INNOVATION & INTELLECTUAL PROPERTY
COLLABORATIVE DYNAMICS IN AFRICA
Editors: Jeremy de Beer, Chris Armstrong, Chidi Oguamanam & Tobias Schonwetter

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Collaborative Dynamics in Africa

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JEREMY DE BEER, CHRIS ARMSTRONG,
CHIDI OGUAMANAM AND TOBIAS SCHONWETTER

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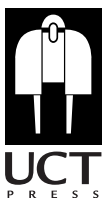

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Preface

This book is among the key outputs of the Open African Innovation Research and Training (Open A.I.R.) Project. Based on case study research in nine African countries, the book examines the recent history and current on-the-ground realities of innovation and intellectual property (IP) in African settings. In doing so, the book reveals complex collaborative dynamics across a range of different countries, sectors and socio-economic contexts, and generates recommendations for how innovation and IP can be married with social and economic development objectives in African settings. This book's sister report, *Knowledge and Innovation in Africa: Scenarios for the Future,* situates the current realities covered in this book within a much longer historical trajectory and multiple potential futures.

Conceived in 2009, established in 2010 and launched in 2011, Open A.I.R. is a pan-African and globally interconnected research and training network, which was established to:

- raise IP awareness in African settings and facilitate critical policy engagement;
- empower a networked, epistemic IP community in Africa;
- identify IP-related innovation bottlenecks and modes of open collaboration; and
- interrogate IP-related innovation metrics, capital and power structures.

Open A.I.R. is financially supported by Canada's International Development Research Centre (IDRC) and Germany's Federal Ministry for Economic Cooperation and Development (BMZ), and collaborates with numerous other organisations and individuals – all of whom are recognised in the Acknowledgements' pages of this book. In addition to the aforementioned case study and foresight research, the Open A.I.R. network engages in a wide range of training, capacity building, outreach and policy engagement activities – both on the African continent and in settings outside the continent where matters of African innovation and IP are engaged. These engagements target external stakeholders capable of changing policies and practices, including:

- innovators, creators and entrepreneurs – individuals and companies;
- business groups such as chambers of commerce and industry associations;
- national, regional and international law-makers and policy-makers;
- issue leaders, such as politicians, judges, professors and practitioners;
- scientific and cultural research and development funding bodies;

- university researchers, administrators and technology transfer officials;
- rights-holders and collective rights management organisations; and
- representatives of indigenous and local communities.

Open A.I.R. is motivated by a vision in which innovation and creativity in Africa are sustainable, properly valued, collaborative, widely accessible and result in benefits that are distributed throughout society. Based on this vision, the network's mission is to better understand how innovation and IP processes work in African settings, how knowledge and technology currently protected by IP can be mobilised, and how IP systems can be harnessed or adapted in a manner that fosters openness-oriented collaborative innovation resulting in just distribution of new knowledge and technology.

This book and the *Scenarios* volume are two parts of a much broader attempt, by Open A.I.R. and other initiatives, to facilitate, in the medium to long term, the emergence of new, pragmatic means of valuing and facilitating innovation and creativity in Africa. Contextually appropriate metrics sensitive to the monitoring of meaningful changes in behaviour around innovation and creativity could be instrumental for promoting African grassroots entrepreneurship, broad-based business development, and a vibrant private sector built on small and medium-sized enterprises (SMEs) with a sustained ability to innovate. And the opportunities for innovation-driven SMEs could also benefit from policy-maker adoption of appropriate metrics when designing the policy and regulatory frameworks necessary to ensure predictable innovation environments for stakeholders.

Open A.I.R.'s core funders, IDRC and BMZ, have provided a framework for Open A.I.R.'s objectives. Open A.I.R. fits within the IDRC's Science and Innovation programme, which supports research and policy engagement in relation to how science, technology and innovation (STI) can be engines of socio-economic development. Within this programme, the Information and Networks (I&N) initiative, which funds the Open A.I.R. Project, aims to better understand the linkages among innovation, creativity, networked collaborations (often enabled via information and communication technologies [ICTs]), and determinants of openness – including IP rights. The IDRC also supported the precursor network to Open A.I.R., the African Copyright and Access to Knowledge (ACA2K) Project, which ran from 2007 to 2011 and generated the nucleus of the expert network now driving Open A.I.R.

BMZ supports Open A.I.R. via Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), under the GIZ commons@ip – Harnessing the Knowledge Commons for Open Innovation initiative**.** The commons@ip initiative focuses on how IP rights interact with open innovation, the knowledge commons, open licences and collaborative innovation. It is part of the BMZ-

mandated Train for Trade programme, which aims at strengthening the private sector and its constituent bodies in the Southern African Development Community (SADC) region through training and capacity building in export promotion, quality control and promotion of open innovation – as well as through promotion of local and regional economic development and trade.

Open A.I.R.'s training and capacity building components include:

- building the network's capacity – through online platforms, network-wide workshops, research methodology support, scenario-building meetings and thematic seminars;
- awarding Open A.I.R. Fellowships to emerging IP scholars and potential leaders – from Tanzania, Kenya, Uganda, Ethiopia, Cameroon, Nigeria and Egypt;
- exchanging knowledge through Africa-wide and South–South knowledge networking at seminars, workshops and conferences;
- growing awareness among African creators, innovators, entrepreneurs and policy-makers of openness-oriented approaches to innovation and IP matters in Africa; and
- teaching at African tertiary educational institutions, including development of a replicable, open course curriculum on IP law and development.

Because of the immense geographic size of the African continent, and unique logistical challenges of African intra-continental travel, ICTs have been instrumental in empowering the research network's "community of practice". Open A.I.R. has an offline presence in 14 African countries and in multiple countries outside the continent. Online, the network includes hundreds of individuals and institutions throughout Africa and from all corners of the globe, linked via a suite of online networking and social-media tools. The Open A.I.R. community of practice advances a culture of multidirectional exchange among African innovative and creative communities and external actors – with a view to sustainably empowering local communities and SMEs. Network members promote cross-fertilisation of ideas via original thinking and partnerships with national and international institutions, scholars, funding agencies, civil society organisations and other willing partners. Those wishing to join the community can visit http://www.openair.org.za/join.

Acknowledgements

True to its emphasis on "collaborative dynamics", this book is the product of the collective energy of dozens of people and institutions in many countries, all of whom work within the Open African Innovation Research and Training (Open A.I.R.) network. Open A.I.R. currently has core network members and institutions in 14 African countries, spanning North Africa (Egypt, Tunisia), West Africa (Senegal, Ghana, Nigeria, Cameroon), East Africa (Ethiopia, Uganda, Kenya, Tanzania) and southern Africa (Malawi, Mozambique, Botswana and South Africa). Other network members and institutions are in Canada, the United States, the United Kingdom, Germany and France. These members are, in turn, linked – via online and offline interactions – to a broader Open A.I.R. network of hundreds of individuals and institutions, including people and entities in Brazil, India, Malaysia, Australia, Switzerland and the Netherlands. The network receives generous financial support from Canada's International Development Research Centre (IDRC) and Germany's Federal Ministry for Economic Cooperation and Development (BMZ).

Each of the editors and authors of this volume is part of, and collaboratively exchanges knowledge and expertise with, this large network, and we the editors, and each of the contributors, are profiled in "About the Editors" and "About the Contributors" sections of this book and on the Open A.I.R. website's Team page, http://www.openair.org.za/content/open-air-team. On this Team page, one can also find the names and contact details of Open A.I.R. Fellows and other network members and institutions. The network is also accessible via its social media platforms, featured at http://www.openair.org.za/join

Open A.I.R.'s administrative hub is the IP Unit in the University of Cape Town Faculty of Law, where Project Manager Nan Warner and Administrator Phyllis Webb are the key operational drivers. Warner and Webb receive management support from two of the editors of this book (and the co-Principal Investigators of the Open A.I.R. Project), UCT IP Unit Director Tobias Schonwetter and Jeremy de Beer of the University of Ottawa Faculty of Law. Also supporting project management are Julie Nadler-Visser of UCT's Research Contracts and IP Services (RCIPS) unit, members of the UCT Finance Department and Faculty of Law Finance Department, and another editor of this book: Chris Armstrong of the LINK Centre at the University of the Witwatersrand (Wits) in Johannesburg.

Network strategic guidance is provided by a Steering Committee composed of De Beer, Schonwetter, Warner, Chidi Oguamanam (another of this book's

editors) of the University of Ottawa Faculty of Law, Nagla Rizk of The American University in Cairo (AUC), Sisule Musungu of IQsensato in Nairobi, Khaled Fourati of the IDRC office in Cairo, and Balthas Seibold of Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in Bonn. Further strategic support from the IDRC is, or has been, provided by Naser Faruqui, Simon Carter, Laurent Elder, Fernando Perini, Matthew Smith, Heloise Emdon and Phet Sayo; Karim Badran and Rose-Marie Ndiaye Pereira on financial matters; and Michelle Hibler and Nola Haddadian on publications. GIZ's involvement is focused on the capacity-building components of the network, which are carried out in collaboration with the GIZ's commons@ip – Harnessing the Knowledge Commons for Open Innovation initiative. At GIZ, in addition to support from the aforementioned Steering Committee member Balthas Seibold, who advises on matters of international knowledge cooperation and networking, support has also come from Petra Hagemann, Christine de Barros Said, Ursula van Look, Marina Neuendorff, Margrit Brockhaus and the Working Group of German Development Organisations on Promoting Innovation Systems. At UCT, as well as those already mentioned, key supporters and collaborators have been the Dean of Law, PJ Schwikkard, Lee-Ann Tong in the Faculty of Law, and, in the IP Unit, the Unit's founder Julian Kinderlerer, its Deputy Director Caroline Ncube and its Senior Research Fellow Bernard Maister. At the University of Ottawa, in addition to those already mentioned, support has been provided by the Dean of the Faculty of Law, Common Law Section, Nathalie Des Rosiers, and Former Dean Bruce Feldthusen.

For this book, key network participants were the team of JD candidates in the University of Ottawa Faculty of Law – Lukas Frey, Will Sapp, Phil Holdsworth, Maya Boorah, Kristen Holman and Saara Punjani – who provided long hours of diligent editorial assistance. In addition, because the research case studies presented in this book all required collection of data from human subjects – via interviews and/or focus group discussions and/or written surveys – this book would not have been possible without the cooperation of dozens of respondents across the countries of study. For reasons of confidentiality, most survey and interview respondents are not named in this book, but we are sincerely grateful for their contributions. Also contributing to the research outlined in this book was Donna Podems of OtherWISE in Cape Town, who advised on research methodologies and supported a methodology workshop for several of the authors featured in this volume, in addition to her support of Open A.I.R.'s monitoring and evaluation (M&E) framework. At this book's publisher, UCT Press, the key drivers have been Publisher Sandy Shepherd and Project Manager Glenda Younge. The cover design for this volume is by Elsabe Gelderblom of Farm Design in Cape Town, who does all of Open A.I.R.'s design work for its website, social media tools, PR materials,

Briefing Notes and the network's other substantial publication output, the Open A.I.R. *Scenarios* compendium – which is available in hard-copy, and on the Open A.I.R. website, as a separate published output and companion to this book.

Network headquarters at the UCT IP Unit serves as Open A.I.R.'s Southern Africa Hub, coordinated by Project Manager Warner. There are also four other Hubs: the North Africa Hub at the Access to Knowledge for Development Center (A2K4D) of the School of Business at The American University in Cairo (AUC), coordinated by Nagham El Houssamy under the direction of Nagla Rizk; the West Africa Hub at the Nigerian Institute of Advanced Legal Studies (NIALS) in Lagos, coordinated by Helen Chuma-Okoro under the direction of Adebambo Adewopo; the East Africa Hub at the Centre for IP and IT Law (CIPIT) of Strathmore University, Nairobi, coordinated by CIPIT Director Isaac Rutenberg; and the Canada Hub at the University of Ottawa Faculty of Law, coordinated by De Beer and Oguamanam. Contact can be made with these Hubs and Hub Coordinators via the aforementioned Open A.I.R. website Team page.

Also integral to the success of the network are its nine Fellows, each of whom has spent time at the UCT IP Unit in Cape Town. The Fellows have contributed to Open A.I.R.'s case study and foresight research, to outreach and training work, and to building the network. The nine Fellows are: Esther Ngom of the Ngo Nyemeck law firm in Yaoundé; Seble Baraki of the Justice and Legal System Research Institute (JLSRI) in Addis Ababa; Moses Mulumba of the Centre for Health, Human Rights and Development (CEHURD) in Kampala; Douglas Gichuki of CIPIT in Nairobi; Milton Lore of Bridgeworks Africa in Nairobi; Eliamani Laltaika of the Tanzania Intellectual Property Rights Network (TIP-Net) in Dar es Salaam; Alexandra Mogyoros, a student in the Faculty of Law at the University of Ottawa; West Africa Hub Coordinator Helen Chuma-Okoro of NIALS in Lagos; and North Africa Hub Coordinator Nagham El Houssamy of A2K4D in Cairo.

Other collaborating institutions are the Program on Information Justice and Intellectual Property (PIJIP) at the Washington College of Law at American University in Washington, DC; the Centre for Technology and Society (CTS) in Brazil; the Centre for Internet and Society (CIS) in India; and the Open Society Foundations, where Open A.I.R.'s key partner is Vera Franz. The Open A.I.R. network has also benefited from interaction with staff at the World Intellectual Property Organisation (WIPO) headquarters in Geneva. In London, Shirin Elahi of Scenarios Architecture is the driver of Open A.I.R. foresight research work, as featured in the aforementioned *Scenarios* compendium that provides an important forward-looking complement to the current picture offered by this volume. Jo Higgs of Go Trolley Films in Cape Town did post-production on the videos available on the Open A.I.R. YouTube channel – videos which show how the network came into being and how the research was conceptualised.

All the people and institutions mentioned here have in one way or another played a role, by collaborating within the Open A.I.R. network, in the conceptualisation, planning, data collection, data analysis, writing, editing, design and production processes that resulted in successful research and the completion of this book. It is hoped that this volume's free availability online, under a Creative Commons (CC) licence, will ensure that the book's collaborative dynamics do not end here at the moment of publication, and continue long into the future in the work of the still-growing Open A.I.R. community.

Jeremy de Beer, Chris Armstrong, Chidi Oguamanam, Tobias Schonwetter
September 2013

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Acronyms and Abbreviations

A2K	access to knowledge
A2K4D	Access to Knowledge for Development Center (The American University in Cairo, Egypt)
AAU	Addis Ababa University
ABS	access and benefit-sharing
ACA2K	African Copyright and Access to Knowledge Project
ACP	African, Caribbean and Pacific Group of States
ACTS	African Centre for Technology Studies (Kenya)
ADPP	Ajuda de Desenvolvimento de Povo para Povo (Mozambique)
AERC	African Economic Research Consortium
AFTE	Association for the Freedom of Thought and Expression (Egypt)
AGOA	African Growth and Opportunity Act
AIM	Agência de Informação de Moçambique
AmCham	American Chamber of Commerce (Egypt)
ARC	Aquaculture Research Centre (Egypt)
ARIPO	African Regional Intellectual Property Organisation
ASSAf	Academy of Sciences of South Africa
ASTII	African Science, Technology and Innovation Indicators
ATO	alternative trading organisation
ATPC	African Trade Policy Centre
ATPS	African Technology Policy Studies Network
AU	African Union
AUC	The American University in Cairo
B-BBEE Act	Broad-Based Black Economic Empowerment Act 53 of 2003 (South Africa)
BCP	bio-cultural community protocol
BIH	Botswana Innovation Hub
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
BoI	Bank of Industry (Nigeria)
BOTEC	Botswana Technology Centre
BPR	business process re-engineering
CAA	Cocoa Abrabopa Association (Ghana)
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CBN	Central Bank of Nigeria

CC	Creative Commons
CCIA	Computer and Communications Industry Association
CEDAT	College of Engineering, Design, Art and Technology (Makerere University, Uganda)
CEHURD	Centre for Health, Human Rights and Development (Uganda)
CEPIL	Centre for Public Interest Law (Ghana)
CIGI	Centre for International Governance Innovation
CIPC	Companies and Intellectual Property Commission (South Africa)
CIPIT	Centre for IP and IT Law (Strathmore University, Kenya)
CIPO	Canadian Intellectual Property Office
CIPR	Commission on Intellectual Property Rights (UK)
CMO	collective management organisation
COCOBOD	Ghana Cocoa Board
CPD	Centre for Policy Dialogue (Nigeria)
CRTT	Centre for Research in Transportation Technologies (Makerere University, Uganda)
CSIR	Council of Scientific and Industrial Research (India)
CTEA	Copyright Term Extension Act (US)
CVCP	Committee of Vice-Chancellors and Principals (UK)
DACST	Department of Arts, Culture, Science and Technology (South Africa)
DEST	Department of Education, Science and Training (Australia)
DFID	Department for International Development (UK)
DHET	Department of Higher Education and Training (South Africa)
DNS	domain name system
DRC	Democratic Republic of Congo
DRM	digital rights management
DRST	Department of Research, Science and Technology (Botswana)
DST	Department of Science and Technology (South Africa)
DTI	Department of Trade and Industry (South Africa)
EAEP	East African Educational Publishers (Kenya)
EC	European Commission
ECBP	Engineering Capacity Building Program (Ethiopia)
ECOWAS	Economic Community of West African States
ECX	Ethiopia Commodity Exchange
EEAA	Egyptian Environmental Affairs Agency
EIPO	Ethiopian Intellectual Property Office
EIPRL	Egyptian Intellectual Property Rights Law
EPA	Environmental Protection Authority (Ethiopia)
EPO	European Patent Office
EST	environmentally sound technology

EU	European Union
EUEI	EU Energy Initiative
Eurostat	Statistical Office of the European Communities
FAO	UN Food and Agriculture Organisation
FCN	Friendship, Commerce and Navigation (Kenya)
FDI	foreign direct investment
FDRE	Federal Democratic Republic of Ethiopia
FDSE	Free Day Secondary Education (Kenya)
FES	Friedrich Ebert Stiftung (Germany)
FLO	Fairtrade Labelling Organisations International
FOSS	free and open source software
FPE	Free Primary Education (Kenya)
FTA	free trade agreement
GDP	gross domestic product
GEM	Global Entrepreneurship Monitor
GERD	gross expenditure on research and development
GI	geographical indication
GIPC	Global Intellectual Property Center
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)
GM	genetically modified
GOAN	Ghana Organic Agriculture Network
GOK	Government of Kenya
GR	genetic resources
GTZ	German Technical Cooperation
HSRC	Human Sciences Research Council (South Africa)
ICANN	Internet Corporation for Assigned Names and Numbers
ICIDSS	International Creativity and Innovation Development Support Services (Ethiopia)
ICJ	International Commission of Jurists
ICLS	International Conference of Labour Statisticians
ICPSK	Institute of Chartered Public Secretaries of Kenya
ICT	information and communication technology
ICT4D	ICT for development
ICTSD	International Centre for Trade and Sustainable Development
IDC	Industrial Development Corporation (South Africa)
IDLO	International Development Law Organisation
IDRC	International Development Research Centre (Canada)
IDS	Institute of Development Studies (Kenya)
IE	informal economy

IFC	International Finance Corporation
IICA	Inter-American Institute for Cooperation on Agriculture
IIDMM	Institute of Infectious Disease and Molecular Medicine (South Africa)
IIED	International Institute for Environment and Development
IIPA	International Intellectual Property Alliance
IISD	International Institute for Sustainable Development
ILC	indigenous and local community
ILO	International Labour Organisation
INAO	Institut national des appellations d'origine (France)
IP	intellectual property
IPA	Industrial Property Act (Botswana)
IPC	International Patent Classification
IPI	Industrial Property Institute (Mozambique)
IPR-PFRD Act	Intellectual Property Rights from Publicly Financed Research and Development Act (South Africa)
IRB	Institutional Review Board (Botswana)
IRENA	International Renewable Energy Agency
ISAS	integrated seawater agriculture system
ISCTEM	Instituto Superior de Ciências e Tecnologia de Moçambique
ISI	Institute for Scientific Information
ISO	International Organisation for Standardisation
ISP	Information Society Project (Yale University, US)
ITC	International Trade Centre
JBEDC	Japan Bio-Energy Development Corporation
JITAP	Joint Integrated Technical Assistance Programme
JLSRI	Justice and Legal System Research Institute (Ethiopia)
K2C Biosphere	Kruger to Canyons Biosphere (South Africa)
KE	knowledge economy
KECOBO	Kenya Copyright Board
KENFAA	Kenya Nonfiction and Academic Authors' Association
KES	Kenyan Shilling
KHA	Kenya Historical Association
KICD	Kenya Institute of Curriculum Development
KIPI	Kenya Industrial Property Institute
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNAS	Kenya National Academy of Sciences
KOLA	Kenya Oral Literature Association
KTO	knowledge transfer office
LBC	Licensed Buying Company (Ghana)
LDC	least developed country

LE	Egyptian Pound
LINK Centre	Learning Information Networking Knowledge Centre (Wits University, South Africa)
LSK	Law Society of Kenya
MAN	Manufacturers Association of Nigeria
MANCAP	Mandatory Conformity Assessment Programme (Nigeria)
MCH	Maasai Cultural Heritage Organisation (Kenya)
MCST	Ministry of Communications, Science and Technology (Botswana)
MCT	Ministério da Ciência e Tecnologia (Mozambique)
MDCA	Malindi District Cultural Association (Kenya)
MDG	Millennium Development Goal
MEA	Multilateral Environmental Agreement
MIST	Ministry of Infrastructure, Science and Technology (Botswana)
MIT	Massachusetts Institute of Technology
MOA	Ministry of Agriculture (Ethiopia)
MOE	Ministry of Education (Ethiopia)
MOFA	Ministry of Food and Agriculture (Ghana)
MoFED	Ministry of Finance and Economic Development (Ethiopia)
MOST	Ministry of Science and Technology (Ethiopia)
MoU	memorandum of understanding
MRC	Medical Research Council (South Africa)
Natoil	Natural Oil Company (Egypt)
NACI	National Advisory Council on Innovation (South Africa)
NCC	Nigerian Copyright Commission
NDA	non-disclosure agreement
NEP	National Enquiry Point (Botswana)
NEPAD	New Partnership for Africa's Development
NESC	National Economic and Social Council (Kenya)
NESTI	National Experts on Science and Technology Indicators
NIALS	Nigerian Institute of Advanced Legal Studies
NRF	National Research Foundation (South Africa)
NGO	non-governmental organisation
NIALS	Nigerian Institute of Advanced Legal Studies
NIPMO	National Intellectual Property Management Office (South Africa)
NIS	national innovation system
NMIMS	Narsee Monjee Institute of Management Studies (India)
NPR	National Public Radio (US)
NPSB	National Policy and Strategy on Biofuels (Mozambique)
NRC	National Research Centre (Egypt)

NREA	New and Renewable Energy Authority (Egypt)
NWLR	Nigerian Weekly Law Report
OA	open access
OAPI	Organisation africaine de la propriété intellectuelle
OCEES	Oxford Centre for the Environment, Ethics and Society
OCFCU	Oromia Coffee Farmers Cooperative Union (Ethiopia)
ODEL	open, distance and electronic learning
ODI	Overseas Development Institute (UK)
OECD	Organisation for Economic Co-operation and Development
OER	open educational resource
Open A.I.R.	Open African Innovation Research and Training Project
ORD	Office of Research and Development (Botswana)
PBIP	place-based intellectual property
PCT	Patent Cooperation Treaty
Petromoc	Petróleos de Mozambique
PIIPA	Public Interest Intellectual Property Advisors (US)
PIJIP	Program on Information Justice and Intellectual Property (American University, US)
PPS	probability proportional to size
PRO	public research organisation
ProBEC	Programme for Basic Energy and Conservation in Southern Africa
R&D	research and development
RCIPS	Research Contracts and IP Services unit (UCT, South Africa)
RIPCO (B)	Rural Industrial Promotion Company (Botswana)
RMI	rights management information
SADC	Southern African Development Community
SARUA	Southern African Regional Universities Association
SCE	Society for Critical Exchange (Kenya)
SID	Society for International Development (Kenya)
SINER-GI	Strengthening International Research on Geographical Indications
SME	small and medium enterprise
SMIEIS	Small and Medium Industries Equity Investments Scheme (Nigeria)
SMME	small, micro and medium enterprise
SNA	social network analysis
SON	Standards Organisation of Nigeria
SPS	sanitary and phytosanitary measures
STCI	Science and Technology Capacity Index
STEP	Science Technology and Economic Policy (US)
STI	science, technology and innovation
STS	Society for Technology Studies (Ethiopia)

SVKM	Shri Vile Parle Kalamani Mandal (India)
TBT	technical barriers to trade
TCE	traditional cultural expression
TGE	Transitional Government of Ethiopia
THE	Times Higher Education (UK)
THRIP	Technology and Human Resources Programme (South Africa)
TIA	Technology Innovation Agency (South Africa)
TIP-Net	Tanzania Intellectual Property Rights Network
TISC	Technology and Innovation Support Center
TK	traditional knowledge
TKDL	Traditional Knowledge Digital Library (India)
TPMs	technological protection measures
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
TTO	technology transfer office
TVET	Technical and Vocational Education and Training (Ethiopia)
UB	University of Botswana
UCC	Universal Copyright Convention
UCITA	Uniform Computer Information Transactions Act (US)
UCT	University of Cape Town (South Africa)
UEM	Eduardo Mondlane University (Mozambique)
UGT	Uganda Gatsby Trust
UK	United Kingdom
UM	utility model
UNCST	Uganda National Council for Science and Technology
UNCTAD	UN Commission on Trade and Development
UNDESA	UN Department of Economic and Social Affairs
UNDP	UN Development Programme
UNECA	UN Economic Commission for Africa
UNEP	UN Environment Programme
UNESCAP	UN Economic and Social Commission for Asia and the Pacific
UNESCO	UN Educational, Scientific and Cultural Organisation
UNFCCC	UN Framework Convention on Climate Change
UNICAMP	University of Campinas (Brazil)
UNIDO	UN Industrial Development Organisation
Unilag	University of Lagos
US	United States
USAID	US Agency for International Development
USPTO	US Patent and Trademark Office
WAK	Writers Association of Kenya
WATH	West Africa Trade Hub

WBCSD	World Business Council for Sustainable Development
WCT	WIPO Copyright Treaty
WEF	World Economic Forum
WEP	World Employment Programme
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation
Wits	University of the Witwatersrand (South Africa)
WPIS	WIPO Patent Information Service
WPPT	WIPO Performances and Phonograms Treaty
WTO	World Trade Organisation
ZAR	South African Rand

Chapter 11

The State of Biofuel Innovation in Mozambique

Fernando dos Santos and Simão Pelembe

Abstract

This chapter provides findings and analysis from a study of the potential relevance of intellectual property (IP) dynamics (specifically patent dynamics) to small-scale, locally driven biofuel production in Mozambique. Through a policy and legal analysis, a patent landscaping exercise and stakeholder interviews, it was found that patenting is not at present the central barrier to successful small-scale biofuel exploitation in the country, but that patenting (and protection of utility models) is likely to become a more prominent issue in the coming years as Mozambique moves from first to second generation biofuel technologies. The chapter concludes that the government of Mozambique's vision of a flourishing sector of small-scale biofuel producers will require aggressive government support, in line with its National Policy and Strategy on Biofuels (NPSB) of 2009, for a range of measures in support of locally driven technology research, innovation and development. Among the issues the government will need to tackle, according to this chapter, is the matter of how to ensure affordable access to technology – whether patented or non-patented – for small farming and producing enterprises to use and adapt (with use of "petty patent" utility models potentially being appropriate in some cases).

1. Introduction

A number of local and foreign companies in Mozambique are producing, or setting up production facilities for, biofuels (ethanol and biodiesel) from agricultural products such as coconuts, jatropha and sugar cane.[1] The government of Mozambique is actively seeking to create the optimal policy framework for

1 For an in-depth account, from a non-IP-focused perspective, of Mozambique's biofuel strategies see Schut *et al.,* (2010).

biofuels production in the country. According to the government's National Policy and Strategy on Biofuels (NPSB) of 2009, one of the key policy aims is:

> To promote and explore agro-energy resources to guarantee energy security and sustainable socio-economic development in order to contribute to the reduction of the emissions of gas with greenhouse effect, which contributes to the global warming, through selection and adoption of appropriate production technologies and methods in agriculture and industry. (NPSB, 2009, translated from Portuguese by the authors)

The NPSB is based on several studies commissioned by the government, including a 2007 study that recommended pursuit of ethanol as a petrol additive and pursuit of biodiesel (Econergy, 2007). The Econergy study report, released in 2008, found that, for ethanol production, sorghum and sugar cane should be clear priorities, along with cassava (Econergy, 2008). For biodiesel, the best-suited crops among those already being cultivated were identified as coconut, sunflower, African palm, castor seed and jatropha. (The jatropha tree is a drought resistant and fast-growing plant that produces non-edible seeds high in oil that can be used for biofuel.) The 2008 Econergy report also concluded that implementation of a biofuel policy and strategy would have significant benefits for Mozambique, including:

- expansion of the agriculturally productive area in order to produce raw materials;
- reduction of fuel importation, then estimated as costing US$20 million per year;
- increased tax revenues;
- creation of 150,000 new jobs;
- increase of exports; and
- growth in the transportation sector (e.g. increase of traffic in ports) (Econergy, 2008).

However, notably absent from the narratives of the private sector, foreign governments and the government of Mozambique is mention of a possible intellectual property (IP) dimension (specifically a patent dimension) to the drive towards large-scale biofuels production for the country. For instance, the aforementioned assessment of biofuels in Mozambique, commissioned by the government and conducted by Econergy, which formed the basis for the adoption of the NPSB of 2009, does not contain a single reference to the role of IP in the development of the biofuels industry in Mozambique (Econergy, 2008).

We set out to discover whether the lack of focus on IP issues in Mozambique's biofuels strategy is perhaps a gap that needs filling. The study sought to understand

the degree to which the biofuel technologies being deployed in (and/or being planned for) Mozambique are patent-restricted. Among the reasons for our desire to probe this question was the government of Mozambique's emphasis, articulated in the NPSB of 2009, on development of localised technologies and small-scale rural enterprises via biofuels production, an emphasis which would be undermined if small-scale actors are not able to gain access to the relevant technologies. (See Chapter 12 of this volume for research into patenting and technology transfer in Egypt's biofuel sector; and see Chapter 10 of this volume for discussion of deficiencies on the African continent in national patent examination and record-keeping.)

2. The research

The central research question for the study was: *To what extent is, or will, IP play a role in access, use and development of biofuel technologies in Mozambique?* This qualitative study, which we undertook between September 2011 and June 2012, consisted of:

- a review of the policy and legal framework relevant to biofuel exploitation, including the aforementioned NPSB of 2009;
- a patent "landscaping" exercise to determine the level of biofuel technology patenting in Mozambique; and
- visits in October 2011 to two provinces particularly active in the area of biofuels production from jatropha oil: Manica Province and Nampula Province.

The first research method, the policy and legal review, was made challenging by intensive activity towards development of the legal framework for biofuels exploitation during the time of the study, and continuing through to the time of finalisation of this report in April 2013. We were, however, fortunate in having access to a number of drafts of the policy instruments being developed. The second method, the patent landscaping exercise, looked at biofuel patents granted in Mozambique between 1999 to 2012, with the data collected from the Mozambican Industrial Property Institute (IPI) and from the African Regional Intellectual Property Organisation (ARIPO, of which Mozambique is a Member State). The data were gathered through direct contacts we have within the IPI and ARIPO.[2] The third method, the site visits to Manica and Nampula, focused on the

2 One of the authors of this study, Fernando dos Santos, served until the end of 2012 as Director-General of the IPI. In early 2013, he began a four-year term as Director-General of ARIPO.

production of jatropha oil and its transformation into biofuels. The objective of the visits was to allow direct observation of production sites and the technologies used therein. During both visits, the team conducted semi-structured interviews with stakeholders, based on a questionnaire consisting of 14 questions, seeking information on engagement with biofuel technology and IP matters related to the technology. Contact was also made with a team of three researchers from the state oil company, Petromoc, which had conducted site visits in 2010 to 39 biofuel projects across all 11 Mozambican provinces (Petromoc, 2010). We took into consideration the Petromoc team's report (see below).

3. Context: Existing studies of Mozambique's biofuel sector

Three existing studies were particularly valuable to our understanding of the biofuels context in Mozambique:

- a 2007 report by the UN Department of Economic and Social Affairs (UNDESA) entitled *Small-Scale Production and Use of Liquid Biofuels in Sub-Saharan Africa: Perspectives for Sustainable Development*;
- the aforementioned Econergy International Corporation report of 2008 entitled *Mozambique Biofuels Assessment – Final Report;* and
- the aforementioned Petromoc report of 2010, entitled *Relatórios de visitas aos projectos de biocombustíveis (Report of Visits to Biofuel Projects).*

UNDESA (2007)

This UNDESA study proposes a path for technology adoption for biofuels production in Africa. The study notes that local technologies have not yet been developed and access to foreign technologies may be restricted due to lack of technology information and the high costs. Therefore, the study proposes that governments should focus on the development of local technologies:

> In sub-Saharan Africa, there is a lack of locally available, locally produced biofuels technology, products, and equipment. Local developers may […] not be aware of the available product offerings in the marketplace and how to obtain these, and foreign technology can be difficult to procure and expensive to purchase. Development of local technologies, products, and services matched to the needs of the marketplace will be important [to] the scale-up of small-scale biofuels throughout sub-Saharan Africa. (UNDESA, 2007, p. 31)

The study describes local technologies and projects related to local technologies for the production of biofuels and demonstrates their usefulness in local communities. It recommends that African governments:

> [a]dvance biofuels technology research, development, and demonstration in order to drive down costs for the technologies; enhance product and system performance, reliability, and efficiency; and expand the base of cost competitive end use applications. These activities should have a particular focus on local technology development and production. National/regional research centers that include small-scale biofuels technologies should also be encouraged. Up-to-date technology information and data exchanges should also be encouraged. (UNDESA, 2007, p. 35)

The approaches to building localised biofuel use and development which are recommended in the UNDESA report appear to be very similar to the approaches adopted by the government of Mozambique in its NPSB of 2009 (see below).

Econergy (2008)

This Econergy study was commissioned by the government of Mozambique and funded by the World Bank and the Italian Embassy in Maputo. The study assesses the baseline conditions in Mozambique; the different feedstocks for biofuels production; the market potential for biofuels; the competitiveness and feasibility of biofuel production; global biofuels production trends and technologies; and prospects for the implementation of projects in the biofuels sector in Mozambique that might align with the UN Framework Convention on Climate Change's (UNFCCC's) Clean Development Mechanism (established by Article 12 of the Kyoto Protocol).

The study reviews the available production technologies for biofuels, as well as technologies likely to emerge in the succeeding decade. The discussion of first generation biofuels production technologies clarifies that these technologies convert only a fraction of the feedstock (oils, sugars and starches) into fuel. The second generation technologies, meanwhile, represent an incremental improvement in feedstock utilisation efficiency by attempting to convert the remaining matter into fuel as well. These technologies are still in the very early stages of commercialisation in Europe and the US and therefore it is difficult to predict how soon they will be deployed in Mozambique. (Of note in this respect was a February 2012 report that Portuguese group Galp Energia is planning a EUR2 million project in Mozambique using second generation biofuel production from jatropha (Macauhub, 2012)).

The Econergy study does not indicate any particular method for how to develop or transfer biofuels production technologies, but suggests that Mozambique should

follow the examples of Brazil and India in exploring partnerships with other countries possessing significant biofuel sectors, as well as exploring how biofuels production and exports might be a vehicle for increasing investment and improving technological knowledge and skills.

Petromoc (2010)

This fact-finding study by Petromoc, undertaken by three officers of the company's Office of Projects and Development, found 39 biofuel projects in Mozambique in 2010: 13 devoted to ethanol and 26 to biodiesel. The Petromoc team assessed, *inter alia*, the technologies used by the companies already producing biodiesel. Some companies did not indicate the type of technology in use, but, in general, those that disclosed such information applied first generation technology. The technology is mainly sourced from India, the Netherlands and South Africa.

4. Findings

Policy and legal framework

The NPSB, approved via Resolution No. 22/2009 of 24 March 2009, lists, *inter alia*, the following benefits Mozambique can achieve via biofuel production:

- gradual substitution of fossil fuels;
- exports via the existing free trade agreement (FTA) among Member States of the Southern African Development Community (SADC), of which Mozambique is a member and which has approximately 250 million inhabitants; and
- acceleration of research and development (R&D) activities to facilitate the adaptation and evolution of technology (NPSB, 2009).

The NPSB also calls for the promotion of participation by academic and research institutions and all components of the scientific community at national level in biofuels R&D. Further, the NPSB calls for development of technologies in local communities and support for small and medium enterprises (SMEs) in the biofuels sector. It is clear, then, that the government of Mozambique is setting great store in biofuels as a pathway to socio-economic development. There is also significant interest from the international private sector and from foreign governments (see NL Agency, 2011; 2012). Of note is Mozambique's biofuels support agreement with the EU and Brazil (ICTSD, 2010). Brazil, which has natural links to Mozambique via a shared Portuguese colonial heritage, is a world leader in biofuel production.

Since the approval of the NPSB, the government has enacted a number of legal instruments to implement the NPSB, including Decrees in 2011 providing for an Inter-Ministerial Committee on Biofuels and regulations for biofuel additives to commercialised fuel (Decrees No. 7/2011 and No. 58/2011). But we found that none of the legal instruments provides entirely concrete mechanisms to facilitate or enable the identification or development of appropriate technologies for production of biofuels in Mozambique. The NPSB itself, however, does aim to promote and explore agro-energy resources through selection and adoption of appropriate production technologies and methods in agriculture and industry. Indeed, one of the objectives of the NPSB is to promote research, by national teaching and research institutions, into technologies for production of biofuels, so that the technologies can be applied by local communities (NPSB, 2009).

The NPSB directs government to enact specific legislation on biofuels and to establish both a National Agenda for Research and Innovation in Biofuels and a National Programme on Biofuels Development. Among specific priorities of the proposed National Programme, some have a technological focus, such as the call for introduction of gel-fuel stoves and the call for R&D on new varieties of biofuel plants and biofuel technologies. In the National Agenda for Research and Innovation, research institutions are to be called upon to support development of the technical capacity necessary to the evolution of the National Programme, via use of conventional biofuel technologies, the emerging second generation technologies and any other technological advancements.

Meanwhile, the Inter-Ministerial Committee on Biofuels, decreed in July 2011 (Decree No. 7/2011), began operations in 2012, presided over by the Minister of Energy and including the Ministers of Agriculture, Science and Technology and Environment. The Committee has broad technological mandates:

- to promote research, development and innovation in the biofuels sector; and
- to coordinate the transfer and validation of technologies and establish demonstration units.

IP rights are recognised in Article 94 of the Mozambican Constitution of 2004, and in 2007, the government issued its Intellectual Property Strategy 2008–2018 (IP Strategy, 2007). In this Strategy, IP is positioned as an instrument for stimulating and protecting creativity and innovation to promote the country's economic, scientific, technological and cultural development. The IP Strategy does not make any specific reference to biofuel technologies. However, one of the Strategy's goals is the incorporation of IP strategy into all Mozambican sectors, both public and private, in a manner that benefits the development of the country. The IP Strategy also prioritises the promotion and safeguarding of technical solutions

developed by local innovators. According to the Strategy, the development of simple, inexpensive technology can be incentivised by means of:

- innovation, by promoting the development of simple technology and safeguarding it by granting utility models (as provided for by Art. 95 in the IP Code of 2006);
- the adaptation of the technology to meet specific local needs; and
- recognising, safeguarding and rewarding inventors by granting utility models.

The IP Strategy also encourages the transfer of technologies, especially for use by SMEs. In terms of the legal framework, the industrial property system of Mozambique is based on the Industrial Property Code of 2006 (IP Code, 2006). The Code sets out the basic regulations regarding industrial property rights in Mozambique, including the definitions, durations of rights, registration procedures, administrative and judicial mechanisms for protection of rights, and anti-counterfeiting and border measures. To supplement domestic legislation, the government has ratified a series of regional and international instruments in the sphere of industrial property, including: TRIPS (1994), the Harare Protocol (1982), the Madrid Agreement (1891) and Protocol (1989), the Nice Agreement (1957), the Paris Convention (1883), and the Patent Cooperation Treaty (PCT) (1970) and Regulation (1993) (see Bibliography for the full names of these instruments). Patents and utility models are the main instruments for protection of technological innovations in the Mozambican IP Code of 2006. Patents are protected for 20 years (Art. 66) and utility models are protected for 15 years (Art. 95). The IP Code allows industrial property rights to be transferable *inter vivos* and *mortis causae* (Art. 17). Voluntary licences of rights are also available under the IP Code (Art. 84).

Legislative provisions for protection of utility models are potentially of particular importance in developing-world settings such as Mozambique, because, as the World Intellectual Property Organisation (WIPO) explains, "[t]he requirements for acquiring a utility model are less stringent than for patents", and "[u]tility models are cheaper to obtain and maintain" (WIPO, n.d.[b]). ARIPO also provides protection for utility models, which are sometimes called "petty patents" or "innovation patents" (WIPO, n.d.[b]).

The biofuel patent landscape

Our patent landscaping exercise revealed that there were 18 patents registered with Mozambique's IPI related to biofuels in Mozambique. All the patents had been filed by companies from foreign countries, i.e. Australia, Brazil, Germany, India, Italy, Japan, Mexico, South Africa, South Korea, Spain and the US. There

was no patented, locally developed Mozambican biofuel technology, and only one patent originated from Africa (South Africa). (See Appendix for a listing of the 18 patents.) Fifteen of the biofuel patent applications had been filed via the PCT International Bureau in Geneva, one had been filed via ARIPO in Harare, and two had been filed directly with the IPI in Maputo. All but one of the patents had been granted between 2008 and 2011, with the other patent granted in 2000.

Key findings that emerge from this biofuel patent picture are: the surge in biofuel patenting activity from 2008 onwards; and the absence of locally developed patented biofuel technology. This picture raises the spectre of foreign control over biofuel technology implementation and development in Mozambique. However, we are cognisant of the fact that none of the simple (first generation) technologies cited in the aforementioned UNDESA study of 2007 are patented technologies. Thus it seems clear that first generation biofuel techniques are largely in the public domain in Mozambique, allowing for SME utilisation and adaptation. At the same time, it seems clear that many second generation technologies are likely to be under patent to a foreign firm at the time of their deployment in Mozambique.

The patent landscaping also found that patenting moves fast when companies sense a violation is imminent somewhere in the world. Data provided by the IPI showed that, as jatropha cultivation began to emerge in Mozambique for production of biofuels, a Japanese company, Sumitomo Chemical Company, filed two jatropha patents (related to controlling weeds in jatropha fields and controlling diseases to which jatropha is susceptible). These moves by the Japanese company show the efficiency and sensitivity of patent monitoring mechanisms by large developed-world firms (see Appendix for the formal details of these two patents).

Interview findings

Interviews were conducted with:

- a representative of Sun Biofuels Mozambique (in Manica Province);
- a representative of an ADPP community biofuel project (in Cabo Delgado Province); and
- a representative of Petromoc.[3]

Sun Biofuels Mozambique

Sun Biofuels Mozambique is a subsidiary of Sun Biofuels UK (Sun Biofuels Mozambique, n.d.). According to the interviewee, the company has developed

3 One of the authors of this chapter, Simão Pelembe, serves as a Legal Advisor to Petromoc.

2,300 hectares of jatropha plantations, which produced 560 tonnes of biodiesel in 2011. In July 2011, the media extensively reported the shipment of the first batch of biofuel produced by Sun Biofuels from the jatropha plant for use by the German airline Lufthansa (*Biofuels Digest*, 2011). According to the media reports, 30 tonnes of oil crushed from non-edible jatropha seeds were produced in Manica Province and sent to Germany. The remaining oil was used directly by the company in its vehicles. Sun Biofuels sourced the seeds from 11 varieties of plants from the Belgian company Quinvita. According to the interviewee, Sun Biofuels is now developing its own plant varieties. Its production of oil is based on a cold-pressing method of extraction technology, which is a non-patented first generation technology freely available in the public domain.

ADPP

ADPP stands for Ajuda de Desenvolvimento de Povo para Povo (People to People Development Aid), a Mozambican non-governmental organisation (NGO). The interview was conducted with a Danish teacher trainer (from DNS Denmark, an international teacher training college) who was coordinating an ADPP biofuel project in Bilibiza, Cabo Delgado Province.[4] Via that project, jatropha seeds produced by local small-scale farmers were being collected and oil extracted from the seeds for use in lamps (and in the production of soap). The technology used, a first generation public-domain (not under patent) cold-pressing method, had been acquired from similar projects in Arusha, Tanzania, via the DNS Denmark interviewee's direct observation of practices there.

Petromoc

This interviewee, in the Projects Division of Petromoc (the state-owned oil company), provided a general overview of the Petromoc projects under way in Mozambique in the area of biofuels. All the projects discussed were still in their initial phases. According to the interviewee, the biofuels industry will be sustainable in Mozambique only if clear national policies are designed that combine fiscal incentives, investments at start-up stage and regulations on the blending of fuel from fossil sources with biofuels. (The aforementioned Decree No. 58/2011 [of 11 November 2011] established that all commercialised fuel in Mozambique must contain at least 3% biofuels by 2015 and 10% by 2021.)

4 The interview was conducted in Nampula Province, but the key project discussed in the interview was in the adjacent Cabo Delgado Province.

5. Conclusions

The research found that, at present, much of the technology in biofuel production was non-patented first generation technology in the public domain. Thus it would appear that the patent regime was not, at the time of the study in 2011–12, hindering access to biofuel technology in use in Mozambique. However, the same may not apply to the more efficient second generation technology that is on the horizon, typically patented, and which is probably necessary to make Mozambique's biofuel industry a strong, sustainable one. Use of the more complex patented technology (by the local Mozambican biofuel producers and researchers envisioned by the NPSB of 2009) will likely require negotiation with the owners of the technology and payment of licensing fees.

The government of Mozambique is clearly going to have to play a strong role if its visions of 150,000 new jobs, localised biofuel technology innovation and vibrant local SME participation in the sector are to be realised. To that end, the Ministry of Science and Technology (Ministério da Ciência e Tecnologia [MCT]), has established a National Programme for the Promotion of Mozambican Innovators (see AIM, 2011; MCT, 2010). The inclusion of the Minister of Science and Technology in the newly established Inter-Ministerial Committee on Biofuels may pave the way for local research and innovation in the area of biofuels technology under the Promotion of Innovators Programme. (The programme had, at the time of the completion of this research study in 2012, already resulted in identification of more than 80 innovators and the filing of more than 40 patent applications. However, none of the innovations was related to biofuels.)

The standard technology transfer modalities will not be appropriate to achievement of the national objectives set out by the NPSB. The NPSB calls for selection and adoption of appropriate production technologies applicable to local communities, whereas the standard technology transfer model is one whereby the technology acquired tends to be for large-scale enterprises – in this case, large industrial biofuel processing plantations and plants. Such enterprises do not typically provide control to local small-scale actors, as such enterprises are incorporated into large bilateral investment projects requiring sophisticated licensing contracts and licensing and royalty payments.

Sophisticated, costly technology and machinery would likely hinder the vision put forward by the NPSB, which seeks SME access to technology. Already in the case of jatropha, we found (in our interviews) the view that small producers are generally not interested in processing jatropha into biofuel themselves. Small-scale jatropha producers seem, instead, more inclined to sell their harvests to large buyers who can transform the seeds into biofuels. Efforts thus need to be made, similar to the initiative we found under the auspices of ADPP, to encourage

small-scale production and the use of liquid biofuels for localised energy needs (perhaps combined, as is the case with the ADPP project, with other uses such as for the production of soap), in order to ignite more SME interest in the planting and use of this particular crop. Accessing technology appropriate for processing of biofuels by small industrial units or local communities could potentially be achieved by:

- identification and use of simple (non-patented) public-domain technology already being used in other African countries or rural areas in Brazil and India;
- promotion of locally developed biofuels technology by empowering local innovators (e.g. the aforementioned National Programme for the Promotion of Mozambican Innovators); and
- provision of easy access to patent information on biofuels technology in order to foster local adaptations of the technologies to suit localised Mozambican needs.

Regarding the third of the three deliverables outlined above – access to patent information – we took note of the WIPO programme (as part of the WIPO development agenda) to support Technology and Innovation Support Centers (TISCs) in several developing countries, including Mozambique. TISCs aim to provide innovators in developing countries with access to locally based, high-quality technology innovation support, including up-to-date, easily accessible patent information. A TISC was established in Mozambique in September 2012, and two TISC focal points are now active (in the Ministry of Science and Technology and in the IPI).[5] Easy access to the patent information available in the TISC focal points has the potential to encourage localised use (and follow-on adaptation) of biofuels technologies of the kind identified by our patent landscaping exercise (and listed in the Appendix to this chapter). The TISC seems to have come at the right time for Mozambique, as it potentially constitutes a crucial bridge between local innovators and the fast-moving innovation systems of the developed world.

Also needed, in our analysis, is strong cooperation – with a clear division of roles – among Mozambique's research institutions, innovators, local industrial concerns and small-scale producers of feedstock – in order to potentially ignite the rise of localised small-scale processing and use of biofuels in Mozambique. The policy and legal instruments that emerge from the NPSB and the Inter-Ministerial Committee on Biofuels must thus provide concrete mechanisms to

5 In December 2011, WIPO reported that TISCs were active in 10 African countries (see WIPO, 2011b).

promote, facilitate and enable the identification of SME-appropriate, environmentally and economically sustainable technologies for the production of biofuels in Mozambique.

Also to be encouraged is informal technology transfer of the kind we found being practised by the ADPP NGO project, i.e. transfer of technology from Tanzanian small-scale farmer groupings to a Mozambican small-scale grouping. This is an example of African innovators transferring knowledge, on an open access basis, for the common good. Broad availability of locally developed technologies has the potential to boost and spread innovation in Africa. This successful free and open transfer of localised knowledge from rural communities in Tanzania to rural communities in Mozambique hints at the fact that focusing on development and sharing of local technologies could be a key path towards innovative, localised biofuels production in Mozambique (and elsewhere in Africa) that is sustainable in economic, environmental and social terms and, in turn, drives equitable socio-economic development.

It is urgent that the two key pillars of the NPSB of 2009 – the National Agenda for Research and Innovation in Biofuels and the National Programme on Biofuels Development – be implemented. To achieve the purpose for which they were created, it is fundamental that the two initiatives:

- prioritise processing of biofuels by small industrial units or local communities;
- promote identification and use of simple technology used in rural areas in other African countries, Brazil and India;
- encourage transfer of technologies, especially for use by SMEs, through appropriate incentives;
- encourage use of patent information and technological information services provided by TISC focal points to identify appropriate biofuels technology;
- promote synergies between research institutions, innovators, local industry and producers in order to identify non-protected technologies and provide for adaptation of such technologies to fit local needs;
- liaise with the National Programme for the Promotion of the Mozambican Innovator, developed by the Ministry of Science and Technology, in order to direct local innovation initiatives towards biofuels technologies; and
- promote the use of utility models, as recognised in the IP Code of 2006, by local innovators.

Appendix 11.1: Biofuel patents granted in Mozambique, 1999 to 2012

From the Patent Cooperation Treaty (PCT) International Bureau in Geneva:

- *Treatment of crude oils* – WO/2000/AU01390 (RMG Services, Australia);
- *Biodiesel fuel production from used vegetable oils for diesel engines, involves performing trans-esterification using triglyceride on used vegetable oils to form methyl ester compounds, and neutralising and purifying methyl ester compounds* – ES20050001805 (Fundacion Cidaut, Spain);
- *Biofuel composition and method for producing biofuel* – WO/2007/127059 (New Generation Bio Fuels Inc., US);
- *Algae Growth for Biofuels* –WO/2008/151373 (Nickolas Mitropoulos, Australia);
- *Integrated multistage supercritical technology to produce high quality vegetable oils and biofuels* – WO/2008/101200 (University of Syracuse, US);
- *Process to produce biodiesel and/or fuel oil* – WO/2008/BR00128 (Ouro Fino Participações e Empr, Brazil);
- *Production method of biofuel from pumpkin* – KR/2008/0045255 (Lee Jang Hoon and others, South Korea);
- *Procedure for the production of biofuel from organic wastes* – WO2009/101647 (Università degli Studi di Milano, Italy);
- *A biofuel composition, process of preparation and a method for fuelling thereof* – WO/2009/004652 (Big Tec Private Ltd., India);
- *Efficient operation of a biomass fermentation plant, comprises fermenting a fermentation substrate in a biogas plant and subsequently energetically utilizing the obtained biogases in a combined heat and power unit* – DE200910024536 (LTS Leipziger Technologie Serv, Germany);
- *Method for producing biofuel using marine algae-derived galactan* – WO/2010/131844 (Korea Institute of Industrial Technology, South Korea);
- *A biofuel composition, process of preparation and a method for fuelling thereof* – WO/2010/0412661 (Big Tec Private Limited, India);
- *Synthetic fuels and chemicals production with in-situ CO_2 capture*, WO/2011/031752 (Fanxing and Zeng Liang, US); and
- *Process and apparatus for extracting biodiesel from algae* – US/2008/0999794 (Echevarria Parres Antonio Jose de Jesus de San Juna, Mexico).

From ARIPO in Harare:

- *Biofuel production* – AP/P/2010/005413 (University of the Witwatersrand, Johannesburg, South Africa).

From applications made directly to the IPI in Maputo:

- *Method for controlling diseases of jatropha* – P175/2010 (Sumitomo Chemical Company, Limited, Japan); and
- *Method for controlling weeds in jatropha-inhabiting place*, P161/2009, P162/2009, P163/2009 (Sumitomo Chemical Company, Limited, Japan);

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Decree No. 04/2006 of 12 April 2006 establishing the Industrial Property Code (IP Code, 2006), available at: www.wipo.int/wipolex/en/text.jsp?file_id=128888 (accessed 13 April 2013).

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Decree No. 7/2011 of 26 July 2011 establishing an Inter-Ministerial Committee on Biofuels – *Decreto Presidencial No. 7/2011 de 26 de Julho de 2011, cria a Comissão Interministerial de biocombustíveis, in BR, I série No. 29, 20 de 26 de Julho 2011.*

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