

# **Advancing the impact of University-generated knowledge in the Southern Africa Development Community (SADC) through academia-industry partnerships**

**A collaboration between BITRI, UB, BIUST, BOTHO,  
BUAN and IDM (Botswana), UNAM (Namibia),  
Universidade Lúrio (Mozambique), Universidade Nova  
de Lisboa (Portugal) and University of Cambridge (UK)**

**Workshop in BITRI, Botswana**

20 – 22 May 2019





## About the Programme

Although six of the world's ten fastest growing economies in 2018 were African and despite overseas investors rating Africa as the second most attractive continent for foreign investment in 2014, there is little by way of significant local R&D capacity to support future growth. Many governments recognise the importance of developing National Systems of Innovation (NSIs) and appropriate local policies and practices, if that investment and growth is to deliver lasting local prosperity. Several members of the Southern African Development Community (SADC) target academia-industry partnerships as an essential aspect of NSIs for not only the efficient identification, protection and application of promising innovations, but also to create the human, social and cultural capital that is central to a successful innovation ecosystem.

This programme addresses the advancement of academia-industry innovation ecosystems that benefit local communities in the SADC region and the knowledge-transfer systems and practices that underlie such ecosystems. It is organized in two themes:

**Theme A: What are the key aspects of enabling R&D, physical capital and human capital (eg: capabilities to handle IP contracts and licensing), for the improvement of the interface between academia and industry in Botswana, Namibia and Mozambique?**

What are the weaknesses of current approaches and how can they inform the improvement of local knowledge/technology transfer practices and the establishment of innovation ecosystems? How can NSIs incentivise innovation beyond the two currently prevalent form of innovation in low- and middle-income countries (LMICs) – imitation and adaptation? What are the lessons that, considering differences of context, can be translated from other SADC countries, other ODA-target countries and from developed countries?

**Theme B: How can policy incentivise the research-to-innovation value chain to secure the application of endogenous innovation for the benefit of local society?**

What novel variables – beyond the commonly measured ones (number of patents, licensing contracts and of spin-outs) – should be analysed to inform policy-making that advances academia-industry ecosystems and NSIs? How can national policy and national trade agreements enable foreign direct investment (FDI) to advance application of endogenous innovation for the benefit of local society?

With the ambition to foster long-term partnerships between the participating research institutions around the theme of Academia-Industry-Society Innovation Ecosystems in the SADC region, the programme includes:

- a **workshop** hosted by the Botswana Institute for Technology Research and Innovation (BITRI, Gaborone, Botswana) – centred around particular cases of research that, through collaboration with industry, have had or have the potential to be applied for the benefit of SADC communities (20-22<sup>nd</sup> May 2019)
- an **exchange scheme between the participating research institutions** to further explore academia-industry relationship practices (17-21<sup>st</sup> June 2019).

## Workshop Program – Day 1

### Setting the scene

8:00 – Transport from Cresta Lodge to BITRI

8:15 – Registration

8:30 – Opening Remarks

- **Shedden Masupe**, Chief Executive Officer of the Botswana Institute for Technology Research and Innovation (BITRI)
- **David Good**, Director of Research of the Cambridge Global Challenges (CGC) Strategic Research Initiative (SRI)

9:00 – Introductions – **David Good and Vibhuti Patel**, University of Cambridge

### 10:00 – Session 1

#### Botswana

- **10:00** – Overview of the national landscape of Academia-Industry innovation ecosystems and of the status of knowledge transfer mechanisms – **Theophilus Mooko**, Permanent Secretary, Ministry of Tertiary Education, Research, Science and Technology
- **10:20** – Clean coal technology researchers at the Department of Chemical Materials and Metallurgical Engineering – **Paul Agachi**, BIUST
- **10:25** – Growing the aquaculture industry in Botswana – **Graham Hall**, UB
- **10:30** – SignCoach – Assistive technology for bridging the gap between the hearing and deaf members of the Society – **Lucia Otsetswe**, BITRI
- **10:35** – The economic use of the communal land in Marole Bonwathothe Farmers Trust in the south west Mahalapye – **Veronica Margaret Makwinja**, BOTHO
- **10:40** – Finding Tech Solutions for Ex-Mine Workers and Families – **Tirelo Modise Moepswa**, IDM
- **10:45** – Nanofiber Membrane Filter Dust Mask – **Kabo Mosetlha**, BITRI
- **10:50** – Using wild indigenous herbaceous legumes to improve arable and livestock farming in Botswana – **Flora Pule-Meulenberg**, BUAN

10:55 – Poster presentation by delegates from Botswana and morning tea

### 11:20 – Session 2

#### Mozambique

- **11:20** – Overview of the national landscape of Academia-Industry innovation ecosystems and of the status of knowledge transfer mechanisms – **Samuel Moiana**, Universidade Lúrio
- **11:40** – A simplified bookkeeping App for informal traders of food products in Nampula Province – Mozambique – **Fidel Bilika**, Universidade Lúrio

- **11:45** – Processing technologies of indigenous African Vegetable and legumes to ensure food and nutrition security of communities in Mozambique – **Rámula Issã**, Universidade Lúrio
- **11:50** – CICA solutions: Artificial reefs, less conflicts more fishes – **Isabel Silva**, Universidade Lúrio
- **11:55** – Environmental and assessment studies of the activity of a graphite mining at Montepuez region, implantation and exploration – **Fred Nelson**, Universidade Lúrio
- **12:00** – The Resource Impact Dashboard (RID): Measuring the local development outcomes from resource extraction – **João Salavessa**, Universidade Lúrio

**12:05** – Poster presentation by delegates from Mozambique

**12:40** – Lunch

### **13:30** – **Session 3**

#### **Namibia**

- **13:30** – Overview of the national landscape of Academia-Industry innovation ecosystems and of the status of knowledge transfer mechanisms – **John Sifani**, University of Namibia
- **13:50** – Low cost and Portable Atmega32 Based Spectrophotometer for Identification of Counterfeit Pharmaceuticals – **Fredson Alfred Phiri**, University of Namibia
- **13:55** – The valorization and value-addition of health products from indigenous herbs and mushrooms in the Northern parts of Namibia – **Selma Lendelvo**, University of Namibia
- **14:00** – Enhancing Community Adaptation through Climate Resilient Agriculture: Encroacher bushes potential as livestock feed in Namibia – **Johnfisher Mupangwa**, University of Namibia
- **14:05** – Aloe vera polysaccharides crude extracts: potential growth promoters and immunostimulants in aquaculture – **Ndakalimwe Naftal Gabriel**, University of Namibia
- **14:10** – Removal of weeds and sediments from the Calueque – Oshakati canal – **Fillemon Nangolo**, University of Namibia

**14:15** – Poster presentation by delegates from Namibia and afternoon tea

**14:45** – **Sightseeing** – 3 Chiefs Monuments, Botanical Gardens and National museum, Tlokweng Kgotla, Parliament building, Main Hall.

**19:00** – **Welcome Dinner at Avani Hotel**

## Workshop Program – Day 2

### Key elements for the establishment of Academia-Industry Innovation Ecosystems

8:00 – Transport from Cresta Lodge to BITRI

8:15 – Registration

8:30 – Introduction to Day 2 – John Sifani (University of Namibia) and Steve Evans (University of Cambridge)

#### 8:45 – **Session 4**

##### Presentation of topics related to the key elements for the establishment of Academia-Industry Innovation Ecosystems

- **8:45** – Assets-based innovation and delivering local sustainability – **Steve Evans**, University of Cambridge
- **9:00** – The challenges of productive upgrading in Southern Africa: linking technical innovation and political economy analysis – **Helena Perez-Nino**, University of Cambridge
- **9:15** – Practical Aspects of Effective Knowledge Exchange and Commercialization – **Shirley Jamieson and Iain Thomas**, University of Cambridge
- **9:30** – Entrepreneurship and social and economic value creation at Universidade Nova de Lisboa – **Isabel Rocha**, Universidade Nova de Lisboa
- **9:45** – Open research tools for emerging bioeconomies – **Jenny Molloy**, University of Cambridge

10:00 – Morning tea

#### 10:30 – **Session 5**

##### Focus group discussions

Focus group discussions between groups of 3 representatives of SADC case studies (1 from Botswana, 1 from Mozambique and 1 from Namibia) and 1 of the speakers from the morning session, about the topics they presented.

*The 5 discussions will happen in parallel and the groups of 3 rotate every 30 minutes. Each of the 5 morning talks will have suggested 3 main topics and each focus group will choose 1 out of the 3 topics for discussion.*

- **10:30** – Topic 1
- **11:00** – Topic 2
- **11:30** – Topic 3
- **12:00** – **Lunch**
- **13:00** – Topic 4
- **13:30** – Topic 5

**14:30** – Afternoon tea

**15:00 – Session 6**

**Presentation of main outcomes of discussion groups**

*This is a public session, open to colleagues from the Botswana research institutions.*

- **15:10** – **Steve Evans**, University of Cambridge
- **15:20** – **Helena Perez-Nino**, University of Cambridge
- **15:30** – **Shirley Jamieson** and **Ian Thomas**, University of Cambridge
- **15:40** – **Isabel Rocha**, Universidade Nova de Lisboa
- **15:50** – **Jenny Molloy**, University of Cambridge
- **16.00** – Overall concluding remarks by representatives of research institutions in Botswana (**Sebusang Sebusang**), Mozambique (**João Salavessa**) and Namibia (**John Sifani**)

**16:30** – Departure from BITRI to Mokolodi Nature Reserve, for game drive and bush braai

## Workshop Program – Day 3

### Policy to incentivize research-to-innovation value chains in Academia-Industry Ecosystems

8.30 – Transport from Cresta Lodge to BITRI

8:45 – Registration

9.00 – Introduction to Day 3 – Fred Nelson (Universidade Lúrio) and Helena Perez-Nino (University of Cambridge)

#### 9:15 – **Session 7**

##### Presentation of topics related to policy to incentivize research-to-innovation value chains in Academia-Industry Innovation Ecosystems

- **9:15** – Transformative Industrial Policy for Africa – **Jostein Hauge**, University of Cambridge
- **9:30** – Intellectual Property (IP) models for sustainability and technology transfer - India and Brazil – **Pratheeba Vilmanath**, University of Cambridge
- **9:45** – Best-practice in knowledge exchange – **Vibhuti Patel**, University of Cambridge

10:00 – Morning tea

#### 10:30 – **Session 8**

##### Focus group discussions

Focus group discussions between groups of 3 representatives of SADC case studies (1 from Botswana, 1 from Mozambique and 1 from Namibia) and 1 of the speakers from the morning session, about the topics they presented.

*The 3 discussions will happen in parallel and the groups rotate every 30 minutes. Each of the 3 morning talks will have suggested 3 main topics and each focus group will choose 1 out of the 3 topics for discussion.*

- **10:30** – Topic 1
- **11:00** – Topic 2
- **11:30** – Topic 3
- **12:00** – **Lunch**

13:15 – What's next? – **David Good**, University of Cambridge,

13.30 – Open IP and knowledge-transfer strategies for addressing societal challenges – **Frank Tietze** (University of Cambridge), followed by discussion of related topics led by **David Good and Steve Evans** (University of Cambridge)



## **15:00 – Session 9**

### **Presentation of main outcomes of discussion groups**

*This is a public session, open to colleagues from the Botswana research institutions.*

- **15:00 – Jostein Hauge**, University of Cambridge
- **15:10 – Pratheeba Vilmanath**, University of Cambridge
- **15:20 – Vibhuti Patel**, Universidade Nova de Lisboa
- **15.30** – Overall concluding remarks by representatives of research institutions in Botswana (**Sebusang Sebusang**), Mozambique (**João Salavessa**) and Namibia (**John Sifani**)
- **16.00 – David Good and Shedden Masupe**

**16.20** – Afternoon tea

## Session 1

### [Day 1]

#### Botswana

**Paul Şerban Agachi**

**Botswana International University of Science and Technology (BIUST), Department of Chemical Materials and Metallurgical Engineering (CMME)**

**Clean coal technology researches at the Department of Chemical Materials and Metallurgical Engineering**

#### Research overview

Department of CMME, has, among the research interests coal beneficiation with long range target: syngas, fuel, tar and chemicals. The focus of this presentation is on synthetic gas (syngas) production through gasification process using Shumba coal and tar production from coal dust produced from Morupule Colliery Mine processing.

Syngas is used mainly as fuel in electricity generators, and has a wide range of uses in the petrochemical and refining industries as feedstock, including methanol and DME production. Our latest researches have been oriented towards determining the composition of Botswana coal to get the best value out of it. Botswana coal is widely subbituminous consisting largely of volatile matter. This quality guarantees good production of gas during devolatilization process. We are currently studying two types of reactors to determine the most suitable for gasification process which BIUST is in possession of at lab scale: fluidized bed reactor (max 900 °C) and auger reactor (max 1100°C).

The tar is the binder in the asphalt of the roads. Tar is a product of condensation of the volatiles extracted from coal through pyrolysis or other procedures. Coal tar was a component of the first sealed roads. We obtain tar in the laboratory, on pilot plant, from different carbonic raw materials. The quantity of tar depends on the choice of the type of process we are using and on its operational parameters.

#### Stage of partnership with industry

The project for the syngas started with Shumba Energy which wanted to find a replacement of the Diesel fuel for their electrical generators with a syngas fuel. Shumba provided the coal for experiments.

The project of tar was initiated by the MP of Palapye who wanted to solve the environmental problem of the coal dust heaps of 300,000 tons and at the same time to pave the roads of Palapye. Morupule Colliery is the supposed to be the industrial partner in the project. They supplied coal dust for experiments.

#### Value proposition and intended local impact

The successful conversion of coal to fuel is extremely important for the country. The country needs a processing industry to confer high value to the products manufactured. It has to change the label of "minerals exporting country" to a "minerals processing country" for the benefit of the population. Not only fuel, chemicals and tar are the benefits of the coal/coal dust processing, but also the social benefits of creating many new jobs.

**Graham Hall**

**University of Botswana, Office of Research and Development, University of Botswana**

#### **Growing the aquaculture industry in Botswana**

Growing the aquaculture industry in Botswana Botswana's economy is transitioning to knowledge-based in order to broaden the country's GDP to non-mining sectors. The agricultural sector offers several avenues to facilitate growth, and aquaculture is one area that supports food security and diversification of the economy. However, aquaculture is a specialized field of agriculture that currently is limited in Botswana by knowledge, skills and capital.

My role has been to work with those businesses interested in developing aquaculture in Botswana by identifying knowledge gaps which limit growth of the industry and exploring how those gaps can be filled. These gaps include knowledge into genetic selection of breeding and production stock; growth rates of fish; quality of feed; and waste water management.

An innovative element of this project is investigating how aquaponics can value-add to the aquaculture industry by removing excessive nutrients from the water used for growing fish. In this way aquaculture and aquaponics are complimentary for the growth of protein via fish, vegetables via the aquaponics, and addressing waste water management and water use efficiency through the filtration effects of the aquaponics facility. In contrast to the aquaculture industry, academia has expertise in research, delivering training and support courses, and experience in attracting grant monies. The interface between academia and industry is a 'natural' synergy in relation to aquaculture and aquaponics. That is, industry can identify any gaps which inhibit industry growth, and academia can undertake the research to fill the knowledge gaps within the industry.

**Lucia Otsetswe**

**Botswana Institute for Technology Research and Innovation (BITRI) – Information and Communication Technologies**

**SignCoach – Assistive technology for bridging the gap between the hearing and deaf members of the Society**

Research overview

SignCoach is a mobile application developed to break the communication barrier between the Deaf society and the hearing. Botswana official statistics indicated that an estimate of more than 20 000 people in Botswana have hearing difficulties. Out of this number 50% are children. Due to insufficient resources, only 514 out of the 10,000 or the 5% have access to formal education. The far-reaching effects of this problem are exacerbated by the fact that the hearing society is not familiar with sign language and therefore cannot communicate effectively with the Deaf.

Stage of partnership with industry

SignCoach has partnered with Botswana Society for the Deaf. Collaboration with the Ministry of Basic Education, particularly the Department of Curriculum Development is in process.

Value proposition and intended local impact

- The public adoption of Botswana Sign language advanced by SignCoach™, contributes to both the National Development Plan and UN Sustainable Development Goals mainly goal 1,3,5 and 10. Which are No Poverty, Good Wellbeing, Gender Equality and Reduced Inequalities.
- With ease of communication with the hearing the Deaf will have good quality education, employment, business opportunities.
- Government departments, non-governmental organizations will use the SignCoach to interact effectively with the Deaf.
- The Deaf will easily unleash their untapped capabilities, lower unemployment rates by building businesses to employ others. They will easily express their views and opinions about our country development.

**Veronica Margaret Makwinja**

**BOTHO University, Faculty of Health and Education**

**The economic use of the communal land in Marole Bonwathohe Farmers Trust in the south west Mahalapye**

Research overview

Most of Botswana's fertile land, settlement and economic activities are concentrated on the eastern strip of the country. Despite that the country has a total land area of 566 700 km<sup>2</sup>, most of it is semi-desert and has not been explored whether it has any economic value. Arable and livestock farming is extremely limited in a fragile ecosystem, coupled with harsh climatic conditions.

Livestock is the primary source of subsistence and income for two thirds of rural household. The Marole Bonwathohe Farmers Trust that has privatized and fenced part of the communal land around Mahalapye for communal grazing. According Leepile's concept note the intention of the trust are to contribute to Botswana's self-sufficiency in food production; to arrange for better management of livestock and improve agricultural output; to conserve agricultural resources e.g. grazing land, water and arable land; and, to compete productively with the national and international community in terms of quality and quantity of agricultural products.

Stage of partnership with industry

The signing of the MOU is ongoing.

Value proposition and intended local impact

The Trust faces challenges of beef export requirements, the patterns of land use, escalating rates of livestock racketeering, the mushrooming of illegal settlements, encroachment of greater Mahalapye into the green areas of Morale and Bonwathohe. Hence, the intention of this project is to educate farmers in the area to review the use of communal land and convert it into a food production zone and make it economically viable.

**Tirelo Moepswa**

**Institute of Development Management (IDM) – Business and Information Resource Management Faculty**

**Finding Tech Solutions for ex-Miners and their Families**

For decades, the mining sector of South Africa relied heavily on unskilled labour from neighbouring countries such as Botswana. Today, these miners, their families and the contributions of their labour are all but forgotten. Long years of working in harsh conditions in Southern African mines has left them with staggering health issues and while these labourers and their families are entitled to benefits including health and pension funds, the lack of concrete registration and organization within the mining communities in Botswana has led to the majority of former miners facing multiple social issues.

Botswana Labour Migrant Association (BoLaMa) was founded with the intention to represent the interest of the miners, their widows as well as their dependents. Their core mandate is to act as a one stop service centre, providing assistance to labour migrants, particularly former and current migrant mine-

workers. Key issues include post-employment rights, migration health, socio economic interventions as well as community education. The association collects minimal subscriptions to cover the day to day running of the office and funding of activities. However, registration of new members and the regular and consistent collection of these subscriptions remains a challenge due to the vast and remote geographic distribution of members. Following a detailed needs assessment study, this project aims to leverage on high levels of mobile technology penetration and develop a USSD platform for use by both members of the association as well as new members. Initially the key tasks to be performed by the system will be the easy payment of subscriptions as well as registration of new members.

#### **Kabo Mosetlha**

##### **Botswana Institute for Technology Research and Innovation (BITRI) – Research and Partnerships Nanofiber Membrane Filter Dust Mask**

BITRI has employed a nanofiber membrane as an air filter material for use in dust masks. The suitability of various polymers such as polyamides, polyvinyl chloride, polymethyl methacrylate and polyurethane to form nanofiber membranes that satisfied international standards for dust masks was evaluated. Electrospinning, contaminant penetration, air resistance (breathability), tensile strength and contact angle measurements were performed to identify polyamide nanofiber membrane as the best performing membrane. A dust mask manufacturing company in South Africa was employed to assist with the assembly of the nanofiber membrane dust mask prototype. BITRI and the dust mask manufacturing company in South Africa are currently exploring the possibility of a joint venture to manufacture and sell the dust masks locally. Compared to conventional dust masks made of microfibres that are already in the Botswana market, the BITRI nanofiber membrane dust mask has superior dust blocking capacity and exceptional breathability thus it offers more protection and comfort to the wearer. The performance of the nanofiber membrane dust mask in a real-life environment will be evaluated in various mines in Botswana and the expectation is that its uptake will be especially high in the mining and construction sectors where dust masks are currently worn due to high amounts of dust in the air.

#### **Flora Pule-Meulenberg**

##### **Botswana University of Agriculture and Natural Resources (BUAN)**

##### **Using wild indigenous herbaceous legumes to improve arable and livestock farming in Botswana**

Worldwide, the use of microorganisms for plant growth promotion is gaining momentum. This is because they are a good source of plant nutrients and compared to inorganic fertilisers, they do not pollute the environment. The objective of this study was to characterise bacteria isolated from the root nodules of herbaceous legumes from various regions of Botswana. Bacteria were isolated and characterised based on their morphology, physiology and biochemistry. They were identified using their 16S rDNA profiles. Millet grown under greenhouse conditions were inoculated with bacterial cocktails. Many of the isolated bacteria possessed plant growth promotion traits such as phosphate solubilisation, siderophore production.

Furthermore, most of the isolates could grow up to 42 °C. Inoculated millet plants were significantly taller than those that received fertiliser and their shoot weight increased 2 times while the root weight did so by 1.8 times compared to the control. Thus, inoculated bacteria increased the growth of millet under greenhouse conditions.

Results were shared with all stakeholders in workshops. Further work is needed before a product can be developed.

Due to prevailing environmental conditions of global warming and climate change, it is important to devise innovative solutions for increasing crop yields without polluting the environment. The use of adapted microbes as biofertilisers are part of the solution. Furthermore the cost of inorganic fertilisers is prohibitive to resource-poor smallholder farmers.

## **Session 2**

### **[Day 1]**

#### **Mozambique**

##### **Samuel Moiana**

##### **Universidade Lúrio, – Legal Office**

##### **National Knowledge-transfer Landscape and Current Status of Intellectual Property Systems in Mozambique**

In the last three decades, collaboration between University and Industry is increasingly essential for the success of development in scientific and technical knowledge-transfer among different actors. Despite the fast growing worldwide collaboration, in Mozambique partnerships include also the Society, in general. However, implementation mechanisms of these partnerships in Intellectual Property (IP)-Systems

need to be strengthened. The objective of this paper is to discuss data related to knowledge transfer between University-Industry-Society taking into account social, financial and legal frameworks, in Mozambique.

Knowledge transfer rather happens between University and Society than between University and Industry or University-Industry-Society. The two most important factors contributing to these are the organizational structures of the University, Industry and Society and the little communication for meeting each other goals and reaching adequate collaboration protocols. While the goals and structure of Society are relatively flexible, the University's can easily influence the implementation of their research outcomes in the Society, and the Industry's are strictly conditioned by its competitors and market demand. Small- and medium-level industries have little confidence on the University's capability to provide reliable solutions to their challenges due to lack of: adequate laboratories, qualified human resources and insignificant existing University patents. Financially, royalties from this collaboration are not yet stimulating IP-systems. Finally, the few Mozambican large-scale industries are technical and innovatively dependent on their mother-industries, located outside Mozambique, limiting its capacity to connect and work with local universities.

Regarding the formal and informal IP, existing administrative and legal structures guarantee the protection of patents and other rights (Copyrighting Law, Industrial Property and Commercial Codes, etc.). Despite the fact that one can protect their inventions, using these mechanisms through the registration process, mainly Industrial Property Code, are technically complex.

It is necessary to effectively invest in the academy, scientific research and industry development to adequately foster knowledge transfer process between University, Industry and Society. As success, coral reefs' restoration is being implemented in the north of Mozambique, involving fishing communities, university and industry.

**Fidel Matias Bilika**

**Universidade Lúrio – Business School**

**Co-authors: Alexandre Edgar Tocoloa and Carlos Mafumissa**

**A Simplified bookkeeping App for informal traders of food products in Nampula Province – Mozambique**

The informal sector plays an important role in developing countries economic growth. In Africa, 85.8 per cent of employment is informal (International Labour Organization, 2018). In Mozambique, more than 7 million economic agents work in the informal sector, with emphasis on agriculture, and contribute more than 60 per cent of the GDP and more than 80 per cent to the employment rate (Radio Mozambique, 2017). One of the challenges the informal traders face is how to get funded from the banks to leverage their businesses. In turn, the banks point out deficient bookkeeping and poor business management. Aly Mbaye (2014) stated that “targeted skills enhancement programs for small entrepreneurs and workers are effective means for increasing the contribution of the informal sector to inclusive growth.” Despite an increasing interest in the informal sector, the government does not sufficiently address the issue. The purpose of the research is to two-fold: to design a simplified bookkeeping App for informal traders of food products in Nampula Province; and to develop skills in basic accounting, management techniques and marketing to leverage the productivity, and facilitate the transition of the informal traders to the formal economy. Regarding the partnership with industry, the researchers identified a consulting company, PHC Mozambique, responsible for manufacturing the App in collaboration with the Faculty of Engineering of Universidade Lurio, and the researchers are contacting the company to sign a memorandum of agreement. The App allows having organized accounting of informal traders and improves their business management in Nampula Province.

**Rámula Issã**

**Universidade Lúrio – Faculty of Health Science, Department of Food and Nutrition**

**Processing technologies of indigenous African Vegetable and legumes to ensure food and nutrition security of communities in Mozambique**

Research Overview

In developing countries, about 40% of food products are wasted during post-harvest and processing. In this sense strategies with the focus to reduce losses should be implemented in order to maintain the availability of food in periods between harvests to processing.

By understanding that malnutrition is multifactorial, the present case study will focus on the design and implementation of combined strategies to improve the main pillars of Food Nutrition Security. To address identified problems, activities will be implemented in regions with high levels of food and nutritional insecurity, high prevalence of malnutrition and on Pigeon pea (PP) producers.

In the study we're going to evaluate and disseminate innovative processing technologies that ensure better development of new food products and are accepted in rural communities, in addition the nutritional profile of the new products will be analyzed and described.

Stage of partnership

Although we have not made contact with partner industries, we intend to design partnerships with organizations that work to improve the food and nutritional security of communities through the provision of food products.

Value proposition and intended local impact

We hope that by developing parallel strategies will increase food availability, as well as improve health knowledge and healthy eating practices in communities.

**Fred Nelson**

**Universidade Lúrio – Faculty of Engineering, Department of Geological Engineering  
Environmental and assessment studies of the activity of a graphite mining at Montepuez region, implantation and exploration.**

Graphite is one of the crucial components of electric car battery and Mozambique has the biggest deposit in the world. Recently, a couple a graphite mining company have begun their work in the Northern Mozambique, where the deposits of graphite are. The Centre of Studies and Engineering Projects (CEPrE) of the Engineering Faculty, Lurio University, have agreed with Sunni Resources (graphite mining company) to studies the impacts of implantation and exploration of graphite mining to the local community and the environment as well. This is the first step of CEPrE towards an interactive relationship with the industry. With this project, CEPrE intends first, to build value to the local community by monitoring the implementation of social responsibility of the company, which aims to help the local community. Secondly, to explore ways of knowledge transfer to the Academia and use this project as Benchmark.

**João Salavessa**

**Universidade Lúrio – Centre for Academic Development and Innovation  
The Resource Impact Dashboard (RID): Measuring the local development outcomes from resource extraction.**

Research overview

Natural resource extraction is a disruptive and inherently conflictual business. For the communities surrounding extractive operations, everything from the livelihood opportunities to the landscape changes. For governments the challenge is to transform revenue windfalls into sustainable development. For mining company costly business interruptions can occur when local populations take the street over disagreement with extractive outcomes. Taking a relational approach and integrating insights from research into the emergence of social conflict and into the role of institutions in creating social capital the RID is a nouvelle methodology to understand and monitor local level development outcomes in extractive settings promoting informed debate between companies, government bodies and the local population on the diverse effects of resource extraction.

Stage of partnership with industry

Two cooperation agreements are in force with mines participating in the study.

Value proposition and intended local impact

The RID advances the understanding of local dynamics around extraction from a development perspective, providing a richest analysis. By putting local populations living in a centre stage it allows for more differentiated understanding of mining-induced local level dynamics as well as relations between communities, companies and authorities. By firmly placing the RID into the public domain it holds the potential to inform public and private stakeholders as well as civil society in their deliberations over development priorities.

## **Session 3**

**[Day 1]**

**Namibia**

**John Sifani**

**University of Namibia, Director of Innovation and Development Portfolio  
Namibian IP status and national landscape of knowledge-transfer practices**

The presentation is about a synopsis of Namibia's IP status and national landscape of knowledge transfer practices. Namibia has acceded to international/continental and regional IP instruments since its independence in 1990. Notable of such include joining the World Intellectual Property Organization (WIPO) in 1991 just a year from its independence. The Namibia constitution under Article 100 recognizes and appreciates the value of IP through development of instruments in form of laws and policies aimed at encouraging the generation, protection and exploitation of intellectual property rights to accelerate growth and industrial development. The coordination and governance of IP matters in Namibia is done by the Business Intellectual Property Authority (BIPA) established as a juristic person in terms of section 3 of the BIPA Act, 2016 (Act No.8 of 2016) with a sole mandate of as the focal point for the registration of business and industrial property in Namibia. The Namibian government places knowledge transfer as key priority for economic development and social upliftment of its citizens. BIPA is responsible for the administration and

protection of business and intellectual property. This is evident in the commitment by government to set aside more than 23% of the Namibia budget to education and training sector annually. Secondly, Tourism sector through interventions like the Community Based Natural Resources Management (CBNRM) where local communities in communal areas i.e. conservancies are assisted to develop their local skills to enhance their capabilities of developing products that are marketable and eventually patentable in some cases. Examples include the arts work by the SAN people, the OMBA products by the Himba people found along the Kunene Region. Lastly, in order to ensure sustainability of the University of Namibia have integrated CBNRM into their nature conservation curriculum under the Faculties of Agriculture and Natural Resources.

**Fredson Alfred Phiri**

**University of Namibia – Faculty of Health Science, Department of Food and Nutrition**

**Co-authors: Clement Temaneh-Nyah, Senior Lecturer at University of Namibia (Faculty of Engineering and IT) and Anthony Ishola, Senior Lecturer at University of Namibia (School of Pharmacy)**

**Low cost and Portable Atmega32 Based Spectrophotometer for Identification of Counterfeit Pharmaceuticals**

Project Overview

Spectroscopy forms an integral part of practical sessions in pharmacy studies. Spectrophotometers are used to identify and quantify solution concentrations by comparing the light absorbance and transmittance properties of a test to a control sample solution. The high price, however, limits usage of spectrophotometer by both universities and government agencies. A mechanical low cost spectrophotometer was developed by the University of Pretoria which requires manual alignment of the light source, the sample cuvette and the detector.

Additionally the device needs to be covered in a blanket during measurements. Transmittance and absorbance values are manually calculated from voltage values measured at the output across the light detector.

We present an Atmega32 based, low cost, portable, more user friendly spectrophotometer prototype. The prototype was tested with different concentrations of potassium permanganate. The results obtained are comparable with literature. It has no moving parts and automates the measurement process while displaying transmittance and absorbance values on an LCD. An RGB LED with wavelengths of 465nm (blue), 515nm (green) and 620nm (red) and 10nm bandwidth was used as the light source.

Stage of partnership with industry

The prototype is being tested at UNAM's School of Pharmacy. Pharmaceutical as well as electronics industry partners and relevant government departments are still to be partnered.

Value proposition and intended local impact

The Atmega32 based spectrophotometer is ideal for universities experiments at low cost. Since it does not require extensive training it is also ideal for preliminary routine quality checks on drugs at border post.

**Selma Lendelvo**

**University of Namibia – Multidisciplinary Research Centre**

**The valorization and value-addition of health products from indigenous herbs and mushrooms in the Northern parts of Namibia**

The value of local natural products in Namibia from plants and herbs is largely unrecognised and untapped commercially despite them being utilized locally. This project aims at promoting local herbs and plants with high medicinal and nutritional value; adding commercial value through research and development; sustainably strengthening the supply chain for production; and stimulating rural development through engagement of local community organizations and SME's to produce these health products. Research at University of Namibia (UNAM) has assessed and validated the medicinal and nutritional properties of local herbs (*Myrothamnus flabellifolius*, *Guibourtia coleosperma*, *Diospyros chamaethamnus*) for development of herbal teas with health benefits as well as food supplements from mushrooms (*Ganoderma* spp., *Kalaharituber pfeillii* and *Termitomyces* spp.) to boost nutrition. UNAM through its Commercial Company, Inceptus seeks to organize and partner with community organizations and SMEs in Northern Namibia in the production of a range of quality assured health herbal teas with benefits. A commercially and environmentally sustainable supply chain of the natural products will be established through engagement of local partners to ensure involvement of local communities and SMEs to strengthen and stimulate the local rural economy. This project will build local human and institutional capacity through training, knowledge exchange and support for establishing and running a sound business model.

**Johnfisher Mupangwe**

**University of Namibia – Animal Science**

**Enhancing Community Adaptation through Climate Resilient Agriculture: Encroacher bushes potential as livestock feed in Namibia**

Research overview

In Namibia, livestock is a major contributor to the agricultural sector. Currently 26 to 30 million hectares of farmland are encroached and this has lowered the rangeland carrying capacity and productivity by up to two thirds. The concept of converting encroacher bushes to bush feed has dated back as earlier as in 1971 in Namibia. However, such efforts have been done on trial and error basis with limited scientific studies. Bush value chains approach has recently gained popularity, as it aims to pay back costly debushing, and also develops the market and create high valuable products out of the harvested bush biomass. Among these value chains, bush feed has gained special interest since it has a potential to increase local livestock feed production and reduce importation of supplementary feeds. University of Namibia has initiated research focusing on nutritional evaluation of bush feed, production of bush feed as pellets, mash and silage, and animal feeding and production studies. The research is being carried in collaboration with key industry partners.

#### Stage of partnership with industry

A linkage with both cattle and game farmers has been established with the Department of Animal Science providing scientific advice and farmers bush feed analysis service in order to increase the adoption of the bush based feed technology. The current partnership includes Namibia Biomass Industry Group (NBIG) collaborating on the analysis of bush feed from both commercial and smallholder farmers, Namib Green Gold Processing (Pty Ltd) partnership is focused on beef cattle feeding studies using bush feed pellets, Ministry of Agriculture, Water and Forestry partnership is focused on nutritional evaluation of bush feed, animal performance studies, and creating data required for bush feed registration.

#### Value proposition and intended local impact

Contribute relevant information on bush feed production costs and benefits, nutritional quality of bush feeds and the livestock products. This ensures sustainable production of quality and diversified safe bush feed products to animals and reduce supplementary feed imports. The intended local impact is value addition of encroacher bushes through sustainable commercial production of bush feeds and contribute to increased livestock and game animal carrying capacity of rangelands.

### **Ndakalimwe Naftal Gabriel**

#### **University of Namibia – Department of Fisheries and Aquatic Sciences**

#### **Aloe vera polysaccharides crude extracts: potential growth promoters and immunostimulants in aquaculture.**

##### Research overview

Researches on medicinal herbs as potential alternatives to synthetic chemotherapeutic drugs have been on the rise in aquaculture in the last 2 decades. The current study was carried out to investigate the effects of dietary aloe vera polysaccharides crude extracts on growth, health status and resistance against low pH in farmed African catfish, *Clarias gariepinus* fingerlings. Fish were divided into 5 triplicate groups before being fed feeds supplemented with 0%, 0.5%, 1.0%, 2.0% and 4.0% aloe vera /kg diet for 60 days. Fish fed 1.0% aloe vera/kg diet had significantly increased ( $P < 0.05$ ) growth parameters and presented better-feed utilization parameters compared to unsupplemented ones. Overall, aloe vera extracts had improved haemato-biochemical indices when compared to unsupplemented fish, and decreased some of the indices especially at high dietary inclusion level (4% /kg diet). Aloe vera supplemented fish had higher survival probability throughout the low pH challenge period, except those fed 4% aloe vera /kg diet and control diet.

##### Stage of partnership with industry

This development is still at an experimental level; collaborations are required in the following areas: polysaccharides extraction, chemical composition analysis, researches to optimize this extracts in all aquaculture important fish species, trial in commercial aquaculture systems, funds for research and development of a product, and marketing of the product.

##### Value proposition and intended local impact

From the study, this product has the ability to improve the quality and functions of fish feed in the Namibian aquaculture industry, and avoid or reduce the use of pharmaceutical drugs.

### **Filemon Nangolo**

#### **University of Namibia – Animal Science**

#### **Removal of Weeds and Sediments from the Calueque – Oshakati Canal**

#### **Co-authors: Sam Shaanika and Tuhafeni Angula (University of Namibia)**

The Cuvelai - Etosha Basin is the most densely populated area in Namibia. In this basin, water is transported to the demand sites through the 160 km long open Calueque-Oshakati Canal. The water is mainly used for irrigation and domestic purposes. Anthropogenic activities along the canal have exposed it to various forms of pollution, mainly nutrients pollution which is resulting in high costs of operation, maintenance and purification of the raw water sourced from this canal. Of priority is the growth of freshwater weeds and sediments in the canal which limit the flow of water to the demand sites. For this reason, this study is aimed to design, fabricate and test a mechanical method or tool that could possible remove freshwater weeds from the Calueque - Oshakati canal. Several methods have been used to remove weeds and sediments from the Calueque – Oshakati canal but all these methods have failed to effectively removal weeds and sediments from the canal. The data for this study was qualitative with very little quantitative data.



The data were collected through interviews, direct personal observations and focus group discussion. Two sampling techniques were employed, namely non-reactive and snowball sampling techniques. The Cause Effect Analysis Method was used to investigate and identify the root cause of a known effect. In conclusion it was found that, the methods used by NamWater to remove weeds and sediments from the canal were ineffective. Northern Namibia constitute about half of the country's total population with an estimate of 1.5 million people. Improved supply of water from the canal will be beneficial for domestic use, irrigation farming, crop and livestock farming, small scale businesses and industrial use. The value proposition in the northern area of Namibia is that, there will be an increase in water availability to schools, hospitals, town councils, villages and farmers (crop and livestock) along the canal. Indirectly this will create jobs and give opportunity to new small scale farmers and green irrigation scheme along the canal.

## **Session 4**

### **[Day 2]**

## **Presentation of topics related to the key elements for the establishment of Academia-Industry Innovation Ecosystems**

**Helena Perez-Nino**

**University of Cambridge – Centre of Development Studies**

**The challenges of productive upgrading in Southern Africa: linking technical innovation and political economy analysis**

This presentation aims to discuss the challenges of productive upgrading and value addition in Southern African economies, with an emphasis on the Mozambican case. The presentation will situate academia-industry partnerships in the broader context of the development challenges facing Southern Africa by way of making explicit their political and economic dimensions and by thinking about the projects from a macroeconomic and regional scale. The presentation will discuss linkages and tensions between technical innovation and political economy analysis and will briefly examine the common challenges in the region and the specific challenges of Mozambique.

**Shirley Jamieson and Iain Thomas**

**University of Cambridge – Cambridge-Enterprise**

**Practical Aspects of Effective Knowledge Exchange and Commercialization**

Cambridge is known for being one of the most exciting innovations clusters in the world. Research can give rise to opportunities with far reaching and surprising benefits to the local and global community. These can range from pharmaceutical and battery technology to clean water technologies and enterprises that can help diffuse global conflict. However, successful development and commercialisation of any innovation does not happen overnight.

Many ingredients go into growing, being part of and sustaining an effective ecosystem in which you can more successfully develop and capitalise on your innovation. Those ingredients are the same everywhere and include willing and able people and organisations, good networks, appropriate infrastructure and realism matched to your circumstances and ambition.

Finding, creating and nurturing the ingredients is one of the key things that a university can do as it helps its community, researchers and partners capitalise on the research and innovation generated within it. Cambridge Enterprise will discuss some of the practical aspects involved in enabling an environment that is supportive of effective knowledge exchange and commercialisation with some real examples from its environment.

**Isabel Rocha**

**University Nova de Lisboa, Pro-Rector for Value Creation**

Entrepreneurship and social and economic value creation at Universidade Nova de Lisboa

At NOVA University we have been implementing a set of policies and procedures to increase the impact of the activities performed at NOVA. These include a new Policy for Intellectual Property Management with clear procedures and incentives to inventors, a spin-off status for companies generated within our ecosystem, a business council to provide advice to the rector in value creation activities and the promotion of collaborative laboratories with industry, among others. NOVA has also been promoting science-based entrepreneurship at all levels, organizing courses and contests where multidisciplinary teams of students work in business ideas (more information in <https://www.unl.pt/en/entrepreneurship/entrepreneurship-nova>). Simultaneously, we have been interacting closely with PALOP countries in different areas, for example through the UDI-Africa project (<https://online.unl.pt/udi-africa/>), which, although not specific for this area,

already allowed the involvement of several Professors from PALOP universities to participate in Workshops in the topics of Intellectual Property.

**Jenny Molloy**

**University of Cambridge – Department of Chemical Engineering and Biotechnology**

**Open research tools for emerging bioeconomies**

Dr Jenny Molloy is a Shuttleworth Fellow at the University of Cambridge, studying the role and impact of open approaches to intellectual property for a sustainable and equitable bioeconomy. In particular she researches the potential for local, distributed manufacturing of enzymes to improve access and build capacity for biological research. This work combines technical development using synthetic biology-based platform technologies with qualitative research on challenges faces by molecular biologists globally through interviews and case studies.

Jenny's research is relevant for the SADC Academia-Industry programme because it examines the role of public domain and open source approaches to technology in accelerating innovation and reducing transactional costs in interactions between different actors including academia and industry.

## Session 7

### [Day 3]

### Presentation of topics related to policy to incentivize research-to-innovation value chains in Academia-Industry Innovation Ecosystems

**Jostein Hauge**

**University of Cambridge – Institute for Manufacturing, Department of Engineering**

**Transformative Industrial Policy for Africa**

African countries are in the process of upgrading and promoting the development of higher-productivity sectors, including manufacturing and high-end services. One of the key elements is the need to expand the industrial sector, which provides opportunities for employment generation, integration and value addition for boosting export earnings and income generation.

This specialized report is intended as a contribution to the thinking process of how to conceptualize and implement transformative industrial policies. It aims to serve as a guide for supporting member states and provide concrete strategies for the integration of industrial policies into national development plans across the continent."

For my presentation in Botswana, I will particularly focus on those aspects of the report which concern what today's developing countries can learn from previously successful industrialisation experiences, and the challenges/opportunities that today's global trade and investment environment poses for technological and economic development.

In light of themes of the workshop, it would also be interesting to discuss the role of innovation versus that of technological 'imitation' in the process of economic development.

**Pratheeba Vilmanath**

**University of Cambridge – Institute for Manufacturing, Department of Engineering**

**Intellectual Property (IP) models for sustainability and technology transfer - India and Brazil**

Research overview

Intellectual Property (IP) models, such as licensing or open access, play an important role in developing, sharing and diffusing innovations. A wide spectrum of IP models exist ranging from fully closed to fully open IP models. In between these extremities lies different semi-open IP models. Selection of adequate and right IP models is an imperative for unlocking innovation and accelerating diffusion processes, more so for sustainable innovations with social and environmental focus. Nutriset, a paediatric nutrition company, for example use mix of IP models to enhance its societal impact in African countries. At macro level (policy and regulatory level), countries may adopt different approaches to IP depending on their socio-economic conditions and local needs (eg. India and Brazil in the case of affordable medicines). The choice of right IP model depends on a range of yet insufficiently understood contextual factors. The aim of the project, 'Intellectual Property Models for Accelerating Sustainable Transitions' (IPACST) is to provide evidence based insights about the relevance of different types of IP models for sustainability transitions under different settings.

Relevance for the SADC Academia-Industry Innovation Ecosystems programme:

Knowledge about IP models and their strategic implementation are of relevance to academia-industry technology transfer process as well because along the technology transfer process, inventors and the

academia need to make decisions regarding the ownership, sharing and exploitation of IP generated. The academia-industry technology transfer ecosystems must be conducive to facilitate such IP decisions and aid successful technology transfer for larger societal, environmental and economic benefits.

**Vibhuti Patel**

**University of Cambridge – Translational Research Office, School of Biological Sciences**

**Best-practice in knowledge exchange**

Research overview

At the University of Cambridge there are a number of Knowledge Transfer Facilitators, based in different departments, who enable research to be translated out of academia into application. We have been assessing the way in which this happens, with particular focus on working with industry and other external partners, to allow us to develop guidance on best-practice when working in this area. In this session we would like to work with delegates to look at how partnerships work, including:

- What enables particularly successful partnerships;
- The main barriers to successful engagement with non-academic partners, and how they can be overcome;
- Creative models interaction that can offer mutual benefit;
- How to recognise when a relationship is not working, and ways to close it down.

**Frank Tietze**

**University of Cambridge – Institute for Manufacturing, Department of Engineering**

**Open IP and knowledge-transfer strategies for addressing societal challenges**

Research overview

The talk aims to clarify the notion of IP rights as instrument to allocate ownership of intangible assets needed to enable 'markets' to function (with innovation systems be seen as markets) versus contracts as instrument to govern the usage of intangible assets (e.g. through different forms of licensing). The talk presents a framework that combines various ownership constellations (from concentrated to fragmented) with different contractual models (from restricted to widely open licensing). While IP discussions often focus on formal IP, such as registered rights (e.g. patents), the framework also works for unregistered rights (e.g. copyright protecting software and algorithms) and even informal IP (e.g. indigenous knowledge kept as trade secrets) that can be of substantial value too. This talk then provides selected examples for how open science approaches can be operated in conjunction with closed IP approaches adopted by university spin-outs to build commercial success, respectively how organisations apply different open and closed IP approaches over time and with different partners to establish local manufacturing skills and capabilities in Africa.

The talk closes with a brief outlook on challenges that African innovation systems may face when scaling up, e.g. when innovations become so successful that international collaborations are needed.

Relevance for the SADC Academia-Industry Innovation Ecosystems programme

While universities prioritize patent-based IP commercialisation, this is a difficult approach in countries that lack strong IP regimes and the required legislation and institutions. For building local innovation systems and incentivizing entrepreneurs to build spin-outs based on IP developed at universities this however may not be critical as the usage of informal IP can also be governed by licensing contracts. When knowledge about formal IP however matters is when universities get involved with partners that understand how to operate in strong IP regimes, such as multinational mining corporations.

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