff. They are responsible for developing activity plans, budget proposals, activity and audited financial reports.

Interviewees from FNI reported that FNI staff are capable of managing collaborations. They indicated that there are two staff that need to have (the required) skillsets to manage private sector engagements and another two staff have the requisite competence to manage partnerships (see Table 5).

As noted in the Introduction Section, an external assessment of FNI made in 2014 showed weakness in financial management, monitoring and evaluation procedures of funded projects. One interviewee from academia similarly stated that FNI has sometimes faced challenges to process and disburse grants expeditiously and timely. According to the interviewee the major cause of this challenge is that FNI is understaffed, especially with employees with skillsets on grants management. FNI has attempted to address some of these challenges by developing project implementation, financial management and administration manuals through a support from Ernst & Young. Its also on the process on implementing a pilot phase of M&E project support program.

Table 5: The number of staff within FNI with relevant skillsets for collaboration

	Number of staff with skillsets at FNI
Private sector engagement	2
Technology transfer	4
Partnerships management	2
Team Building	2
Research Management	2

⁴ This is not a comprehensive and exhaustive assessment of all the policies and capabilities of FNI that enable PPP.

5.3 External policy and legal frameworks

Interviewees suggested that a key driver of collaborative research among FNI, research organizations and the private sector in Mozambique is the Government's vision of putting Science and Technology as an engine of poverty reduction and economic development in Mozambique. Indeed MOSTIS (2006: 9) states that "Mozambique's vision for STI is: The ubiquitous and equitable availability and use of Science, Technology, Innovation and ICTs as a right of all Mozambicans, in order to accelerate poverty reduction, wealth creation and the improvement of their social wellbeing." Currently under revision, MOSTIS stipulates that in order to accelerate poverty reduction through science and technology, "...a policy focus on the promotion of multi-disciplinary, multi-stakeholder research targeted to problems affecting the most vulnerable social groups, private sector financial involvement and S&T [Science and Technology] cooperation and commercialization" are needed. It also encourages for innovative and networked public-private partnerships for continuous learning and knowledge diffusion among various stakeholders.

Another strategy framework, which an academic interviewee mentioned, is the National Research Agenda of Mozambique. The interviewee stated that a key objective of this agenda is facilitating and promoting research partnerships among Government ministries, academia, the private sector and farming communities with the aim of encouraging innovation and knowledge transfer, which improve productivity, ensure youth employment and income generation. To facilitate this, the Government aims to put in place research facilities, such as labs, research grants through FNI, incubation of startups in high risk business sectors. It also attempts to encourage multidisciplinary research, put intellectual property rights in place, and increase awareness of the population about the role of science and technology and establish community technology promotion centers. Similarly, another interviewee from academia stated that the Government highly values a fruitful research partnership with regional and global researchers in areas that are key for the country's development needs.

An interviewee also indicated that the ICT Policy Implementation Strategy is an important enabler of collaborative research between researchers and the private sector. Following this strategy, the Mozambique Research and Education Network (MoRENet) was established with the aim of facilitating research partnerships among academics locally, regionally and internationally. The project website⁵ states that "[t]he network, which is intended to be a framework for fast and efficient exchange of research data among its members, has as main philosophy to take advantage and make use of the already deployed fiber infrastructure in the country. The network accommodates both public and private academic institutions and research centers."

Although not mentioned by interviewees, desk review suggests that there are other policies that may encourage collaboration among researchers and the private sector in Mozambique. One of these policies is the Industrial Property Code, Decree No. 04/2006 of April 12 (effective June 12, 2006). This policy governs Mozambique's intellectual property system (Nathan Associates Inc., 2009). This law recognizes and gives legal precedence to local collaborations as well as international agreements, which the country has entered with other key stakeholders (Nathan Associates Inc., 2009).

⁵ <http://www.morenet.ac.mz/index.php/en/about-morenet>

6. Factors enabling and constraining collaboration and knowledge transfer between FNI and other SGCs

Interviewees from FNI were also asked to reflect on incentives for FNI to collaborate with other SGCs. They stated that international collaborations often bring knowledge and experience sharing opportunities, such as training workshops, seminars, research visits and scientific meetings, which are crucial for capacity development in grant and research management activities of FNI. In general, International collaborations are viewed as crucial activities to gain insights into best practices, norms, regulations and procedures of other institutions in different countries. International collaborations are also useful to have access to resources and facilities, such as improved research management systems and software. At personal level, employees of SGCs can benefit in research collaborations, information about research grants and scholarship opportunities.

Interviewees were asked to identify the major obstacles that hinder FNI from entering into collaboration with other SGCs and international stakeholders. The perceived obstacles include: differences in the internal grant management policies and procedures of SGCs, language barriers, differences in government commitment for STI research funding, lack of political frameworks for bilateral and trilateral or regional research collaborations, differences in the level of development between countries, differences in research thematic priorities, lack of common template of Memorandum of Understanding (MoU) between SGCs, level of autonomy of SGCs to make decisions, bureaucracy and differences in fiscal cycles and periods. When a collaborative research grant between two SGCs happens, it often comes with management challenges. According to an interviewee from academia, a collaborative research project between Mozambican and South African researchers can be taken as a case in point. Funded jointly by FNI and the South African National Research Fund (NRF), researchers from the University of Western Cape (UWC) and Universidade Pedagogica conducted a research project entitled 'Systematic review and documentation of research on indigenous knowledge systems in sub-Saharan Africa'. The project was largely successful, leading to publication of a number of reports and policy briefs. However, it also showed that managing international projects is challenging and a number of lessons were learned, especially from the Mozambique side. These lessons include: (a) differences in grants disbursement systems between two or more collaborating SGCs should be carefully evaluated and risk mitigating measures put in place. It is reported that the South African researchers received finances immediately whereas researchers from Mozambique got the research fund quite late. This led to unequal progress in the research project between the two research groups. (b) Researchers often do not have the required capacity of managing international collaborative research projects. As such, targeted training on grants management, especially for international projects, is crucial. (c) There is a need to improve university bureaucracy in disbursing grant funds but also in encouraging academics to allocate some of their time to research. (d) Inadequate incentive for research. University researchers are often paid salary only for their teaching duty regardless of their research engagement. Lack of incentives, together with university bureaucracy in implementing research projects, leads researchers dropping out from a project.

In the following, we will briefly assess the presence and strength of SGC-related policies and, SGC capacities and capabilities that enable knowledge transfer between FNI and other SGCs⁶.

6.1 FNI's capacities and capabilities

⁶ Again this is not a comprehensive and exhaustive assessment.

As indicated earlier, FNI has two staff dedicated to partnerships management. The institution also has a lawyer who oversees legal issues on both local and international engagements of FNI. Interviewees at FNI reported that the two staff in general need to have the required skills in negotiation and leadership to facilitate international relationships. This can be shown by the number of partnership agreements entered and being negotiated as shown in Table 5. However, interviewees stated that its current capacity to manage international collaborations is reasonably good considering the age of the research council. They also stated that FNI has a strong enthusiasm to strengthen its international engagement capacity and increase its international joint research projects. They indicated that they are eager to partner with a number of SGCs under the SGCI, including their hope for participation in a possible phase two SGCI.

6.2 External policy and legal frameworks

A key policy framework that enables national, regional or international collaboration is MOSTIS. According to this strategy, policy priorities and directives of Mozambique on STI are in line with other STI regional and international policies and priorities, such as those of African Union, NEPAD and UNESCO. It further states “Mozambique will seek ways of promoting regional cooperation in the use of S&T [Science and Technology] for development, as many problems of development may best be solved with strong regional cooperation. Some issues have an inherent regional aspect, such as food security. Others can require resources that would exceed the capacity of a single development country to supply, such as HIV/AIDS” (MOSTIS, 2006: 12). The strategy stresses that Mozambique should actively partner with its neighbors, regional and Africa-wide institutions, and funding partners to capitalize on successes and extend learning for mutual and equitable benefit. This would include establishing linkages between relevant institutions within the region and the continent to best exploit scarce resources. There are also other Key policies that contributes to orientation for the FNI. These include Economic and Social Plan, Agenda 2030, and SADC Program.

7. Recommendations for FNI

Over the last decade or so, FNI has funded over 337 projects and tried to encourage PPPs in these projects. A fruit processing private company, which I visited during the field visit, may be taken as an example of a successful PPP project that was supported by FNI. Interviewees from academia and the private sector in general hold FNI with high regard. They also expressed strong optimism about its future role in the country’s research landscape. This baseline study as a whole suggests that FNI is a dedicated public research granting organization in Mozambique with reasonably good level of grants and collaboration management capacity, which is commensurate with its age. This is in line with an (earlier) assessment by Sida (Elming and Abrahamsson, 2010:32/3), which states that “...FNI and its functions well live up to what can be expected from a very young national research funding organization, both in terms of research administration and management of funds. FNI also seems to have a high credibility among researchers, which is a basis for a successful organization.” Despite this my overall observations during the field visit indicated to me that FNI is keen to strengthen its organizational capacity further, especially through active participation in the SGCI. Besides, interviewees have made suggestions, which may be taken into account by FNI so that it can be able to achieve its goals more efficiently and effectively.

- **Strengthen its current performance:** some of the academic and private sector interviewees suggested that FNI has indeed played a commendable role in facilitating and funding scientific research in Mozambique. However they were in the view that it should not be complacent with its current performance. Instead it should be open for and strive to strengthen its current

capacity by actively working with donors and regional and international organizations that have a strong track record of research grant management. One interviewee for example stated that “FNI can increase its organizational capacity by learning from best practices and experiences of other relatively well-established SGCs. It can benefit from focused training and experience-sharing programs with South African National Research Fund, especially in grant management processes.”

- **Improve proposal submission procedures:** Although not related to local and international collaborations, interviewees from academia suggested that duplicate submission (i.e. both softcopies and hard copies) are required to apply for funding under current arrangements. They commented that submitting only one version either through a digital system or hardcopy can allow for researchers to choose a preferred option and submit on time. This is because researchers in remote areas where there is no access to internet might be able to send their proposal submissions through postal services whereas those with internet access can submit through email or online systems.
- **Increase transparency on proposal evaluation outcomes:** FNI has proposal scoring criteria in place, which includes scientific quality (50%), research capacity of applicant (25%), economic significance of research (10%), gravity of the problem (10%) and the degree to which the project fits with priority sectors (5%) (Elming and Abrahamsson, 2010). According to interviewees from FNI, eligible proposals are sent to external subject matter specialists to be reviewed. Some interviewees however noted that researchers who have not won grants often complain about absence of sufficient justification and/or communication about the reasons why their application is rejected. Thus, the interviewees suggested that FNI needs to increase its transparency about the criteria and scoring model of proposal evaluation and final evaluation outcome, especially for unfunded proposals. Other interviewees also suggested that FNI should disburse grants on time to avoid unnecessary project delays, which in turn may decrease dropping out of project partners.

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Annex

Table A6: List of key informants interviewed in October 2017

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