

Proceedings of the 2010 ATPS ANNUAL CONFERENCE & WORKSHOPS

25 - 30 November 2010 | Conrad Hilton | Cairo, Egypt

Edited by Prof. Kevin Urama Dr. Nicholas Ozor Wairimu Mwangi



The State of Science, Technology & Innovation in Africa:
Implications for Achieving the Millennium Development Goals

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Edited by
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Executive Director, ATPS

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The African Technology Policy Studies Network (ATPS) is a multidisciplinary network of researchers, private sector actors and policy makers promoting the generation, dissemination, use and mastery of science, technology and innovation (ST&I) for African development, environmental sustainability and global inclusion. ATPS intends to achieve its mandate through research, capacity building and training, science communication/dissemination and sensitization, participatory multi-stakeholder dialogue, knowledge brokerage, and policy advocacy.



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The entire Secretariat team of the ATPS played a crucial role in the success of the event. We thank them all for their various contributions and facilitations. We are particularly grateful to Dr. Nicholas Ozor, ATPS Senior Research Officer who led the team that prepared this proceeding including Ms. Carol Thuku, Mr. Nelson Akenga, Ms. Wairimu Mwangi, Mr. Ernest Acheampong, Ms. Michele Mbòo Tchouawou, Ms. Edel Kwoba and Ms. Jacinta Kahi.

Prof. Kevin Urama

Executive Director

ATPS

About ATPS African Technology Policy Studies Network

ATPS is a multi-disciplinary network of researchers, private sector actors, policy makers and civil society actors promoting Science, Technology and Innovation (STI) generation, use and mastery for development in Africa. Its vision is to become the leading international center of excellence and reference in STI systems research, training and capacity building, communication and sensitization, knowledge brokerage, policy advocacy and outreach in Africa. ATPS is a key institution in Africa with significant experience and mastery in knowledge generation (through Research and Training), knowledge brokerage (through stakeholders dialogue), knowledge dissemination and outreach (through publication, STI journalism and policy advocacy), and knowledge valorization (through innovation challenge programs). ATPS collaborates with relevant institutions within and beyond Africa to achieve knowledge sharing, and use through research and capacity building, international cooperation and partnership, and youth and gender empowerment.

It acts as a broker between knowledge and technology generators, the policy makers, the private sector, and the local communities on the one hand, and between regions and countries on the other. The institution's reach-out mechanism and reach-out systems include Research Capacity Building (RCB), Training and Sensitization (TS), Communication and Stakeholder Dialogue (CSD), Outreach, Knowledge Brokerage and Policy Advocacy (OKBPA), International Cooperation and Partnership (ICP), Youth and Gender Empowerment (YGP), and Participatory Monitoring and Evaluation (PME).

With a regional secretariat in Nairobi, ATPS operates through national chapters in 29 African countries including Diaspora chapters in Europe and the United States of America (USA). ATPS has an expansion plan to cover the entire Africa. The ATPS has since been involved in many funded Research, Capacity Building and Advocacy programs in Africa on issues of STI including, but not limited to Climate Sense program, Agricultural Innovation program, Health Innovation program, Water and Sanitation, Socialization of Science, Research Policy and Practice Linkages, among others.

Abbreviations & Acronyms

AFSJ African Federation of Science Journalists

AID-ME Academy for International Development – Middle East

AMCOST African Ministerial Council for Science and Technology

ANDI African Network for Drug Diagnostic Innovation

ANPA Association of Nigerian Physicians in the Americas

ARIPO African Regional Intellectual Property Organization

ARU Ardhi University

ATPS African Technology Policy Studies Network

AU African Union

AWFST African Women Forum for Science and Technology

AYFST African Youth Forum for Science and Technology

BRIC nations Brazil, Russia, India and China

BTA Biotechnology Trust Africa

CPA Consolidated Plan of Action

CSD Communication and Stakeholder Dialogue

CSIR Council for Scientific and Industrial Research

CTA Technical Center for Agricultural and Rural Cooperation

EJUST Egyptian Japanese University for science and technology

EMA Environment Management Agency

EUMETSAT European Organisation for the Exploitation of Meteorological Satellites

FDI Foreign Direct Investments

FIRMS Fire Information for Resource Management System

GDP Gross domestic product

GERD Gross Expenditure on Research and Development

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GHG Greenhouse Gases

GIV Generic and Incremental Value

GLORIA Global Research in International Affairs

GSM General Skilled Migration

HCST High Council for Science and Technology

HSMP Highly Skilled Migrant Program

ICP International Cooperation and Partnership

IHSS Institute of Human Settlement Studies

IKC Indigenous Knowledge Center

IPR Intellectual Property Rights

LOC Local Organizing Committee

MDGs Millennium Development Goals

MSG Meteosat Second Generation

NAPPSA Nigerian Association of Pharmacists and Pharmaceutical Scientists in

America

NASA National Aeronautics and Space Administration

NCST National Commission for Science & Technology

NEPAD New Partnership for Africa's Development

NSC National Steering Committee

NSI National System of Innovation

NUS Nigerian University Systems

OECD The Organisation for Economic Co-operation and Development

OKBPA Outreach, Knowledge Brokerage and Policy Advocacy

OSF Open Society Foundation

OSI Open Society Institute

PME Participatory Monitoring and Evaluation

R&D Research and Development

RCB Research Capacity Building

S&T Science and Technology

SADC Southern African Development Community

SET-DEV Science, Ethics and Technological Responsibility in Developing and

Emerging Countries

STDF Science and Technology Development Fund

STEPRI-CSIR Science and Technology Policy Research Institute- Council for Scientific

and Industrial Research

STI Science, Technology and Innovation

STM Science, Technology, and Mathematics

STR Scientific and Technological Research

TK Traditional knowledge

TS Training and Sensitization

UNESCO United Nations Educational, Scientific and Cultural Organization

WIPO World Intellectual Property Organization

WNCH Women 'n' Children's Health

YGP Youth and Gender Empowerment

YIAP Young Innovators Awards Program





1.1 Introduction

The Millennium Declaration set 2015 as the target date for achieving most of the Millennium Development Goals (MDGs), which established quantitative benchmarks to halve extreme poverty in all its forms. As the date approaches, the world finds itself mired in an economic, social, and environmental crisis that is unprecedented in its severity and global dimensions. Incidentally, Science, Technology and Innovation (STI) underpin every one of the MDGs and hence become prerequisites for development. Abundant evidences show that ccountries that deliberately invested in science and technology have gained much success in improving the quality of life of their citizens. The deliberate investment in STI is, therefore seen as one of the most crucial priorities for any country to realize its short term, medium term and long-term development objectives. This is because STI are now universally recognized as the drivers of national economic development, and key contributors to poverty reduction, disease prevention, universal education, environmental conservation, and global partnerships which are the key focus of the MDGs.

Africa, replete with abundant natural resources, intellectual capital, indigenous knowledge and culture has a comparative disadvantage in overall development because of poor governance and political instability; conflicts; low human capacity and outputs; escalating growth in population; food insecurity; poverty; malnutrition and disease; and most importantly, low science and technological investment. The continent has most often adopted a short term view to human development and has continued to rely on external financial support often targeting short-term activities and solutions. As a result, the continent has failed to invest adequately in science, technology and innovation as sources and drivers of economic growth and long term sustainable development. This is evident in Africa's low and declining public expenditure on Research and Development (R&D) which has made Africa lag behind in key science, technology and innovation indicators. It becomes imperative therefore to review the state of STI in the continent. Strengthening capacity in STI through investments in research and development by African countries can lead to the much desired sustainable development. This can be achieved through policies, programmes, institutions and partnerships.

The African Technology Policy Studies Network (ATPS) and its partner, the Academy for International Development – Middle East (AID-ME) organized a 5 day international conference and workshop from 25 – 30 November 2010 in Cairo, Egypt. The strategic objective of the meeting was to discuss issues under the theme "The State of Science, Technology and Innovation (STI) in Africa: Implications for achieving the MDGs" with a view to reviewing the status of STI in Africa, identifying existing gaps therein, and most importantly chart a proactive way forward for achieving sustainable development in Africa through STI capacity building and utilisation, and strategic policy planning.

The conference and workshop brought together one hundred and seventy delegates representing various stakeholder groups, institutions and professions, resource persons, development partners within and outside Africa, donors, and friends of the ATPS.

1.2 Conference Sub-Themes

The ATPS believes that strengthening Africa's capacity in STI is the necessary condition required for the much desired development of African economies and global sustainability, including meeting the MDG goals. The conference offered the opportunity for stakeholders to deliberate on the following interlinking sub-themes and set the agenda for ATPS allied institution's activities to leap frog STI development in Africa:

i. Governance of Science, Technology and Innovation in Africa: The sub-theme addressed issues of policies and legal frameworks necessary for Africa's development through STI. It covered the new policy directions required to respond to a changing world; examine the national systems of innovation; research and innovation policy; labour market and higher education policy; the governance of innovation and international policy advice that is reshaping the contours of STI governance in Africa.

- ii. Investments in Research and Development (R&D) in Africa: The sub-theme addressed issues of R&D investments by both governments and private sectors. This included policy and institutional mechanisms necessary for domestic R&D and Foreign Direct Investments (FDI) as a carrier of new scientific knowledge and related technological innovations; role of collaboration between universities, private sectors and research in fostering innovation. It also included the challenges to R&D investments in Africa and the way forward.
- iii. **STI indicators:** The sub-theme dwelt on the numerous indicators for measuring science, technology and innovation and the status of countries in Africa. It covered the scientometric analysis based mainly on bibliometric (number of publications) and patent indicators. It provided comparisons of STI indicators between Africa, the rest of the developing societies and the developed societies. It emphasized the roles of the African STI Observatory, African STI Indicators Initiative in defining Africa's common STI Indicators.
- iv. **STI** and development in Africa: The sub-theme addressed the current status of STI across African countries and developed scenarios for future developments in the sector. It covered the innovative approaches in tackling STI challenges; current role of scientific community in Africa gaps/challenges in S&T development in the continent, major S&T issues on the continent, way forward; ICT role for advancing S&T in Africa roadmap, opportunities, challenges; issues related to access to scientific knowledge status of access, limitations to access, areas concerned; requirements for sustainable STI in Africa including research, publications, patents, resources, management, etc.
- v. **Gender issues in STI:** The sub-theme addressed the roles of women and youths in STI development in Africa. It covered issues on STI enrolments in schools by gender; gender equity efforts in science and technology education and future directions for research; features of educational innovation and teachers' work that affect attempts to achieve such equity; challenges and opportunities for women and youth participation in STI in Africa; and gender mainstreaming in STI for Africa's development.
- vi. Knowledge management and Intellectual Property Rights (IPR) and STI development: The sub-theme addressed issues on how to harness science and technology for sustainable development through the protection of intellectual capital and the access to technology and innovations. It covered areas such as the traditional knowledge system; the framework for ensuring that local people share in the benefits arising from the appropriation and use of their knowledge and of the biological resources of their environment; the international agreements on IPR for STI development; policy and institutional issues for STI development in Africa; and standards, norms, guidelines and options, which African countries can rely on for protecting their indigenous knowledge, technological know-how and biological resources for economic growth and sustainable development.

1.3 Conference and Workshop Objectives

The overall purpose of the conference was to examine the state of science, technology and innovation in Africa and derive implications for achieving the Millennium Development Goals. Specifically, the conference was meant to:

- apprise African policymakers, science experts, private sector actors, and civil society on the current state of STI in Africa;
- equip African policymakers, science experts, private sector actors, and civil society with the necessary skills for the formulation and implementation of integrated STI policy responses to the current global challenges, and better understanding of the implications of no action;
- iii. build a network of experts across Africa who can provide genuine leadership and direction for enduring STI development in their respective countries and regions;
- equip delegates with the necessary information for active participation in strategic global dialogues on relevant STI policy issues such as climate change, global food crisis, biodiversity and ecosystems services, global financial crisis and other response strategies,
- popularise the concepts of socialisation of Scientific and Technological Research (STR) in Africa;
- vi. popularise the need for building Responsible National Systems of Innovation as bedrocks for STI development in African countries;
- vii. initiate process towards building framework for an innovation through enhancing intellectual property rights and knowledge appropriation strategies in Africa;
- viii. inform strategic inter-ministerial, trans-disciplinary, inter-sectoral, and international collaboration and knowledge sharing in addressing the challenges of low investment in STI in Africa and its implications for achieving the MDGs; and
- ix. launch the following on-going STI response actions by the ATPS and its partners, including:
 - the Biennial Report on STI in Africa
 - The African Manifesto for Science Technology and Innovation
 - The Climate Change Innovation Award

1.4 Expected Outcomes

The following outcomes were expected to emerge from the conference and workshop:

- A clear understanding of the current state of STI in Africa, including the existing gaps and the way forward towards realizing the MDGs by relevant stakeholders.
- A clear understanding of the roles of relevant stakeholders in ensuring that an enduring development is achieved in Africa through STI.

- iii. The formation of key STI stakeholder network across Africa that could support development initiatives in the sector from among the policy makers, science experts, private sectors and the civil society.
- iv. Launching of the initiative on Biennial Report on STI in Africa, The African Manifesto for STI and the Climate Change Innovation Challenge.
- v. A peer reviewed conference proceedings published as a book.

1.5 Conference and Workshop Methodology

The conference and workshop lasted for 5 days and adopted a dynamic participatory process which encouraged networking activities, knowledge circulation and collaborative strategic planning. It took the following formats:

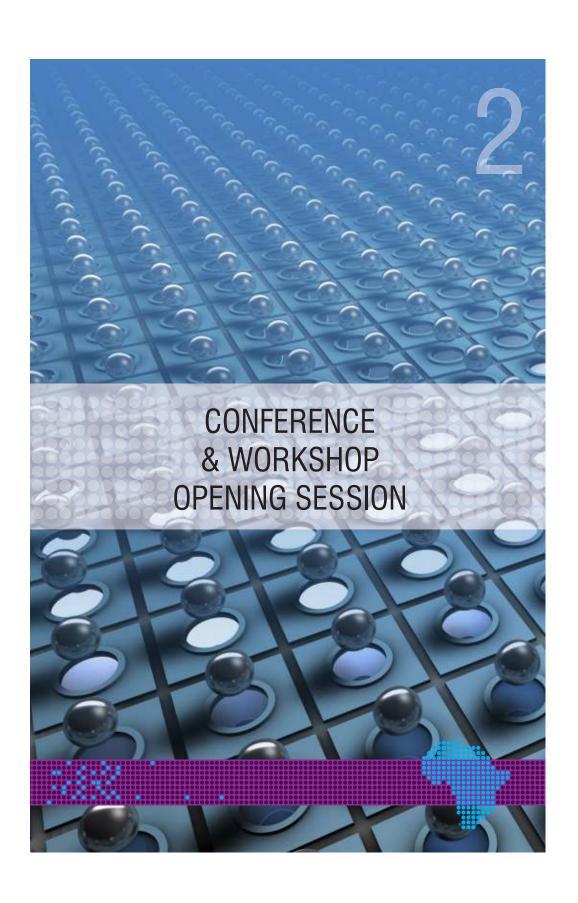
- > Plenary Sessions: This involved keynote speeches by selected international experts in the different thematic areas, followed by facilitated brainstorming sessions to fill knowledge gaps and address questions arising;
- > **Facilitated Parallel Breakout Sessions:** This involved presentations by invited participants based on the conference sub-themes and ATPS strategic activity lines;
- Plenary Participatory Dialogue: This involved participatory discussions aimed at framing common response strategies; research and policy priorities and way forward for realizing Africa's development through STI.

1.6 Venue and Date of the Conference and Workshop

The ATPS 2010 Annual Conference and Workshop was held at the Conrad Hilton Hotel, Cairo, Egypt from 25 – 30 November 2010.

1.7 Supports for the Conference and Workshop

The 2010 Annual Conference and Workshop was organized by the ATPS in collaboration with the Academy for International Development – Middle East (AID-ME).





2.1 Opening remarks by Ms. Manal Samra, ATPS Focal Point Coordinator for the Egypt Chapter



The opening session of the event had kicked off by 9:25 hours with welcoming remarks by Ms. Manal Samra, ATPS Focal Point Coordinator for the Egypt Chapter. Ms. Samra welcomed all the delegates to the meeting on behalf of other ATPS national chapter coordinators, AID- ME, and the local organizing committee members in Egypt and from the Secretariat in Nairobi. She reflected on her journey with the ATPS as that of a development initiative to bridge the gap between Egypt and the rest of Africa. She specifically thanked the ATPS for playing the leading role in Science, Technology and Innovation (STI) for sustainable African

development through their networks in 29 African countries and in Diaspora and also in engaging relevant stakeholders including the policymakers, private sector actors, science experts and the civil society groups towards the achievement of sustainable development in Africa. She concluded by inviting all delegates to share with each other the vast experiences, knowledge and expertise that each had brought to the meeting so as to develop an appropriate

way forward towards the attainment of Millennium Development Goals (MDGs) in Africa through STI development. The session was chaired by Prof. Maged El-Sherbiny, President Academy of Scientific Research and Technology and Assistant Minister for Scientific Research in Egypt who also represented the Egyptian Government during the occasion.

2.2 Remarks by Mr. Marsden Momanyi, Chair, Executive Conference Organizing Committee (ECOC)



The Chair of the conference organizing committee, Mr. Marsden Momanyi welcomed the delegates to the conference. He emphasized the reason for the choice of Egypt as a venue for the conference and workshop tracing the origin of STI development to Egypt. He reminded delegates that ATPS is a multidisciplinary network of scientists, researchers, civil society actors, private sector actors and policymakers, thereby conferring on each delegate present at the conference a stakeholder role at the ATPS. He thanked the members of the conference organizing committee especially the local organizing committee members in Egypt for their commitment and

hard work in organizing the 2010 ATPS Annual conference and workshop. He also thanked the ATPS management, the Board and Chair of the Board, Prof. Sam Wangwe for their commitment and support for ATPS matters and events. He described his role in the conference as not only that of the Chair, ECOC, but also as the Coordinator of the African Youth Forum for Science and Technology (AYFST) and an Acting Senior Communication Officer at the ATPS. He encouraged delegates to register properly for the conference and obtain the conference package.

2.3 Remarks by Dr. George Essegbey, Director, STEPRI-CSIR, Accra, Ghana and representative of the National Chapter Regional Council



Dr. George Essegbey, on behalf of the National Chapter Regional Council members, welcomed the delegates to the conference and workshop and expressed his satisfaction for the choice of Egypt as the venue for the 2010 ATPS conference because civilization which is part of STI started in Egypt citing the construction of the Egyptian Pyramids as an example. He therefore traced the conference theme 'STI development' as being in tune with the choice of Egypt as the venue for the conference. He congratulated the ATPS Focal Point Coordinator; Ms. Manal Samra and her team and the entire Egyptian people for hosting the conference. He noted that the ATPS had

grown recently from strength to strength as is reflected in its increased membership, more programs and more chapters. He envisioned that the conference would come out with very useful decisions and recommendations that will impact positively on ATPS' progress and the network and also chart the way forward for the realization of MDGs in Africa through STI development.

2.4 Remarks by Prof. Norah Olembo, Patron of the African Women Forum for Science and Technology (AWFST)



Prof. Olembo, Patron of the African Women Forum for Science and Technology (AWFST) welcomed the delegates and thanked the Egyptian Chapter and the ATPS for providing such a comfortable venue for the conference and especially for women delegates for attending the conference. She demanded applause for the women present from the audience and this was given to them. Prof. Olembo reiterated the decision to strengthen the role of women in STI which had been emphasized during the Abuja conference in 2009 stressing that women needed to rise up and hold hands with their male counterparts and move STI development forward for the benefit of

the African people. She expressed satisfaction with the venue of the meeting noting that it is historic for the ATPS and its stakeholders and enjoined delegates to take advantage of their participation to explore the beauty and historic places in Egypt. She further expressed delight with the large turnout of delegates for the conference noting that this would create good opportunity to discuss the state of STI in Africa and it's implication for achieving the MDGs. She noted that STI development in Africa is growing, laying emphasis on the relaxation of opposition to the genetically modified products in Africa. She said that this will create enabling environment to fast track STI development in the area to be able to reduce hunger and malnutrition in the continent. She gave an example of Kenya where GM cotton is currently being grown by farmers while maize and other crops are in the pipeline. She remarked that the STI development in Africa is beginning to bear fruit though more efforts are needed to realize a sustainable feat. She further noted that we needed appropriate laws and infrastructure to effectively and efficiently develop STI in Africa.

2.5 Remarks by Prof. Agnes Mwangombe, Chair, African Women Forum for Science and Technology and ATPS Board member



Prof. Agnes Mwangombe, Chair, AWFST and an ATPS Board member welcomed the delegates on behalf of AWFST and thanked Ms. Manal Samra, ATPS Focal Point Coordinator in Egypt and her LOC members for ensuring that the conference was held in Egypt. She pointed out that AWFST was launched in July 2009 in Mombasa and had successfully organized a conference in Ghana in 2010. She noted that the conference afforded the Forum to map out strategies

and initiatives to embark on under the ATPS umbrella. She cited the development of the Forum's Fliers, development of WE CAN Program and upgrading of the Forum's website as examples of their current efforts. She encouraged all women to register as members and emphasized that membership spread across countries where ATPS has its presence including the Diaspora Chapters in USA and Europe. She emphasized the Forum's commitments to continue to contribute towards Africa's development in STI using both in-house and Diaspora expertise and skills.

2.6 Remarks by Mr. Tennyson Magombo, Chair, African Youth Forum for Science and Technology (AYFST)



Mr. Tennyson Magombo, Chair of the African Youth Forum for Science and Technology (AYFST) welcomed delegates to the conference on behalf of the AYFST. He emphasized the potentials of African youths for STI development. He maintained that youths in Africa are passionate to free its people from hunger, poverty, diseases and other problems bugging the continent. He especially thanked his fellow youths and especially their mentors who attended the conference for their steadfastness in African development initiatives through youth programs. He likened the African youths and their potentials to the story of a farmer who was rearing chicken,

and then one day found the egg of an eagle in the bush.

The farmer took the egg and mixed it with the chicken eggs that were being brood. When the eggs hatched, the chicks came out and the little eagle also came out. The little eagle grew up among the chicks and could do everything the chicks did. This little eagle could eat grains, could run up and down just as the chicks. Then one day the farmer felt so sorry for the little eagle because he knew that this is an eagle and not a chick, so he picked the eagle and told the eagle 'you are an eagle you can fly'. The farmer then threw it up in the air but the eagle failed to fly because it had not been trained on how to fly even though it could fly. The farmer felt sorry and took the eagle again another day, threw it in the air, the eagle tried to flap its wings a bit but fell on the ground again. The farmer nearly cried and he spoke so strongly to this little eagle and said 'you are an eagle you can fly'. The third time he threw it in the air and the eagle tried to flap the wings and then the eagle realized that it could fly and then it flew away. It then realized that it was not a grain eagle but a fish eagle.

Mr. Magombo noted that the potential to fly was in the little eagle but it could only realize it after several trials and mentorship by the farmer. He noted that this is the case of the African youth today stating that there is a lot of potential in the youth.

"There is need for the youths to realize the potential that is within them. But there is also need for our mentors to build the capacity of the youths to realize their potential. African youths comprise a huge pool of talent and energy that is currently not being fully exploited. Given the opportunity, the African youth can be an important driver of change. They have the potential to lift the continent out of poverty. I take ATPS as a farmer in my story, who is telling the youths in Africa that there is potential in you. As Dr. Kevin Urama, Executive Director ATPS usually puts it, 'youths are the powers of Africa' and the AYFST strongly believes that we are the powers of Africa indeed".

Mr. Magombo further emphasized that Africa cannot develop without the youths. In recognition of that, he noted that the ATPS has done well in building the capacity of the youth through various programs under STI policy research and policy implementation. He cited example in 2005 when ATPS in collaboration with CTA, The Netherlands initiated the formation of African Youth Forum for Science and Technology (AYFST) which was launched in Ghana. Since then, AYFST has provided a youthful platform for young African professionals to build capacity in science, technology and innovation policy research, policy dialogue and policy safe practice. Also in July 2009, ATPS launched a youth innovation challenge program dubbed WHY I CAN designed to build a culture of innovation among people in Africa by promoting innovation through targeted collaboration partnerships with researchers, private sector actors and policy makers. Other programs aimed at the youth are the Youth internship and post-graduation fellowship program, integrated leadership and apprenticeship training, and the integrated peer to peer collaboration. Emphases are laid on agriculture, health and environment, which include climate change and sustainable management of eco-system services under the different youth programs.

Mr. Magombo concluded his remarks with a quote from Martin Luther King which states that "we begin to die the moment we stop to do something about the things that matter." As youth in Africa, we realize that the moment we stop doing anything, then that is the beginning of our dying. So we will not stop, we will fight on. He also gave another quote from John F. Kennedy which states that "If our free society cannot save many who are poor, then it cannot save a few who are rich." In the same vein, if our science, technology and innovation cannot save many who are poor in Africa, then it cannot save a few who are rich. There is need for Africa to come up with appropriate technologies that can be translated into development projects and change lives of many Africans. This is our challenge and as the youth, we will not sleep nor give up until we see a new Africa free from hunger, poverty and diseases. Africa as a continent needs action to build the capacity of the youth today for Africa's sustainable development tomorrow. ATPS is committed to do that but needs government and donor supports at various levels. This is our (youth) call to conscience and action.

2.7 Remarks by Mr. Diran Onifade, Chair, African Federation of Science Journalists (AFSJ)



Mr. Onifade, Chair of the African Federation of Science Journalists (AFSJ) welcomed delegates on behalf of the AFSJ. He appreciated the style of ATPS in recognizing the Journalists in the mainstream of events and emphasized the need to continuously communicate STI information to targeted audience using appropriate channels. He noted that before then, journalists were not involved in the mainstream of events but would be required to communicate credible news to the public. This became difficult as many journalists did not meet up to this because they were not involved ab initio in the mainstream of events. He commended the ATPS for leading this

change of getting journalists involved in key issues like STI for African development. According to him, "this is a whole lot of progress that ATPS has thought it fit that we (journalists) should be on the high table and will participate in every event during this conference and workshop. I say this is a whole lot progress, because even we journalists are worried on how much of science gets to the end users, to the industry, to the man on the street whose attitude needs to change as a result of science, technology and innovation development. I would say very little of this because the media as the medium in between does not get carried along. Now that this is happening, I think things will change towards the millennium". He concluded by emphasizing that journalists also need a lot of mentoring and training to be able to appreciate and communicate STI effectively for overall African development.

2.8 Remarks by Mr. Rhett Bowlin, Director, Higher Education Programs, Open Society Foundation (OSF)

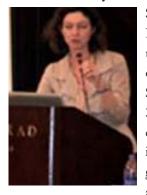


Mr. Rhett Bowlin, Director of Higher Education Programs at the Open Society Foundation (OSF) formerly Open Society Institute (OSI) welcomed the delegates and stressed the fact that ATPS is on track in promoting STI today for Africa's sustainable development tomorrow. He emphasized OSF's commitment in building climate change adaptation capacity in Africa which the ATPS has keyed into to take forward.

This point of convergence will enable OSF learn more about Africa and what it can offer for climate change adaptation capacity. He

remarked that the Executive Director of ATPS, Dr. Kevin Urama is on the Advisory Board of OSF thereby affording ATPS the opportunity to participate in many programs of the Foundation.

2.9 Remarks by Susan Schneegans, Editor, UNESCO Science Report, 2010



Susan Schneegans of UNESCO Paris and Editor UNESCO Science Report 2010 welcomed the delegates and expressed her happiness towards the invitation extended to her by ATPS to attend the conference. She noted that she would be presenting the UNESCO Science Report 2010 which had been launched earlier in November 2010 in Paris during the conference. She pointed out that the document is a status Report that comes out every five years with full information on the state of STI during the five year period across the globe. She was happy to inform the delegates that the first two authors of the sub-Saharan African Chapter are from the ATPS

namely; Dr. Kevin Urama and Dr. Nicholas Ozor. The other co-authors are Ousmane Kane and Mohammed Hassan. She concluded by stating that she would also be speaking about the highlights on North Africa as contained in the Report later during the conference.

2.10 Remarks by Dr. Kevin Urama, Executive Director, ATPS



The Executive Director of ATPS, Dr. Kevin Urama welcomed delegates to the unique conference and workshop in Egypt aimed at discussing the future of science, technology and innovation in Africa. He emphasized the need for regional integration especially in the movement of Africans within the continent to be able to engage in the business of developing the continent. He regretted that currently some African countries pose enormous barriers to free movements of Africans into their countries and decried this as a bane for African development and charged delegates to come up with solutions to this problem during the conference. He remarked

that in the workshop, not talk shop, we aim to chart the way forward for STI development by Africans and for Africa, a kind of development that is home-grown taking into account the peculiarities of the African continent.

He thanked ATPS partner in Egypt, the LOC and AID-ME in particular for hosting the conference and for their numerous support especially in aiding the entry visas of delegates to Egypt for the conference and workshop. He extended his sincere appreciation to the Egyptian Government led by Prof. Maged El-Sherbiny, the President of Academy of Scientific Research and Technology and Assistant Minister for Scientific Research; Prof. Samuel Wangwe, Chair of the ATPS Board; Prof. Peter Ongo Alogo representative of the Nigerian Government; representatives of the ministries of science and technology from different countries present at the meeting; other Board members of the ATPS, distinguished members of the press; and other categories of ATPS stakeholders present at the meeting.

Dr. Urama reiterated ATPS' belief in Africa's sustainable development through STI. According to him, we should be eager to be part of solution providers rather than continuing to lament on our numerous problems and challenges. A case example is the ATPS efforts in the development of the African Manifesto for STI which would be launched during the conference. He noted that Africa needs robust science, technology and innovation base in order to move forward in development. By this, we need to better understand our strengths, weaknesses and opportunities and synthesize them in order to make sure that we better define our science and technology, better govern them, harness them, implement them, monitor and also evaluate them. ATPS as you know is a multi-disciplinary network and we pride ourselves with working with the quadruple helix including the policy makers also the private sector, the science experts and the civil society in knowledge brokerage, capacity building, knowledge generation and also utilization of science, technology and innovation for addressing the day to day problems of the Africans. He felt pleased and confident that the full representation of relevant stakeholders in the meeting will add tremendous value in charting a proactive way forward in sustaining African development through STI. This would be achieved through a clear understanding of what each delegate needed to do at the end of the conference to contribute to this mission. Dr. Urama particularly implored the African Union Commission and the African Ministerial Council on Science and Technology (AMCOST), which is chaired by Egypt, and all the other regional bodies to come forward with clear milestones on how to realise Africa's development through STI. He requested the Chair of the session who is also the President of the Egyptian Academy of Sciences and Assistant Minister for Scientific Research, Prof. Maged El-Sherbiny to facilitate the institutionalization of the ATPS in the Ministry of Science and Technology in Egypt.

Dr. Urama maintained that the 2010 ATPS Annual Conference and Workshop will not just be another conference stressing on the need for delegates to come out with practical solutions that will help Africa to develop through STI. He gave an analogy of an editorial captioned "Give me a conference of achievement." In this editorial, the author Mr. Vesin likened the repeated self-flagellation that we have in Africa's conferences to lecturing a poor person on the state of his or her poverty and telling him or her that poverty is not a good state to be in. The author wondered, "Do you really need to tell him or her? Do you feel what he feels? Would it not have been better to show him a way out?" A few people, Dr. Urama noted, will not point out the tremendous achievements that Africa has made in the most difficult circumstances of its development struggle. They present charts and charts of poverty, tones and millions and billions of people living under one dollar a day and leave to proffer solutions. The author of the editorial further argues, "Do all these harsh critics of Africa have any solutions to offer? 'Enough' he says, with meaningless conferences of despair. Give me conferences where successful people can show me how to succeed and I will walk many miles to attend." Dr. Urama further expressed that he could not agree more with the author of the

editorial pointing out that the ATPS believes that Africa can come out of poverty and it can only do that through scientific, technological and innovation capacity building. ATPS believes that Africa can achieve the Millennium Development Goals and it can only do that through STI. He emphasized that increasingly, the measure of a nation's wealth will depend on the knowledge it accrues and how it applies it, rather than the resources it controls. Otherwise Africa would have been the America of the world today. The land mass we have can swallow the whole of Europe and South America.

The natural resources we have are enormous and actually powered the Industrial revolutions of the 18th century. But where are we? It is my firm belief that the reason is that we do not have enough critical mass of home-grown scientific, technological and innovation capacity in the continent to be able to harness, use and nurture these resources in order to ensure value addition to what we have.

He lamented that what we do in Africa is to engage in primary exports where we sell our primary resources for few dollars per tonne and buy the value added processed ones at thousands of dollars a tonne. We cannot continue that way. This is why we are now here to negotiate and try to chart a way forward to come out of this quagmire that has withheld the resource cost in economics. The challenge is therefore, for us to engage individually and make sure that we provide solutions. Let us be part of the solutions in charting the way forward and forget the litany of problems that we all know too well or should I say, that is sometimes orchestrated to inform the dependency syndrome that has ailed Africa for a long time. It is in this direction that ATPS and its partners are launching the African Manifesto for Science, Technology and Innovation.

The manifesto, which is a sister product to another manifesto for India and also a global manifesto that was done by a Research Center launched at the Royal Society in London in July 2010, in all, are efforts to rethink in new directions and new pathways for innovation and for seeing the problems we have as challenges and opportunities for progress. He remarked that if there were no problems, there would be no solutions and STI is knowledge used to solve problems.

Ironically, the African Manifesto has been funded by the European Union not by African governments. Only Nigeria has contributed funds to the activities for developing the manifesto through different agencies that have worked on it. And then I ask myself the question. Can we really develop from outside? I don't have an answer. But I think after this meeting, we may think of how to really engage in STI so that we can move forward in our development struggle.

He further noted that Africans must begin to build our scientific and technological training capacity or we will remain an impoverished appendage to the global economy. Our time to act is now. And the period for us to participate is now and on-going. The conference proceeding is therefore planned in a very participatory manner to make sure that your voices are heard. Your dreams are articulated and the actions that you can do are documented and taken forward. We would like to see that we unleash the power for STI entrepreneurship after this conference in you, in me, in our countries, in the AU Commission, within our youths, within our women so that we can think freely, think outside the box and become more trans-disciplinary in thinking, in order to be able to move Africa forward.

2.11 Remarks by Prof. Samuel Wangwe, Chair, ATPS Board

The Chair of ATPS Board of Directors, Prof. Samuel Wangwe welcomed delegates to the conference and expressed his appreciation of the cream of STI actors that attended the conference. He thanked the LOC and ATPS Secretariat for a well-organized conference and workshop which had drawn expertise from a well-balanced stakeholder group, gender and discipline. He noted that the diversity of delegates will enhance the discussions on how to improve African development through STI.

He reflected on his 25 years' experience as a researcher, policymaker, politician and private sector actor which has proved that science, technology and innovation underpin development initiatives of any sector or in any country.

He cited an example of his role in ensuring that a party's manifesto in Tanzania contained issues of science, technology and innovation as a basis for ensuring sustainable development in the country. He challenged delegates to ensure proper representation of STI issues in their respective institutions, organisations, countries and regions as the case may be.

Prof. Wangwe observed that Africa had been ahead during the early civilization period which was led by Egypt as evidenced by so many writings, blacksmithing and constructions but lamented that we had now been overtaken because our colleagues over there (referring to the North) have invested tremendously in STI development. However, he expressed optimism that Africa will still meet up with STI development and be able to lead again because we have done it before. This he said will however require commitments and actions by every African and especially our governments. He suggested that we should be good learners and listeners to be able to acquire knowledge and communicate effectively especially by sharing the unique information that each and every one of us in Africa has to offer.

2.12 Remarks by Prof. Maged El-Sherbiny, President Academy of Scientific Research and Technology and Assistant Minister for Scientific Research



In his welcoming remarks, the Chair of the session who was also representing the Government of Egypt for the conference Prof. Maged El-Sherbiny expressed delight on all the good words said about Egypt by other delegates and demonstrated great pleasure in seeing the calibre of delegates at the conference and workshop. He reminded delegates of the six core subthemes of the conference which border on; Governance of science, technology and innovation in Africa; Investments in Research and Development (R&D) in Africa; STI indicators; STI and development in Africa; Gender issues in STI; and Knowledge management and Intellectual

Property Rights (IPR) and STI development; stressing that they have been carefully selected. He further gave brief remarks on each of the sub-themes.

Talking about the first subtheme on the governance of science, technology and innovation in Africa Prof. Maged informed delegates that the African Ministerial Council for Science and Technology (AMCOST) which Egypt currently chairs has supported the development of Africa's Consolidated Plan of Action (CPA) to drive STI development in the continent. He expressed desire that the outcomes from the conference and workshop will be useful to Egypt and for the implementation of the CPA. He hoped that all stakeholders including NGOs, researchers and governments have roles to play in the scientific and technological development of Africa.

On STI investment, Prof. Maged noted that the overall investment on research and development in Africa is very low stating that it had forced many nations to seek for collaborations and partnerships with donors to be able to realize meaningful progress in research and development (R&D) initiatives in Africa. According to him, countries in Africa are now putting more and more money every year, even though we still lie between 0.1% - 1.5% of the GDP. He maintained that the African heads of states have pledged to move up to 2% of GDP in R&D investment but this has not been realized so far.

Talking about Science and Technology indicators, Prof. Maged noted that the New Partnership for Africa's Development (NEPAD) which is the technical arm of the African Union (AU) has been working very hard in partnerships with UNESCO and other multilateral organizations to produce the Science and Technology indicators for Africa. About 19 African countries have already signed in for this and this is a very important step forward.

On science and technology innovation development in Africa, Prof. Maged remarked that a

current initiative called African Network for Drug Diagnostic Innovation (ANDI) which was developed in Nigeria is already flourishing across other African countries. ANDI is a network for drug innovation and diagnostics. Another initiative called GLORIA is on-going in Egypt. GLORIA is a network with high broadband, high speed, 1 GB per second, and soon it will be 10 GB per second while efforts are in place to increase the broadband to 40 GB per second so as to be able to penetrate all African countries. This network is for education and science.

On gender and STI, Prof Maged noted that youth and women for science are very important issues. He assured delegates of the various levels of supports given to youth and women currently by African governments. He also felt pleased with the level of participation, desire and commitments to science and technology by youth and women as shown during the ATPS conference.

Lastly, Prof. Maged expressed the relative importance of knowledge management and Intellectual Property Rights (IPR) for STI development in Africa emphasizing that the media for example has contributed in knowledge management on issues of STI by sharing information with the public. The most important thing is not only for the leadership of the political agenda to be supportive of science and technology innovation but as well as the public. He remarked that the Intellectual Property and enormous knowledge of our people need to be conserved through close working relationship with regional and international organizations and patent office including, ARIPO, WIPO as well as PIPO - a new pan-African organization being currently established.

Finally, Prof. Maged called on delegates to utilize the opportunity of their being in Egypt to visit the historic and cultural places in Egypt and enjoy their stay not only for science and technology innovation but also for culture and society as well as experiencing the friendliness of the people. He once again thanked the organizers of the conference and workshop for their excellent planning of the event.

With those remarks, Prof. Maged formally declared the conference and workshop open and launched the Egypt Chapter of ATPS. He expressed his sincere happiness and the Egyptian Government's willingness to collaborate with the ATPS in promoting STI today for African development tomorrow and pledged their full support for ATPS Programs.

2.13 Keynote Address:

Sustainable Development, Education, Research and Innovation: Vision for Knowledge Economy - The Case of Egypt by Prof. Maged El-Sherbiny, President Academy of Scientific Research and Technology and Assistant Minister for Scientific Research

With about 78 million people, more than 17 million students and about 100,000 researchers, Egypt is located in the heart of the Middle East linking Africa with Asia and one of every four Arabs is an Egyptian. Egypt is part of the Arab world, part of Africa, and also part of the Mediterranean hence placing the country in an advantageous position over many others. Egypt plays a very crucial role as a hub for science, technology and innovation around the regions that it belongs to and progresses towards the knowledge economy. It targets an annual economic growth of at least 8-9% to sustain its development and considers Science & Technology as a vehicle to transform its economy.

To achieve this, Egypt adopts the 4P concept of publications, patents, prototypes and products often referred to as the complete cycle of science and technology (fig 1).

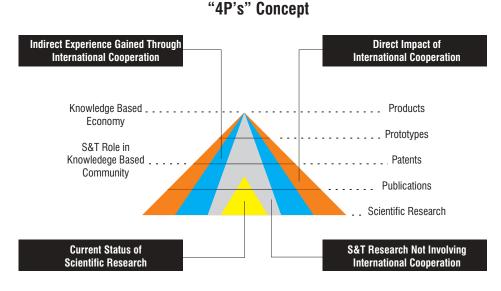


Figure 1: The Egypt 4P Concept of Education, Research and Innovation

The target is to reach at the top of the pyramid where knowledge economy will be achieved. To achieve this, there is need for direct and indirect experience from international cooperation. An investment plan of 3.5 billion Egyptian pounds is required to realize the movement to the top of the pyramid. More so, a major restructuring of STI governance and political goodwill is required to strengthen the country's initiatives on STI development.

Through political goodwill, the High Council for Science and Technology (HCST) was established to champion STI issues in Egypt. The Council is presided over by the Prime Minister and is made up of eight other ministers related to STI issues, six eminent scientists-one of whom is a Nobel Laureate, and civil society actors. The Science and Technology Development Fund (STDF) of the Council coordinates 362 research institutes in Egypt who host 98,000 researchers serving the whole 78 million Egyptian communities.

The Egyptian STI Plan of Action therefore dwells on 6 major platforms including:

- 1) Re-Structuring of Science and Technology Governance.
- 2) National Initiative for Human Resources Development.
- 3) Priority National Projects.
- 4) Funding of Science and Technology.
- 5) National Initiative for Informal Education.
- 6) National Initiative for Innovation.

While the human resource development initiatives aim to:

- 1) Expand the Critical Mass of Young Scientists
- 2) Encourage International Interactions "Science Decade"
- 3) Provide Mobility Grants
- 4) Encourage Brain Circulation
- 5) Institute Chairs of Excellence
- 6) Support Capacity Development Packages

On the other hand, the country's priority national domains include:

- 1) New and Renewable Energy through; new technology for wind turbines; innovative concentrated solar power; photo-voltaic thin films with nanotechnology. By the year 2020 Egypt hopes to achieve 20% of electricity supply from the renewable, cut down emissions by 20% and also increase the efficiency of electricity by 20%. This needs huge investments in renewable energy and will create a lot of job opportunities for the teeming population of Egypt. We have about 720 megawatts being produced by wind and the plan is that we reserve 700 square kilometres to be able to get at least 8 Gigawatts of energy.
- 2) Desalination and Water resources through; non-traditional water resources management and desalination with renewable energy sources
- 3) Life Sciences through; combating hepatitis c virus disease and industrial biotechnology and pharmaceutics
- 4) Food and Agriculture through; increasing yield of economic crops, e.g. rice and increasing marine aqua-culture of fishes
- 5) Space Technology, Remote Sensing and ICT through; earth observation and climate change research and capacity building and super grid-computing and data mining
- Social Sciences and Humanities.

In view of the above, Egypt's national objectives for green technology aims to:

- Add some 8000 MW of electric capacity by 2020.
- Maximize localization and creation of indigenous technologies compatible with local conditions and needs.
- 3. Transform Egypt to be a **hub** not only for renewable energy industries and development, but also as an exporter of electricity from renewables to the European grid.
- 4. Create a human resources pool of skilled personnel in manufacturing, constructing, operating and maintaining renewable energy facilities (job creation).

The funding of Egypt's STI is achieved through:

- 1) Establishment of Science and Technology Development Fund (STDF).
- 2) International Cooperation Agreements.
- 3) Financial Programs and Venture Capital.
- 4) SBRI funding mechanism.

A survey of 3000 companies in Egypt working on innovation related businesses shows that the innovation rate in Egypt is about 18%. However, it is hoped that this will increase with the numerous initiatives currently being put in place including; the center of excellence and industry links; multi-disciplinary research efforts; Small and Medium Scale Enterprises and spin-off companies; industrial and technological parks; innovation funds (EU); and the 4P initiative. In order to achieve innovation, consistent management of basic research to production is important as can be seen in Fig. 2 below:

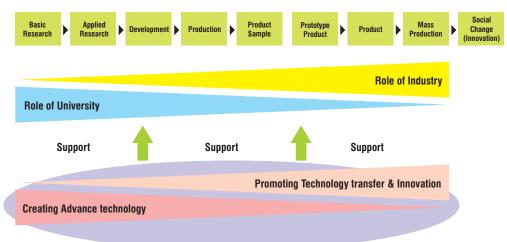


Figure 2: Innovation Support Chain

Informal education is very important, because it helps the youth to understand science and apply it accordingly. In Egypt, the initiatives for informal education currently taking place are:

1) Science and Math educational programs.

- Science and History Museum.
- 3) Marine and Oceanography Institutes.
- 4) Multi-Media Educational Programs.
- Science Dissemination "ScienceBook". The Sciencebook works in the same way like the popular Facebook being used by over 95% of Egyptians.

Egypt launched the Science decade marking ten years of cooperation with different countries in the area of science and technology development and this has facilitated the achievement of set targets. For instance, in 2007, with Germany, Egypt established mechanisms of supporting PhD students, funding the government projects and mobility among people. In 2008, we started with Japan, and we ended up with what is called the EJUST. EJUST is Egyptian Japanese University for Science and Technology and we are now receiving scholarships and these scholarships are not only for Egyptians, but also for Arabs and other African countries. This year (2010) we are working with France, and we are focusing on issues of space technology, agriculture and archaeology. We hope that by next year it's going to be the USA, then China and the European Union. These partners will work with AMCOST to support the African decade of science and technology.





Session 1 3.1 Sub-themes on the State of STI in Africa

This session was chaired by Prof. Samuel Wangwe, the Chair ATPS Board of Directors. Following is an overview of presentations made during the session.

Risk Governance of Science and Technology: Issues for the Development 3.1.1 of Africa and Related Experiences in Europe by Prof. Wiebe E. Bijker, Maastricht University, the Netherlands



If Africa takes the development of science and technology in its own hands, as the African Manifesto for Science, Technology and Innovation argues for, how then can we avoid falling into the same traps that Europe and the US frequently drop into? New technologies such as biotechnology, genetic modification, medical technologies, and nanotechnology pose difficult choices. How to choose and balance the benefits and risks? This also poses dilemmas to democracy: can we involve citizens and stakeholders, even if they are no experts? Or should we hand over the governance of science and technology to experts, and thus trade democracy for technocracy? These questions were answered in this paper.

It is basically argued that Africa should own its own science and technology, meaning that Africa should develop a new form of science and technology. New doesn't mean that it will be anything less than what is done in the US or in Europe or in Asia, but it would be more. It would be including indigenous knowledge, indigenous crafts and not in a traditional way, but in a new and innovative and adaptive way. This boils down to arguing for science and technology that needs to be socialized, rooted, and embedded in Africa.

Science, technology and innovation underpin almost every aspect of human existence and therefore optimizing the benefits of STI is an increasing priority for the governments and the people of Africa- the African Manifesto. To make this work, we need for science, technology and innovation to be socialized into African society. The implication of that is that we need to develop, you need to develop, and Africa needs to develop its own form of governance of science, technology and innovation. Good governance in Africa will mean that leaders need to draw lessons from other countries that have developed good governance structures in STI. It is important to realise that this is not just political correctness. Actually science and technology governance in Europe and US is also in crisis and unfortunately, there are no quick fixes. It would therefore be rather pedantic, if not foolish for any European to come to Africa and try to tell Africa how to govern science and technology. Actually I look forward to African forms of governance of science and technology that Europe may learn from. The personal point is that I think most if not all democracies in the world still are based on the 19th Century-old and obscure constitutions. No wonder our constitutions do not have the instruments to properly deal with 21st Century science and technology. This is the challenge.

Two questions are critical in the global discussions of STI governance. Firstly, how can we relate scientific expertise to politics? And secondly, how can we deal with knowledge that is not scientifically certain? The first point can be explained by reviewing the specific role that scientist may play; but we are getting into an era where science does not have all the answers to human problems. Stakeholders including farmers, scientists, etc. have roles to play in ensuring successful application and use of STI. In the Netherlands, a committee of 15 scientists charged with the mandate of identifying bio-technology trends for the next 10 years and societal dialogue in the Netherlands on Nano-technologies were able to argue that a bio-based economy was imminent pointing out the need for huge government investments on the initiative and the usage of waste products as raw materials for industrial production. This formed the core recommendation that the committee submitted to the Dutch Government. However, the committee formulated dilemmas in such a way that the government would push in the direction that they really wanted. This was a good strategy.

Experience shows that the use of scientific advisory committees, when properly organized, brings scientific expertise to politicis, politicians and the policymakers. It is therefore crucial to combine the potentials of different disciplines in a trans-disciplinary approach including natural science, social science, humanities, arts, engineering, etc. in order to solve problems.

There is need to embrace current technologies such as Nano-technology and understand the peculiarities and risks inherent with it and how to tap from its potentials for development rather than ignore it completely. The risk of such technologies is uncertain and need to be deciphered by trans-disciplinary teams of stakeholders with support from governments. We need stakeholders who can help to balance the benefits and the costs and together with those stakeholders, we must organize some form of debate that feeds into politics. But there are crucial problems where it is not even clear where society wants to move. In case of toxicity, that is clear, we do not want toxic materials in our society.

In the case of proto and human enhancement, we do not even know where we want to go. A memory implant in the brain might be good but there are lots of people who think that tinkering with the human identity, the human brain is a straight offence of the creation of God, so it is the last thing one should do. These are big issues and big risks that require STI governance to provide direction to. It requires champions to also advice governments so that the interests of the people are met even as development targets are also realized.

In conclusion, it is important to note that if scientific expertise is to be brought to politics, politicians and policymakers, there is need to assure the scientific quality of the product, process or service so as to meet highest standards that will be respected by the society. There is need to provide 'serviceable truth' which is referred to as scientific knowledge tuned to policy making. Again, there is need for requisite institutions such as the US Academies of Science or Health Council of the Netherlands to take forward the initiatives.

On the other hand, democracy can deal with uncertain science through the recognition of the spectrum of risk situations; participation of plurality of expertise, depending on risk situation; experimentations with democracy involving stakeholders, citizens, etc., and benefit from diversity of expertise. Finally, if Africa is to develop, own, own up to its African science, technology and innovation, then it also needs to develop new institutions and styles of democratic governance of STI.

3.1.2 Investments in Research and Development in Africa by Dr. George Owusu Essegbey, Director, CSIR-STEPRI, Ghana



During the beginning of the millennium, the United Nations decided to commit themselves to setting goals and specific targets for human developments. In about the middle of the decade they constituted a task force to look at the specific role of science, technology and innovation. The report that came out was very emphatic, that for the Millennium Development Goals to be attained, we cannot but have a framework of action that places science, technology and innovation at the center of the development process. This led to the establishment of the African Science & Technology Consolidated Plan of Action which all our people are

committed to. In the document, it was stated clearly that knowledge production is really about the product of science ... the generation of scientific and technical knowledge about Africa's problems and identification of specific ways to solve the problems. Technological innovation ensures the generation of specific product processes and services. The paper provides an analysis of the research and development investments that we are carrying out on the various countries in the continent. The critical actors in the system include the institutions and institutional linkages, and the environment as constituted by internal and external systems (Figure 3). The supply and demand sides of the system also enable one to understand the basic features in analysing the R&D investments. Investment here will include technology innovation generation, extension, adoption and creating the conditions for R&D to be sustained.

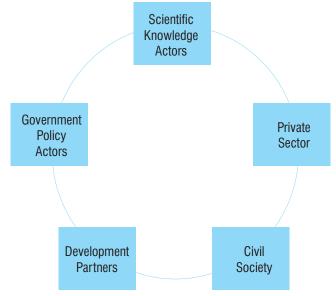


Figure 3: The Critical Actors in the Innovation System

It is critical that in all the eight millennium development goals, Africa lags behind in one way or the other in virtually all of them. This does not mean that we are not making progress because evidence shows that some countries in Africa are striving, for example, to halve extreme poverty and hunger.

Only Tunisia and South Africa spend around 1% of GDP on R&D (Figure 2). The next best of African countries include Uganda, Botswana and Algeria expending between 0.7% and 0.35% of GDP on R&D. Indeed, most of the Sub-Saharan African countries including Nigeria, Zambia, Senegal and Ethiopia have R&D expenditures which are less than 0.5% of GDP. The real issue of percentage GDP is not only about the level but also in terms of the quantum. The GDP of Sub-Saharan African countries are rather small with an average real GDP per capita of only \$1423.21 compared to that of the East Asian and Pacific countries of \$3508.3. The industrialized countries have an average of \$8656.1 (Ndulu et al, 2007). If already the GDP is relatively small, a smaller proportion of that GDP compares poorly with the proportions of other relatively larger GDPs. The investment in R&D has a direct correlation with outputs and indicators of R&D. For example, whereas Korea has about 4,627 researchers per million populations, Cote d'Ivoire has about 66 researchers per million populations. That perhaps sets the stage for the next output indicators. In terms of contribution to scientific knowledge, the African countries performed quite poorly. Korea spills out about 18,467 S&T journal papers per 10,000 population whereas Ethiopia, for example, spills out 148 S&T journal papers. Another important output is high-technology exports.

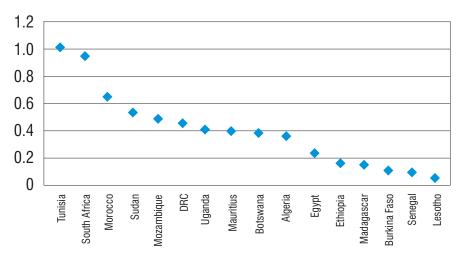


Figure 4: R&D Expenditures of Selected African Countries. Source: World Development Indicators, 2010.

¹ This is in 1996 PPP dollars

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, electrical and other kinds of machinery. Again, whereas countries such as Brazil, Korea and China show high-technology exports in several billions, countries such as Zambia, Ethiopia and Mali only show a few millions in exports coming from the few industries operating in the countries. If we critically examine China's model of R&D investment, Africa could learn a lot from it. From the year 2000 China's R&D investment has increased tremendously and the bulk of the investment came from the private sectors. In 2000 for instance, the R&D expenditure coming from the private sector was 59.9%, while in 2005, it grew up to 68.3%. The lesson to learn here is clear and that is that there is need for private sector involvement in investing in R&D efforts in Africa. For Singapore, the private sector in 1990 invested about 4.1% in R&D, but in 2004, the total investment from the private sector in R&D expenditure had increased to 63.8%. Therefore, Africa needs to strengthen its private sector to create greater research & development investments growth if we are to see what we want to see, that is, achieve the 1% of GDP investment in R&D and even more.

Applying the innovation system framework to analyse research & development investments shows that the challenge we have is to strengthen the roles of the critical actors in order to enhance R&D investments and capacity. The policy makers and leaders in governments drive the business and priorities of the nation hence it is important that they be convinced first on the need to address the challenge of investment in R&D. In an address to the National Academy of Sciences of the USA in 2009 President Obama stated that "We will devote more than 3% of our GDP to R&D, invest in basic and applied research, create new incentives for private innovation, promote breakthroughs in energy and medicine and improve education in maths and science." If African Presidents, the leadership of our nations, can catch this vision, this dream, and run with it, we would not be discussing R&D investments below 0.5%. Our scientists and researchers, in applying themselves to the scientific endeavours in their various institutions will be able to make headway. The private sector needs to link up in the innovation system to take up outputs from R&D. For this to happen, there need to be a favourable environment enabled by the policymakers. We need to strengthen the internal environments and take advantage of opportunities in the external environments and especially look at the technological advancements that are also in practice.

In conclusion, Africa's R&D investment lags behind the industrialized economies and Africa needs to catch up. To catch up, we need to strengthen the roles of the critical actors and we need to articulate clear vision for us to be able to do this. Institutions are key and we need to strengthen those institutions. We need to create a conducive environment for this to happen and address the challenge of building competitiveness in our various countries. When we do that STI can be applied to address Africa's development challenges.

3.1.3 The Role of Youth in STI Development in Africa by Mohamed Zarkani, Director, Young Innovators Awards Program, Egypt



In 2004, the Young Innovators Awards Program (YIAP) started a modernization initiative aimed at stimulating the culture of research and development in Egypt. We went to public universities and discussed with the Deans of relevant faculties on the need to engage their students in a competition to get funds for their graduation projects. Through the cooperation of relevant university personalities, the program now covers all the 18 public universities, 67 faculties of agriculture, engineering and science and funds about 500 graduation projects every year. The level of success was also due to the efforts by some students who took the program forward by

doing good projects which now inspired other students to participate in the program. The lesson to learn here is that the youth need a platform to be able to manifest their potentials.

There has been a fresh wave of enthusiasm and today is just another example of this wave to mark the eagerness by African scientists and policy makers to excel in STI. It is believed that STI is an essential ingredient that promises to alleviate Africa from much turmoil. R&D itself is an important bridge factor between too much consumerism and valuable production. It involves nurturing of on-going know-how or its acquisition, and subsequent value addition through the supply chain. Nurturing young scientists is a process that should be diligent and meticulous so as to provide effective results. According to the African Development Bank, 40% of the African population is below the age of 15 years. Africa by far has the largest global youthful population. This shows the manpower size and the potentials available if we can mobilize these youth and align them in the right direction, how beneficial this could be. In Egypt for instance, there are approximately 2 million students enrolled in higher education. Higher education is the first step for a young scientist that enables his or her personal development. It is very important to nurture him/her at this level to make sure that he/she develops and takes the right steps towards his/her career.

The civil society on the other hand has not had a noble impact in Egypt for some time now. There are about 24,000 NGOs in Egypt and only 50 or 60 of them actually do tangible things. A lot of them were unfortunately involved in embezzlements and other not-so-noble courses and it took quite a while before a few of them started making impacts in the society. No one can disagree that NGOs are very effective in mobilizing youth and supporting them in nurturing their initiatives to fruition. In Egypt, research development program, science and technology and development fund and social corporate development has a provision to include youth in their overall agenda. YIAP through these initiatives conduct capacity building lecture series for students especially to inculcate in them the need for research and

development in the relevant fields of agriculture, engineering, science and technology. Other areas of training are in intellectual property rights, commercialization of enterprises and opportunities provided by venture capital. After 7 years, we have around 5,000 students graduating from the YIAP program and hence we have created a scientific community, a community we know of bright young leaders, and bright young scientists that can make a difference in the future. Members of the community continually share experiences and opportunities amongst themselves in a regular open dialogue seminars and workshops. Some beneficiaries of the program have already established their own companies. YIAP has achieved success through the partnerships it has brokered between the governments (in this case public universities), the privates sectors (mainly funders) and the civil society groups to encourage young graduates to become entrepreneurs. This model can also be replicated in other parts of Africa to support youth to participate in development of African nations.

3.1.4 Building Centers of Excellence in STI in African Universities: Lessons from World Bank STEP B Project in Nigeria by Prof. Michael Adikwu, National Project Coordinator, Science and Technology Education Post-Basic Project (STEP B) the World Bank Nigeria.



No nation can succeed economically without a strong and solid scientific educational base particularly in this era of knowledge economy. The convergence of local and global factors of development has engendered discussions on re-definition of the basis for the development of nations, especially in the developing world. Among the social stressors addressed by specialized units of various international agencies and development partners and their stakeholders are; disease, poverty, hunger, land degradation, global climate change, regional and international conflicts, human migration, illiteracy, digital divide, environmental pollution, water

scarcity, energy insecurity and social inequity. To effectively tackle some of these stressors, Nigeria is setting up centers of excellence based on the Generic and Incremental Value (GIV) model. Due to paucity of resources Nigeria obtained a credit facility from the World Bank to help in financing this system to establish Centers of Excellence under the World Bank STEP-B Project. A center of excellence in this respect is a research program managed by an institution, an advanced research institute, a network of institutions or operating independently, typically in one geographic location and deemed by merit review to be of the highest international quality in personnel, infrastructure and research output (Inter Academy Council, 2004). Each center received up to USD7million and was selected through a merit-based process that also ensured that selected disciplines match national development priorities. A 20 man-working Committee was set-up by the Minister for Education of the Federal Government of Nigeria and membership included Vice chancellors of universities;

Rectors of polytechnics; Provosts of colleges of education; Executive secretaries of regulatory agencies; Representatives of the private sector; Representatives of learned societies; and Members of the STEP-B Project team. The documents used in the process were; Centers of Excellence under the STEP-B project; In Retrospect and Future Perspectives, by the STEP-B National Project Coordinator; STEP-B Project Synthesis Report; STEP-B Draft Project Implementation Manual; STEP-B Project Appraisal Document; while the GIV model acted as the point for triangulation - that is, as the reference point.

Examples of activities and items that were considered for funding under a center of excellence were:

- > the purchase of new, modern laboratory equipment;
- > light rehabilitation of essential laboratories (the construction of new facilities are not supported);
- > cooperative international scientific projects with research teams outside Nigeria;
- > the installation of ICT, library media and related equipment;
- > training of staff for capacity building and management (technical middle and higher level staff and technicians);
- > workshops, conferences, study tours;
- > research stipends for outstanding research fellows;
- > stipends for post-doctoral scholars to conduct research at the centers and;
- > awards to attract visiting professors from outside Nigeria to teach and conduct research at the centers

Locations of Centers of Excellence: Specific examples of emerging Centers of Excellence that qualified for funding include:

- > University-based centers.
- > Polytechnic-based centers.
- > Research agencies

Areas of National Priority for the establishment of the centers of excellence

- > Science, Technology, and Mathematics (STM) Education
- > Infectious and Zoonotic Diseases
- > Food Security Studies
- > Renewable Energy
- > Environmental Protection and Preservation
- Software Engineering
- > Chemical Technology Development
- > Multimedia Technology and Cinematography

- > Solid Minerals Research
- > Advanced Materials Science and Manufacturing
- > Biotechnology

Other miscellaneous considerations for the selection of a center of excellence include:

- > Merit based selection
- > Monitoring and Evaluation: at least twice a year
- > Guidelines for Funds Utilization
- > Infrastructure
- > Equipment and Materials
- > Postgraduate Development
- > Transport and Travelling including conference attendance
- > ICT equipment and training
- > Supplementary personnel cost
- > Maintenance and miscellaneous expenditure
- > Consultancy services

Funds were disbursed to the centers at the ration of 25 %, 50% installments depending on need and type of purchases. In order to sustain the project, other national bodies such as the Education Trust Fund, Petroleum Technology Development Fund, etc., are participating in the programme. Also, the centers aim to self-sustain themselves through the commercialization of research results. A Center of Excellence Management Committee exists for each center and also the private sector involvement is a prerequisite for funding each center.

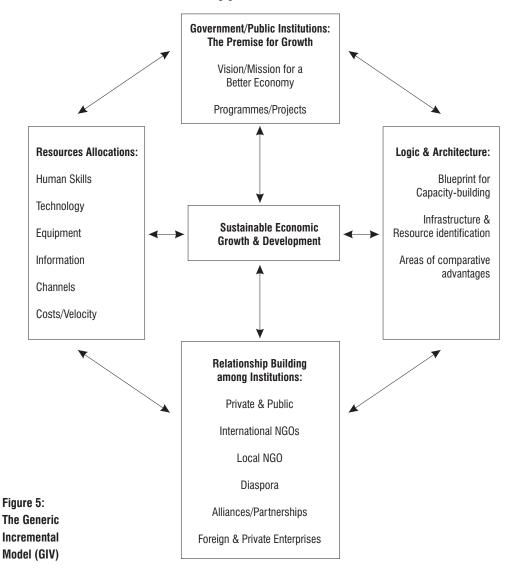
Eligibility Criteria

The approved basic documents for consideration of the award were: a strategic plan, procurement tender proceedings/manual and audited account for the past three years; evidence of cooperation with other institutions; explicit linkage to the strategic objectives of the institution and STEP-B; recognition and/or support by relevant professional and or private sector organization.

Selection Criteria

- > The proposals selected had to address local, regional, and/or national needs as defined in the STEP-B report, NEEDS document, Science and Technology Policy, National Policy on Education, etc.;
- > Human and institutional capacity and management including enhanced links with partner institutions

- > Sound project plan demonstrating feasibility, sustainability, risk analysis, result framework and short start-up period;
- > Track record of performance in the area of the activity, including a record of cooperation with other institutions;
- > Appropriate physical facilities and communication network;
- > Transparent and accountable procurement, financial management and auditing procedures;
- > Demonstrable benefits outside the realm of the specific institutions;
- > Availability of funding and other support from other source;
- > Sound project plan demonstrating feasibility, sustainability, risk failure analysis, result framework and short start-up period



This model proposes a GIV (Generic and Incremental Value) framework with four distinct and related phases. It provides a holistic view of the society and its needs, appropriate institutional relationships to guide and manage resources (all factors of production); and thus allows African nations and the continent as a whole to focus on its areas of comparative advantages. For instance, India invested early in technical education; Institutes of Information Technology initiated several decades ago have spawn major technological operations such as out -sourcing in Bangalore which was made possible because of large, cheap labor and English speaking advantage; China used technology transfer from the Soviet Union coupled with massive human capital development. From 1953-1967, China transferred a total of three hundred (300) industrial plants, a spectrum of Soviet technology, and administrative techniques and skills needed for managing the modern technology. Currently, China produces 350,000 engineers per year, fueling massive economic growth and global competitiveness. The same can be said of Korea and other emerging giants in Asia. There is therefore an urgent need for a systematic and a master plan in Africa with capacity building in engineering, technology, human resource training, and infrastructural development.

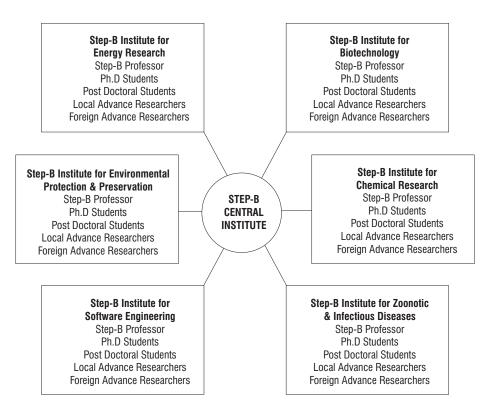


Figure 6: The Structure of STEP-B Centers of Excellence

The institutes were created to represent the organogram (Figure 6). The STEP-B has eleven Centers of Excellence some of which are represented in Figure 6. Professorial Chairs were created with STEP-B funds. The STEP-B professor is given a budget for running the institute and he can take up to 15 PhD students and an additional 15 postdoctoral students. Over 70 % of PhD students who finish their studies from Nigerian universities should be able to automatically access the centers for postdoctoral research in advanced areas. The rest 30 % must be sent overseas for their postdoctoral training with money from the Central Institute. The institute should also attract other highly and internationally acclaimed professors and researchers to assist the Chair of the institute.

Those attracted should be purely by patents and publications. To maintain quality, if this class of people cannot produce up to 5-10 accepted/published papers a year, they should automatically be replaced. No institute should have more than 5 additional local staff. Their duty should be to help in doctoral and postdoctoral supervision. The institute should rigorously invite postdoctoral researchers from overseas as a matter of paramount importance. In this arrangement, both capacity and a library of knowledge are expected to be built and strengthened. Foreign researchers may be sought but this should be kept to the barest minimum. For very thorny national problems foreign researchers must be brought to help local researchers and can be a postdoctoral researcher(s) who can be given up to three years in Nigeria. By the time they leave, that problem should have been solved or insight into the problem is gotten.

The model will assist Nigerian educational system to:

- > Internationalize Nigerian educational system
- > Produce high level manpower for the system
- > Check falling standard of education
- > Solve difficult national problems through research
- > Help Nigeria to meet the Millennium and Other Development Goals
- > Carry out researches that can be commercialized.
- > Increase the volume of research and research output.

Conclusion and Recommendations

For rapid technological development, Africa must pay attention to capacity building with the necessary entrepreneurial skills; training of high level manpower through the establishment of postdoctoral research systems in areas of comparative advantage in terms of resources; building Science and Technology curriculum on materials that are abundant in the African environment; establishing centers for the study of the history of African ideas because there is African science that is not "African magic".

3.1.5 Contributions of Africans in Diaspora to STI Development in Africa by Dr. Anthony C. Ikeme, CEO, Clintriad Pharma Services, Extron, USA



There is no way any nation can develop without building capacity in science and technology. Doing this requires not just training highly skilled experts here in Africa, but also retaining them to improve on their skills. According to Nelson Mandela, "to this day we continue to lose the best among ourselves because the lights in the developed world shine brighter".

This does not in any way suggest that the people that are left in Africa are not among the best, but the truth is that a good number of them have not left because they have not found opportunity. There are

quite a few that want to stay back, even with the attractive opportunities and offers available. So why do they leave? The push and pull factors as shown in Table 1 explains why Africans emigrate.

Table 1: The Push and Pull Factors that drive emigration of African Experts

Push Factors	Pull Factors
 Poverty Unemployment Lack of opportunity Bad governance Hostile regime Political instability/Conflicts Ethnic conflicts 	 > Greater opportunities > Higher salaries Purchase Parity Pay for nurses in Australia or Canada is 14x that in Ghana and 25x that in Botswana > Higher Education/Professional career development > Higher standard of living > Family/Marriage Immigration policies in OECD countries Favors highly skilled workers (Education, Experience and Profession) Canada: Skilled Workers Immigration Scheme UK: Highly Skilled Migrant Program (HSMP) USA: Employment-based Immigration Visa Scheme Australia: General Skilled Migration (GSM) Visa

Data in Figure 7 shows the number of immigrants from selected African countries that were admitted in the United States of America in 2009. The data only shows the number that was officially documented and only from the USA.

127,000 African Immigrants Admitted in the US in 2009					
Nigeria	15,253	Kenya	9,880	Sudan	3,577
Ethiopia	15,462	Morocco	5,235	Liberia	3,695
Ghana	8,401	Somalia	13,390	Sierra Leone	2,687
Egypt	8,844	South Africa	3,175	Togo	1,680

Figure 7: African Immigrants admitted in the US in 2009

This number has been on the increase and the most saddening aspect is that majority of those leaving are among the best brains in the continent. The whole pattern of migration has led to what we call today the Diaspora. Various people define the term Diaspora in many ways. Essentially, Diaspora is talking about a community of people living outside their country of origin or their region of origin; in this case we are looking at Africa as a whole. According to Prof. Bolade Eyinla, Diaspora Africans are "people of African descent who trace their roots back to Africa and have such attachments to the region". The African Union Commission described Diaspora Africans as "people of African origin living outside the continent, irrespective of their citizenship and nationality and who are willing to contribute to the development of the continent and the building of the African Union".

The concern is not just about people leaving the shores of Africa, but it is more worrying to see the quality of those that are leaving. Data in tables 2 and 3 show the percentage distribution of those that are leaving Africa and their quality respectively.

Table 2: Estimates of Brain drain from Africa

Estimates of the Brain Drain from Africa: Diaspora Concentration of Tertiary Educated Africans 2000 Percentage of Nationals with University Education Living Abroad		
25 - 50	Angola, Equatorial Guinea, Eritrea, Ghana, Guinea Bissau, Kenya, Liberia, Madagascar Mauritius, Mozambique, Nigeria, Sao Tome & Principe, Sierra leone	
5 - 25	Algeria, Benin, Burundi, Cote d'Ivoire, Cameroon, Chad, Comoros, Congo, DRC (formerly Zaire), Djibouti, Ethiopia, Gabon, Guinea, Malawi, Mali, Mauritania, Niger, Morocco, Rwanda, South Africa, Senegal, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe	
<5	Botswana, Lesotho, Burkina Faso, Central African Republic, Egypt, Libya, Namibia	

Table 3: Quality of brain drain from Africa to the US

	Total Foreign Born (%)	African Born (%)
High School or Higher Degree	62	86
Well Integrated into the Labour Force	61	71
Unemployed	6.8	4.5
Management/Professional Positions	Less Likely	More Likely

From this perspective of emigration, it can be said that Africa loses and the developed countries gains. On the other hand, Africa has also gained a lot through brain gain and brain circulation. The latter had enabled Africans in Diaspora to obtain quality education and skills for useful economic developments in their respective African countries. The Diaspora also serves as brain banks as they become a very important resource for their country of origin. Through their networks and the social capital they build, they are able to facilitate the flow of knowledge back to their homeland. By virtue of their living in these foreign countries, they improve their national reputation because they show the kind of skill that they have and they show that they actually have something to offer. However, this national reputation can also be negative depending on what they do in the countries where they live.

The other school of thought talks of brain circulation. By this, the emigrants move back and forth from their countries of origin to the foreign land. They may own businesses in their country of origin or work in global firms hence may have some form of intra-company transfers. Some also have dual citizenship and maintain residences in both their country of origin and their country of residence.

On the remittances that come from the Diaspora, it is estimated that in sub Saharan Africa, over 20 billion dollars was remitted in 2009. If you include North Africa for the same period, it will come up to 32 billion dollars. This figure is argued to represent only 15% of the actual remittances that come to Africa as others are transferred through other means that cannot be documented. They invest their earnings back in their home country and a lot of Diaspora communities are involved in community projects where they contribute to their home country. These contribute to the economic development of Africa. The different framings of the brain drain phenomenon can be summarized as in Table 4.

Table 4: Different Framings of the brain drain phenomenon

1. Brain Drain	2. Brain Bank	3. Brain Gain	4. Brain Circulation
Permanent movement of highly skilled manpower from home to host country	Accumulated reserve of highly skilled experts in diaspora	Returnee: - enhanced skills - networks & contacts	Back & forth movement between home & host country
	Willingness to contribute	Permanent resettlement	Intra-company transfers
Dependency on foreign expertise & technology	to the development in their home country	in home country	in globalised firms
		Avoids brain waste	Short & long term
Low capacity to absorb	Virtual return of talent	0 '' ' '' '	involvement in home
& utilize new technology	and skills	Capacity to mobilise old contacts, colleagues &	countries
	Capacity to mobilise resources within the host	classmates for the benefit of Africa	Dual citizenship
	countries for the benefit of Africa	Solione of Amou	Multiple residences

As far as Africa is concerned, the brain bank is not being tapped optimally for Africa because no structure has been adequately put in to truly tap the Diaspora. The Diaspora is there but their input into development in Africa is minimal. Likewise, brain gain is not happening fast or put in another way, the rate of return of migrants does not sufficiently offset the brain drain that is going on in Africa currently. It is not very clear also that the remittances that come from the Diaspora actually go towards science and technology. What is certain is that the remittances help in poverty alleviation to improve the circumstance of the family members at the country of origin. For brain circulation, it is observed through multinational agency transfers, but this cannot yet be compared to the brain drain. It can therefore be concluded, the dominant impact of migration dynamic in Africa currently is brain drain. Because of the fact that the dominant impact or dynamics of migration for Africa is brain drain, the impact is very obvious. Data on the world distribution of researchers show that Africa contributes only 2.2 percent to the world's researchers in 2007 and only 2 percent in 2008 to the world's scientific publications. It contributes only 0.1 percent to the world's total patents filed (UNESCO World Science Report, 2010).

Ironically, "52% of highly skilled workers in the United States (with Ph.D. degrees and working in science and engineering) are foreign born" (Freeman, 2005). So the question is how much do poor countries contribute to the development of rich countries?

Other impacts of brain drain are:

- Weakened capacity to absorb new technology
- Poor research agenda
- Loss of skills for development

- Reduction of job and wealth creation capacity
- Reduced capacity to absorb imported technology
- Slowdown of research and technological innovations
- Reduced Capacity for achieving MDG
- > Dependency on foreign expertise and technology
 - African countries spend an estimated US\$4 billion every year to employ about 100,000 non-African expatriates

Implications of Brain Drain for Economic Development

- > Weakens capacity for Achieving MDG
 - STI Underpins every one of the MDGs
 - Africa is the only continent where not a single country will meet all 8 MDGs
- > 40% of SSA's population continues to live in extreme poverty
 - Nearly 300 million people
- > 34 out of 50 least developed nations in the world are in Africa
- > Underdeveloped Education Institutions
- > Over 50% of Nigeria's academic personnel work abroad
- > Comatose Healthcare Sector
- > 75% of all doctors in Ghana and Zimbabwe leave within a few years of completing medical school
- > More Ethiopian doctors are practicing in Chicago than in Ethiopia
- > Low pace of Scientific & Technological Development

Now what is the way forward? How do we move this forward? The question is not where we are today. And the reason why we are here today is because we believe that we can do something about it. Borrowing a leaf from the Taiwan example on the role of Diaspora, Africans in Diaspora can support a lot of development initiatives of their countries of origin. Stressing further on the Taiwanese example, when the policymakers realized that there were a lot of Taiwanese in Diaspora, engaged with them, started working with them to look at potential policies that would help move Taiwan from where they were at that point to where they wanted to be. Through this engagement, they started creating policies that would help to galvanize development of technology in their country.

They started creating the infrastructure, the necessary policies, and upgrading universities in their education system. They created the enabling environment that attracted their citizens in Diaspora. Not just the Diaspora, the enabling environment also favored investments from non-Taiwanese. This led to the creation of the Hsinchu Science and Industrial Park in Taipei. This made a lot of the Taiwanese move back from different places including the Silicon Valley back to Taiwan and started building or creating companies within their own country and

employing a lot of people. Over 370 companies in semiconductor, computer, telecommunication, optoelectronics, etc. were created. In Wireless LAN, they actually achieved up to 85 percent of the global market in that field.

Every Diaspora will tell you, when they live in foreign land over time, some miss home, some just want their country to do well because there is a national pride in seeing one's country do well. Once they get to that point, all they want to do is to come back and contribute to their homeland. But the question is; do we have the infrastructure? Are we prepared as a continent, as a government? Are we ready to absorb and to tap into this resource? This is what has helped Taiwan to get to where they are today.

What can African Diaspora do?

As Diaspora, Networks:

- > Create and sustain forums for STI knowledge generation, dissemination and uptake to the benefit of African governments, institutions and STI practitioners at home
- Create a viable platform that will enable African governments and institutions to leverage and appropriate the knowledge, skills, and expertise of Africans in Diaspora for the development of Africa.
- > Facilitate the development of effective networks among science and technology based Diaspora organizations which will enable them to enter into strategic alliances and initiate joint development projects across countries in Africa.
- > Build networks and facilitate partnerships with home based STI practitioners for circular flow of knowledge

As Professional Networks:

- > Form professional associations, support integration and professional advancement in foreign lands, e.g. NAPPSA, ANPA
- > Helping immigrants find jobs, promotions and advancement within their industry
- > A source of skill, relationships, and learning the model for success from more experienced professionals
- > Could serve as conduit for channeling cutting edge knowledge to counterparts in their home country
- > Contribute towards the identification of priority development issues for Africa in their professional sphere of operation

As Investment Networks:

- > Raise/mobilize funds for investment in Africa
- > Market opportunities for investment in STI initiatives in Africa
- > Use connections and influence to attract business and investment to Africa

As individuals:

- > Invest in home countries
- > Provide human and technical resources
- > Lobby governments, institutions and foundations to adopt and support STI initiatives
- > Representation in governance structures
- > Policy and technical advice
- > Direct participation in implementation by individuals and institutions

Finally, African Diaspora should not project an aura of superiority over home-based partners because the home-based professionals have current knowledge of the terrain. Also, the home-based STI practitioners should see their Diaspora counterparts as partners, not adversaries. The challenge for African governments is to reduce the rate of brain drain, tap into the African brain bank in Diaspora, facilitate brain circulation, and increase brain gain. While brain drain cannot be prevented, it can be managed to the mutual benefit of individuals, sectors, and countries concerned.

3.2 Facilitated Discussions from previous presentations (Questions, Comments and Answers)

Questions	Answers	Comments
What is the importance of STI in governance? How do we build strong STI institutions in Africa?	There is opportunity for African institutions to build institutions to drive governance issues. ATPS has a role to play in networking with relevant stakeholders to achieve STI development We should not negotiate on poverty and keep peer review very high on the agenda. We will need to set own priorities that is driven by need	Politicians can change their ways if they get pressure from major social groups in the society
What are the impediments to STI investment in Africa?	There are limited resources and competing needs for resource allocation. In this scenario, politicians tend to concentrate on low hanging fruits rather than long term investments	
How can the role of the scientists be mainstreamed in the realization of the scientific and technological development of Africa?	Through networks and relationship building, scientists in Africa can identify priority areas in their respective countries for effective R&D. Science indicators are easy to measure and can translate into an upgrade of country's status on STI development	There is need to understand what science, technology and innovation mean in Africa and the indicators for measuring achievements in the continent.
		It will be difficult to convince the Diaspora Africans to return to their countries when they know that the infrastructure and political environments in their countries are still not adequate to support the type of contributions they want to make to their countries.

Questions	Answers	Comments
What influence does the ATPS have on African governments? For instance, what power does ATPS have on African governments to utilize what has been done in Rio de Janeiro for a sustainable development and the implementation of the Agenda 21 which is a huge index of how to fight poverty in developing countries?	ATPS working with African governments can influence decisions that will yield success stories. This can then be out-scaled to other countries or at least form basis for influencing other country governments who did not adopt the strategy. ATPS should share success stories of performing Chapters in Africa to be able to motivate others lagging behind.	
How can ATPS facilitate the support of African governments in creating enabling environment for the private sectors and the Diaspora Africans to contribute to the scientific and technological development of Africa?	Through policy advocacy, networking and knowledge brokerage, ATPS can facilitate the involvement of private sectors and the Diaspora Africans in R&D efforts in the continent.	
	Diaspora Africans can succeed in supporting Africa's STI development if there are effective partnerships between people in the Diaspora and the stakeholders at home.	
	The little publications in Africa do not get to the market. This underscores the role for private sector involvements.	
What are the investment priorities of African governments for research and development?	Remarkable efforts in terms of investment have been made on agriculture and food production in Africa.	
How do we make the conference 'a conference of achievements' with results and impacts?	By putting to practice all we have discussed and agreed on during the conference.	

3.3 Session 2 Case Examples of Global STI Developments: Lessons for Africa

This session was chaired by Prof. Samuel Wangwe, the Chair ATPS Board of Directors. Following is an overview of presentations made during the session.

3.3.1 The State of STI in the Caribbean Islands: Lessons for Africa by Prof. Ishenkumba Kahwa, Dean Faculty of Pure and Applied Sciences, The University of the West Indies, Mona Campus, Kingston 7, Jamaica

Background



University of the West Indies has 3 main campuses located in Jamaica, Trinidad and Barbados. There are several islands of which many of them are small; some with as few as 5000 people but Jamaica is the biggest with two and a half million people. According to UNESCO Report Science Technology and Innovation, many of the publications are coming from Jamaica, Trinidad and Tobago, and Barbados where the universities are located as shown in figure 8 as follows.

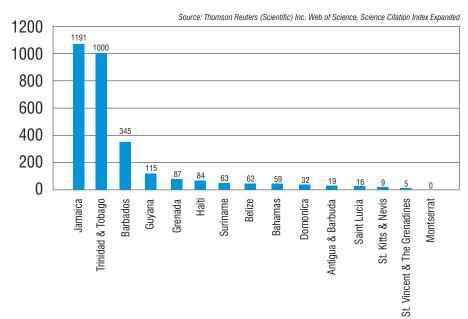
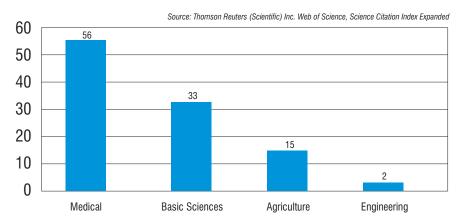


Figure 8: Cumulative number of scientific publications in the CARICOM countries, 2001-2007

Since 2001, a few other islands are coming up with some decent postings in terms of research and development papers which is quite encouraging. However the publications are biased towards the medical sector which takes 56 per cent with basic sciences, agriculture and engineering following as shown in figure 9 as follows.



Note: The combined total is greater than 100% because some publications relate to more than one discipline

Figure 9: Scientific publications in the CARICOM countries by broad discipline, 2001-2007 (%)

One would expect agriculture to be leading because of its contribution to the economies of these countries. The fact that medicine and health are doing quite well is no coincidence to the very good primary healthcare and the life expectancy which is in the region of 70 years plus.

The University of West Indies is the main university in the Caribbean. It leads in terms of research output as about 71 percent of publications come from it. However, there are other institutions which are growing. In terms of patents, the university is not doing well as most of the patents come from external researchers who seek protection in the Caribbean. In terms of research and development, there are two main challenges, one relating to stagnancy in research output and the other being that research and development does not articulate very well the industrial needs as well as the national development agendas. This makes the universities questionable on their relevance to serve the people and also how they can be supported. With regard to basic sciences, universities are going in the wrong direction. Ideally, research and development should proceed from basic sciences to applied sciences and then develop some technologies that benefit the livelihood of the users. Most of the universities perform well in basic science and research but the challenges are on transforming the results to products. The government and industry expects tangible products and these are lacking thus the importance of universities in the development discourse is not visible.

In order for science and technology to be useful, it requires a complex interplay of people and

institutions. However, there is lack of good organization at institutional levels to take advantage of all the developments in science. This comes in the wake of the fact that for science developed locally or outside to function as engine for development, the different elements must come together. This has been the frustrating part as many institutions and researchers do not work in collaboration with each other. For example, the researchers, politicians and businessmen are extremely important but they do not appreciate what is important for one and what is important for the other. The politicians are interested in winning elections; businessmen like making profits and the researchers care less about money or politics as long as they are publishing and become professors. However, it can be pointed out that these stakeholders do not have competing interests but they are complimentary. Despite the complementarity in their interests, they rarely come together to produce a system that can translate science into technology and innovation. In many instances, these stakeholders put the blame on government yet they are the ones not doing what they are supposed to do. Under such situations, government has no choice except to go overseas for expertise and business follow suit. Those in academics resort to publishing papers to become professors. In this regard, everyone will be moving but not together, and the blame is shifted from one party to another.

The government particularly the Ministry of Agriculture in Jamaica is not interested on how many papers the university publishes on different subjects in agriculture. To the government, no meaningful progress is made when the research does not translate into products for human consumption. It is indisputable that science, technology and innovation is the engine of the future and it is embedded in the 2020 vision in Trinidad and Tobago and the 2030 vision in Jamaica. All the key stakeholders agree to that but the strange thing is that businessmen, for example in Jamaica are establishing research and development companies overseas. They justify their actions on the basis of globalization and they put their money where returns from investments are promising. The question that remains pending is why the stakeholders and institutions fail to come together.

There are two main problems and these are applicable to other countries. First of all, it is poor governance. There are no government structures or policies or mechanisms that are effective for the science, technology and innovation sector. Secondly, there is the challenge of poor funding which incapacitates researchers. There is limited funding for research and development. The budget allocation for the last 10 years has not improved despite the calls for governments to priorities research and development. The scenario where there is no adequate funding and governance structures results in research being left to scientists to do as they wish, when they wish, if they wish and how they wish. The consequences are economic as the countries do not have an agenda to articulate within the development goals. For example, the government may want to develop agriculture but does figure out how science is going to help

and what must be done in order for science to be exploited. So there is no institutional control and management. The result is a situation which is not sustainable. What is needed here is an institutional model. The model is needed to make sure that the institutional mechanisms and funding get things to work. That has not been the case in the Caribbean. Instead, the Caribbean has only been able to create individuals who can do good research, and that has got its problems as well as its own advantages.

The ICONIC research model can be used to make poor nations participate in research. The model is based on every research effort having an ICON driving it. The model is so powerful that even initiatives which start as "institutional efforts" quickly turn into ICONIC operations. However, there are limitations to the iconic model and there is need to put institutional mechanisms where the agenda is set by the institute and the researchers are all focused on particular problems. The limitations are in terms of sustainability, replicability, continuity, scale and impact. The lack of an institutional arrangement for doing research and translating it into products remains a formidable challenge. Important lessons can be drawn from Rwanda as it provides an ideal case study on the significance of good governance. The total number of papers is very small in Rwanda but the trend is going in the right direction. The same applies to Uganda which is also progressing and Ghana which fought off the challenge as well. These examples make it apparent that there are certain things that need to be done in Africa, the Caribbean and other places to actually begin to bring in institutional arrangements to bear on the science and technology that can help people. There is encouragement emanating from some countries in Africa where the coffee business is being transformed reasonably well because of infusion of science and technology and institutional arrangements. There is need to create institutions that focus on science and technology.

The Caribbean countries are looking for what they can learn in agriculture from Africa and if it is relevant they will exploit it and there are areas they can work together. There is room for collaboration to pull together the resources. The areas that need particular attention are those pertaining to funding and governance. One of the options is to identify people who have distinguished themselves in their own fields and link them up with the international funding arrangements. Africa and the Caribbean have the brains to find solutions to global challenges but what is lacking is the funding. There is need to exploit the strengths of the Africans and the Caribbean using the strategic recovery model. However the model has attracted a number of criticisms that it focuses on solving other people's problems instead of Africa's and Caribbean problems.

However, it can be argued that many of the problems are global challenges. If one looks at these quantum dots, for example, they are marvelous stuff that can help in terms of lighting problems, medical diagnostics and others. There is needed to look for better lighting sources

in the Caribbean and in Africa. Many Caribbean people and African countries need nanotechnologies because they have high potential to resolve some of the problems. It is quite possible to tap into the global issues of research and development. The financial issues faced by the developing countries in doing science can be solved by having collaborative projects. For example, the South African High Commission in Kingston is setting up an arrangement where Calico countries would have stronger science links with South Africa and the rest of Africa. In a nutshell, it can be pointed out that STI governance is a major, major issue and if not addressed, serious problems will emerge.

3.3.2 State of STI in Europe and lessons for Africa by Mr. Alphonso Alphonsi, Coordinator of SET-DEV Project and Consultant for LSC



SET-DEV is learning partnership on the governance of science that involves European, Indian and African partners. It is founded on the need for scientific and technology responsibility in developing and emerging countries. The SET-DEV project culminates in the African manifesto which is a call for Africa sovereignty on STI. It advocates for full socialization of science, technology and innovation and for a democratic governance of STI. It emanated from the fact that science and technology were either unfamiliar or unrelated to African tradition and culture. In addition, African problems were so dire and direct that science and technology apart

from very simple transfer of technology was viewed as simply a luxury that was not necessary.

When discussing what European experience Africa can learn from, the thing that comes to mind is the Lisbon strategy of the European Union of 2000. It is a very big structure of member states in Europe of strengthening the science and technology to serve the European community in the new context of knowledge society. One of the aims of the Lisbon strategy was to make Europe became a knowledge economy.

Can Africa borrow these kinds of strategies? There is an African proverb that those who start cooking first broke many pots. This can be reciprocated with a European proverb that when you stop rowing against stream, you do not remain where you are, you go back. This is the perception. The first information or lesson is that Europe is the backbone of science and technology and innovation. The feeling is that there is a risk if it stops rowing as it will go back. So the perception of science and technology in Europe today is not the perception of success but is a sense of a perception of decline. The perception of decline is driven by insufficient public participation in priority-setting and in establishing science policy directions, growing reservations with regard to certain scientific developments and feeling of lack of control, perceived isolation of the world of science from the everyday realities of economic and social

life, questioning of the objectivity of scientific evidence and insufficient quality of scientific information available to the public.

Think tanks in Europe, in terms of science and technology contemplate that there is a big problem concerning the future of science and technology and innovation. The mobilization of STI in Europe comes from some researchers who are involved. There are some signals of scarce social mobilization of STI as evidenced by low appeal of scientific faculties and difficult access for young researchers. There is decreasing social status of scientists; poor attention to S&T by political leaderships; women discrimination in scientific careers and intense sense of fear, worry or disinterest among people about research. There is need for socialization of science and technology because science and technology are major social areas that are socially constructed. They are socially embedded and they have continuous correlation with society. Socialization can be a flexible and responsive approach because it goes in two directions. The area in which it is looked at how these multiple connections come in to effect is not fixed. They can be changed and adapted to the context because one can explore in-depth the multiple connection between science and society in different areas. However, there is a risk of disconnection between science and society and the increasing dependence from the science and technology produced elsewhere, without there being the capacity to handle, adapt, modify, develop and steer its use. There is also the risk of not considering the marginalization and the bias towards one element, for instance investment. There is a lot of debate in Italy about investment for research, why there are too few investors, why they do not work, why the area is so complex, and multi layered and multi-dimensional.

It is relevant for STI to promote stakeholders conceptualizing the research and also empower women. The ATPS is doing a very important activity to mobilize women resources. This is not only a matter of justice, of equality, as is perceived in Europe but an investment. Science can be an unfriendly environment for women and there is an ingrained structure of discrimination which is very interesting and very important. It is something that came out from our research. There is a denial from the scientists both male and female that science can be a field of discrimination against women. It goes against the popular idea of science as objective and independent from given condition. Experiments in major research and technological institutions like the European Special Agency went through a long process to recognize that even within their structure there was discrimination against women. Women are missing in scientific leadership. This is important because it is an area in which Europe, Africa, India share common problems, a common situation and a common class of actors. Women provide a knowledge system and this is an experience from the African and Indian context. There is need to recognize and valorize different scientific tradition and systems of knowledge. It can be argued that Europe is socializing to the global STI. For Europe, scientific production and scientific research is multi centered, geographically, culturally and socially

diverse. The gender bias that exists in current STI should be overcome. The indigenous knowledge; fostering brokerage initiatives for innovation; strengthening the evaluation programs areas of concern where responsibility needs to be exercised are shared awareness about the relevance of STR. There is also need for promoting the participation of stakeholders to contextualize research; enhancing the role of women, linking modern science and capacities, enhancing the management of scientific research institutes and improving the governance of science, technology and STI. The challenges of SET-DEV dialogue relate to the plurality of knowledge systems. These involve incorporating the current revision of the epistemological, philosophical and cultural foundations of science, of which a critical vision of western science can be part and recognizing and valorizing different scientific traditions and systems of knowledge.

3.3.3 Status of STI in India: lessons for Africa by Dr. Ejanawala Haribabu, University of Hyderabad, India



One cannot speak of science and technology without speaking of society nor can one speak of society without talking of science and technology. A stage has been reached where there is science and technology on one hand, and society and culture on the other. In the contemporary societies, science and technology are seen as means to achieve societal development which includes economic development that is efficient in productivity, cultural development which includes education and knowledge and social development which includes equality and justice.

Science and technology have potential for uplifting the society. S&T innovations are supposed to address problems of production, problems of services, whereas institutional innovations are essential to address the MDGs. There are institutional innovations to address these MDGs in India. India's population has passed the 1 billion mark, as it is a huge country of continental proportions. There is a high proportion of the young population in the group of between 14-35 years, and this is being shown as an important demographic division, in the sense that this group is going to occupy positions in the economy. Great emphasis is being put on establishing new educational institutions, and improving higher education. The GDP of India has been growing at a relatively high rate and this rate is attributed to the liberalization of polices introduced in the early 90s. These policies also brought into existence certain kinds of disparities in the sense that wealth generation and accumulation was accrued by only a small section of the population. There are disparities in the country in terms of access to healthcare, education and drinking water.

After independence, India started with the goals of achieving technological self-reliance

using science and technology for economic, cultural and social development. One-fourths of Indian population in the late 50s was faced with an enormous shortage of food, and it is in this context that the liberalization policies on chemical fertilizers, pesticides, irrigation and mechanization were introduced. It yielded desirable results in terms of productivity of food grains and volume of production of food grains. Pesticides were introduced into the soil and there were problems of salinity of soil and water logging. Water logging created some other conditions like malaria. Now India has achieved self-reliance in science and technology. The technology was built in the context of state of the art technology by developed countries for launching vehicles and satellites. On the basis of satellites, the Indians, against all odds, acquired self-reliance in building nuclear reactors for the production of energy. One of the important areas of innovation in Indian context is pharmaceuticals. India is the major producer of generic drugs and this was facilitated by the IPR Act of 1970. According to the National Intellectual Property Rights Act, one could produce the same drug using a different process, and would not be infringing on the patent rights. This resulted in production of low cost drugs. For example, the HIV/AIDS drug which is produced by Indian companies is very low in cost compared to what the American companies would sell. There are only 2 cancer drugs in the world, one is by American company and the other is Indian. The American drug is maybe 20 times as expensive as the Indian drug. With regard to information technology and related services, India has registered enormous growth and basically India specializes in providing IT services. Its contribution to GDP is about 5.4% and off-shore product development value is US\$1.9 billion. The IT software and services employed 1.6 million in 2007.

In the case of energy, India is producing solar energy basically to address the problem of non-renewable energy sources and the consequences of use of non-renewable sources and mitigation of climate change consequences. Recently, the government of India launched its Solar Energy Mission, according to which by 2020, India is targeting to produce about 20,000 megawatts of solar energy and recently a nanotechnology mission was also launched. There are a couple of examples of Nano–particle based products on the market. One is the Nanosensor particle based heater which is already in the process of getting commercialized.

With regard to institutional innovations, India is eradicating poverty and hunger through the National Rural Employment Guarantee Act of 2005 which ensures legally 100 days of work in a year with minimum wages. While issues of the provisions of the act can be challenged in a court of law, what kinds of jobs are reserved for women? Several reported interventions, in the area of science & technology and in the area of higher education indicate that some states reserved one-third of all seats to professional education for women. This has a dramatic effect of increasing the number of women in all these professional posts. Another institutional innovation is the right to free compulsory education in 2009, in which every child, male and

female, is supposed to go to school, and it is the responsibility of the government to establish schools and if that is not done, the government can be challenged in a court of law. The right to property by women was recognized about 14-15 years ago. Women are able to seek a share in the family property. The government of India also has instituted a couple of legislations, one is the National Biological Diversity Act aimed at conserving all natural resources. This Act guides or regulates access to bio-diversity for research and development, both commercial and non-commercial. There is also an Act which protects farmers' interests-Protection of Plant Varieties and Farmers' Rights Act, according to which the varieties of the farmers, are protected by law.

With regard to MDGs, India has adopted a rights based approach to address MDGs. One of the important areas that India is contributing is bio-technology. It is using tissue culture and horticulture extensively. There is export oriented horticulture industry which uses tissue culture. However, there are problems with genetic engineering. Genetic engineering technology was introduced in non-food crops like cotton. BT cotton was adopted by farmers in cotton growing states extensively, and there have been environmental consequences of genetically modified cotton seeds. Recently, the government of India placed a moratorium on the commercial introduction of a genetically modified egg-plant, Brinjal, and the Minister for Environment held public hearings in 6 cities and gathered public opinion. On basis of the information, he indicated that India was not introducing BT Brinjal commercially because a lot of bio-safety tests have to be done.

With regard to SET-DEV project, India developed a manifesto based on the critical evaluation of the science and technology innovations in the country. The manifesto is called Knowledge Swaraj. Swaraj means "freedom". The manifesto is based on three values namely plurality; sustainability and justice. India has been used to a system where sciences are viewed as an improvement tool and society and culture are to adapt themselves to science. There is a change, in that, science should be socialized and it should be integrated to society knowledge systems. This calls for democratization of STI and involvement of stakeholders in the innovation process right from the beginning.

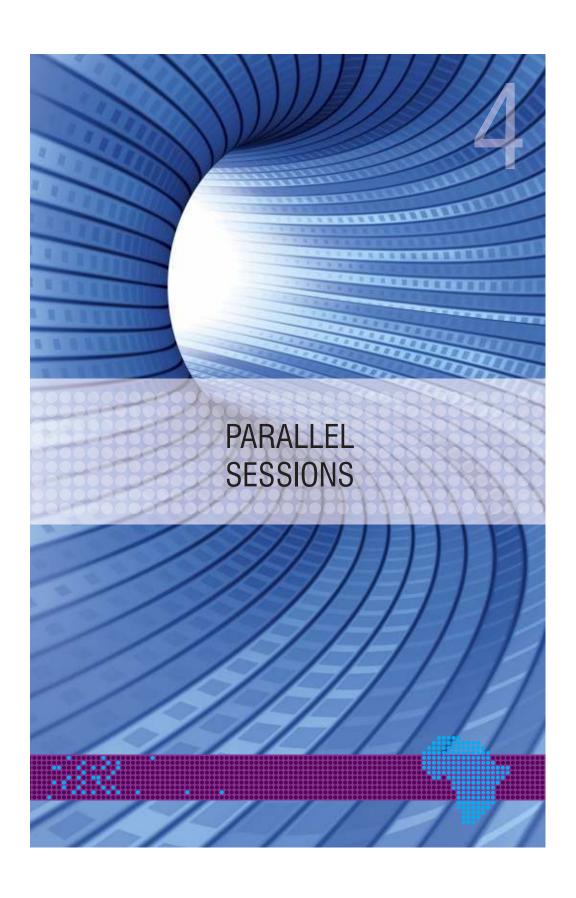
Africa can draw lessons from India's experience especially its proactive state policies, rights-based approach to address MDGs and the emphasis on knowledge society and policy interventions to realize these goals. These experiences are relevant to the African context as there is need to adopt appropriate pathways for innovations. There are opportunities for collaboration among countries in the south.

3.4 Facilitated Discussions from the case studies (Questions, Comments and Answers)

Discussions on the case studies by participants centered on how best African researchers, policymakers, practitioners and especially governments can learn from the gains and challenges of STI development from other countries in order to promote better STI development in Africa. Participants resolved that there is need for North-South and South-South collaborations in pursuing this agenda. They also noted that there is need to socialize African scientists and technicians themselves rather than concentrating on socializing STI only. This is because the relevant stakeholders in STI development still need to understand themselves and work together in an innovation system to be able to realize an effective STI development in Africa. Key questions that guided discussions by participants included:

- > To what extent has Diaspora Indians contributed to STI development in India?
- > How best can we foster university-industry linkage to ensure effective STI development in Africa?
- > What are the expectations from individual delegates from the conference?

In conclusion, the chair of the session Prof. Sam Wangwe emphasized the need for a national system of innovation embedded in sound policy frameworks and legislation as a vehicle for effective and efficient STI development in Africa. He welcomed the opinion that both scientists and science need to be socialized in order to realize the dreams of STI development in Africa.





Parallel Sessions comprised of presentations from delegates along the line of the subthemes of the conference. Delegates had earlier submitted papers for presentation at the conference. These papers were initially peer reviewed and recommended for presentation at the conference. There were four parallel sessions for paper presentations. These include:

Session One: Comprised of papers under the subthemes: Governance of STI (subtheme 1); Investment in STI (subtheme 2); and STI indicators (subtheme 3).

Session Two: Comprised of papers on STI and development in Africa (subtheme 4); and knowledge management and intellectual property rights (subtheme 6)

Session Three: Comprised of papers on gender issues in STI development in Africa (subtheme 5)

Session Four: Comprised of Regional and National Steering Committee workshop on traditional knowledge systems and increasing access to benefit sharing of intellectual property in Africa

4.1.1 Sciences, Technology and Innovation in Côte D'ivoire: How things are doing by Lacina Coulibaly, Côte D'ivoire

Monsieur Coulibaly's presentation aimed at sharing the achievements of implementing Science, Technology and Innovation (STI) activities in Côte d'Ivoire whilst making recommendation for improvement through institutional organization. He pointed out that, STI has featured prominently in Government's development agenda when the first president, Félix Houphouët Boigny established bilateral cooperation between Côte d'Ivoire and France, which created a favourable environment for agricultural research development. He revealed that, the recent government has merged the Ministry of Higher Education with Scientific Research in an effort aimed at ensuring effective implementation and improvement in Science, Technology and Innovations. He recommended that, institutions particularly non-governmental organizations concerning STI issues should be properly streamlined to enhance coordination and development of Science, Technology and Innovation activities.

4.1.2 Assessment of Failure Causes in Medical Research in Africa Case Study of Morocco by Saïd Boujraf, Morocco

Monsieur Boujraf presented a typical experience of Morocco's willingness to enhance his research potential in medicine and medical sciences amidst political, economic and sociological constraints. He pointed out government's effort to improve scientific research by introducing a budget allocation of 0.2% of national income. However, this has not translated to real and concrete strategy of medical research in the country based on effective vision of the outcomes. In his findings, he enumerated some challenges that are hindering the development and effective implementation of quality medical research, which included; the lack of understanding the current importance of scientific research in terms of priority in many of the activities and areas of national development; the lack of focus on the part of medical faculty members and researchers, who are involved in overtime jobs in search of additional incomes; and the brain drain canker which has led to the loss of well-trained and qualified human resources, and greatly impacted on national development.

4.1.3 Tanzania Policy Environment and Legal Framework in Relation to STI use by SMEs by Mafunda D, Tanzania

Mr Mafunda's presentation focused on the challenges hindering the development potential of Science, Technology and Innovations in Tanzania. He highlighted the major constraints which included ineffective and poorly coordinated policy and legal framework, poor business development services and limited access of SMEs to finance. He emphasized that, the inability of SME to thrive well in national economy could be attributed to the use of poor and obsolete technologies making their products non-competitive, limited access to effective and

efficient technology and existence of industrial support institutions which are weak and operate in isolation without focusing on actual requirements of SME sector. He hinted that, government has begun a major review of legislations, policies and programs aimed at addressing major SME constraints related to STI.

4.1.4 New Paradigms for Indigenous Health Biotechnology Innovation and Entrepreneurship by Eddy C. Agbo, USA

Mr Agbo's presentation discussed three biotechnology-driven paradigms for addressing some of the locally-relevant healthcare challenges as a way to, and a model for, locally-driven innovations and sustainability. First, the critical role of small indigenous biotechnology companies for enhanced positive outcomes and sustainability of healthcare development in sub-Saharan Africa. The second model discussed evolving public and private sector efforts that are harnessing relevant biotechnologies to create open systems of knowledge sharing and essential new products from inside-out. Finally, operational models that look at a broader set of issues than purely financial metrics, with specific examples. He drew lessons from BRIC nations (comprising Brazil, Russia, India and China) that have modelled small businesses as the central core to their biotechnology development, strengthened through government and investor-backed small business grants and loan programs.

4.1.5 The Role of University Technical Staff in enhancing Science, Technology And Innovation: Challenges and Opportunities, A Legal Perspective in Tanzania by John M. Wambura, Tanzania

Mr. Wambura's presentation critically examined university technical staff as crucial human resource base in contributing and enhancing science, technology and innovation in Tanzania. He revealed that inadequate or lack of involvement of technical staff wholly or partly in teaching, researches, consultancies, freedom of associations and publications by high ranking scientists/academicians particularly in some African countries including Tanzania had adverse mental, physical, social and economic effects as well as infringement of human and intellectual property rights. Analysing relevant provisions of international, regional (African Union) and Tanzanian laws, he recommended integrative and mutual approaches to planning, implementation and administration of science, technology and innovation in Africa in order to incentivize and maximize the use of technical staff without infringing their human and intellectual property rights.

4.1.6 Strengthening Research & Development In Nigerian Universities: A Pre Requisite For The Attainment Of The Millennium Development Goals (MDGs) by N.B. Saliu and J.N. Bisong, Nigeria

Mr. Saliu's presentation highlighted on the challenges of meeting the millennium development goals through the implementation of high quality research by the Nigerian

University Systems (NUS). He attributed this inefficiency from the system to the absence of an enabling research environment which is brought about by inadequate staff, inadequate staff training and welfare, rapidly growing student population, unstable academic calendar caused by strikes from teaching and non-teaching staff, insufficient infrastructure, lack of appropriate government policy and weak institutional supports. He was of the view that, Government should put in place an appropriate science, research and development policy. He also recommended that, universities should strengthened collaboration with industry, maintaining productive research contacts with international research organizations and foreign universities. Office of Research Administration should be established and properly funded in each university. There should be inter-university collaboration on research within the NUS and that, universities as champions in research and development should properly key into the National System of Innovation.

4.2 Parallel session 2

4.2.1 Poor Integration of Science, Technology and Innovation (STI): Implications for Poor Achievement of the Millennium Development Goals in Africa by Onyenekenwa Cyprian Eneh, Nigeria

Mr. Onyenekenwa's presentation sought to review the poor integration of STI and associates it with the under achievement of MDGs in Africa. He recommended that, in order to overturn the poor performance, African countries should embark on aggressive and massive creation of awareness for natural science and technology related careers from the basic to senior secondary education system, in order to have feeder student population for natural science and technology courses in tertiary institutions, and confront head-on and urgently some unfavourable African attitudes and environmental factors, including marginalizing women from science and technology-based professions, immoral and corrupt uses of ICTs and other factors, which impede the integration of STI.

4.2.2 Utilizing Modern Computer Technology to enhance safety and efficiency on the Kenyan Roads by advancing the System of Monitoring and Implementation of Traffic Rules and Regulation by Fredrick Mulama, Kenya

Mr Mulama presented an initiative that utilizes modern computer technology to enhance safety and efficiency on the Kenyan roads. He was of the view that, the project could be used to enhance discipline on the roads, improve work efficiency of the traffic police, and improve implementation of traffic rules and regulation. He recommended that, collaboration between Kenyan government and the telecommunication industries such as Safaricom will be instrumental in driving the application of such technology in making substantial impact on Kenyan roads.

4.2.3 Regional Development and Revolution of Technopark by Ahmed Elzatahryand Amr and Farouk Abdelkhalik, Egypt

Mr. Ahmed made a presentation which examined the establishment of technopark as an innovation platform for promoting technology transfer from universities to companies. He pointed out that the proposed environment should be a pole of molten alliance between the Research centers, the university, the core facilities, the government, business enterprises or incubators, and the Research & Development industry. He was of the view that, result will be a dynamic environment attracting the best intellectual minds, with their innovative ideas, affording the latest technologies in a wide number of areas, under the care of govern-mental sector to enhance the development of regional, national economy.

The Role of Science, Technology and Innovation on Sustainable Biofuel 4.2.4 Production and Use by Prof. Francis D. Yamba, Zambia

Prof. Yamba's presentation explored the role of science, technology and innovation in analysing suitable feedstocks for sustainable biofuel production and use. He initially analysed economic advantages of use of sweet sorghum and Jatropha, on one hand, and other energy crops, on the other hand, for bioethanol and biodiesel production, respectively. He was of the view that, research was required on the feedstock characterisation and optimisation of feedstock life cycle in order to improve on the availability and quality of suitable feedstock suitable for local conditions.

The Greening of Innovation Systems for Eco-Innovation: Towards an 4.2.5 Enduring Climate Change Adaptation in Nigeria by Prof. Femi Olokesusi, Nigeria

Prof. Olokesusi's presentation focused on identifying how the National System of Innovation (NSI) theory, may provide the framework for the development of climate change adaptation policies and eco-innovation policies and initiatives in Nigeria. He argued that NSI offers Nigeria a new platform for bringing together actors such as the knowledge centers, policy makers, the private sector and development partners in a collaborative and task focused manner towards efficient and effective adaptation to climate change, but also engender a paradigm shift in environmental management.

He outlined how eco-innovation could be harnessed to build a strong Science, Technology and Innovation (STI) capability towards the challenges of climate change and reducing the cost of acquiring foreign technologies. He lamented that, though there is a huge potential with regards to the policy implications of developing this synthesis and paradigm shift, until now, these opportunities have not been explored.

4.2.6 Intellectual Property law for a Development Trade Agenda by Djims Milius, South Africa

Mr. Milius presented the current status of intellectual property (IP) law as a tool for sustainable development of Africa. He indicated that there were challenges confronting the implementation of IP laws in South Africa. He pointed out that compulsory licensing is an underused if not sufficient remedy to address various issues around patent failure and monopoly and 30 years of high-technology patenting (e.g. biotech) suggest that we have granted unwarranted and too-broad patents. As a way of moving forward, he noted that, it was crucial to generate development driven law that would produce tools for development policy; adopt a view for developmentalism and progressivism in technology learning and upgrade. He highlighted his organization's (Intellectual Property Law & Policy Research Unit of The University of Cape Town) agenda as a new force within South Africa which intend to influence IP law and policy in Southern Africa and other parts of the continent.

4.2.7 Indigenous Knowledge; A Key to Unlocking Malawi's Potential in Achieving Millennium Development Goal 4 by Dr Cecilia Maliwichi Nyirenda, Malawi

Dr Nyirenda's presentation highlighted on the activities of Indigenous Knowledge Center (IKC), a non-governmental organization that compiles, preserves, manages and promotes indigenous knowledge. She presented one of their activities which examined innovative methods to harness IK in healthcare provision in Malawi where some people resort to traditional healthcare because modern hospitals are inaccessible; lack drugs, personnel and laboratory equipment; and staff ill-treat patients. In their findings, it is evident that both modern and traditional health care systems have shortfalls which cannot be eliminated soon. However, she pointed out that, the way forward should be formalizing traditional maternal healthcare and integrating it with modern healthcare. She recommended that further studies should be undertaken to ascertain the truth if medicinal plants application were responsible for the high uterus ruptures in pregnant women. She was of the view that, unless evidence-based policies are implemented, people will not cooperate; making it difficult for Malawi to achieve MDGs.

4.3.1 Enrolment and Performance of Girls on Science and Technology Institutions: A Case of Bunda College of Agriculture, Malawi by Babettie Abigail Juwayeyi, Malawi

Ms Juwayeyi presented the current status of low enrolment and poor performance of females in science and technology in Malawi's higher education institutions. She pointed out that, several attempts have been made to improve females' participation and performance in scientific and technological literacy are being undertaken, including science subjects being made compulsory in secondary schools and many publications emphasizing on empowering women and girls to participate in STIs written by different women including University of Malawi lecturers but the imbalance still exists. She indicated that, challenges still remain with cultural and socio-economic backgrounds of the girls and poor quality of education standards. She concluded that, unless education provisions are expanded, school inputs are provided; communities are involved in STI policy making processes and the socio-economic and cultural factors are addressed, number of women in decision making positions is increased, incorporating girls in STI will remain in the dark.

4.3.2 Exploration of Factors Militating Against Active Participation Of African Women In Science, Technology And Innovation Development by Ezeibe, Adaku B. C. (Mrs.) & Nwaoga, Chinyere T. (Mrs.), Nigeria

Mrs Ezeibe's presentation focused on the behavioural tendencies of women and sociocultural, economic circumstances and legal barriers that constraints women's participation in science, technology and innovation (STI) development in Africa. She pointed out that, women participation in STI development cannot be equated to that of their male counterpart due to some obvious factors. However, in spite of these obstacles, she recommend that improving women education standard, training women on entrepreneurial skills acquisition and support services policy level intervention and enhancing women self-image will contribute to active participation of women in STI development.

4.3.3 Developing the Active Participation of African Women In Science Technology And Innovation: The Entrepreneurial Approach by Ezeibe Adaku B. C. (Mrs), Nigeria

Mrs Ezeibe examined the way by which entrepreneurship act as a vehicle for African women active participation in STI Development. Her findings revealed that entrepreneurship constitutes enormous potential in women participation in STI development in Africa, mainly contributing in the areas of job creation/unemployment reduction, increased in productivity and innovations, potentials for economic growth and improved social opportunities. She therefore recommended a comprehensive entrepreneurship programme and strategies that

propel the engine of economic growth and development as well as the provision of economic empowerment measures conducive and suitable for African women, such as supportive education, infrastructural development in the rural areas among others.

4.3.4 'Women got talent' "It is not ability that is unevenly distributed in our Society. It is opportunity" by Martha Ngozika Adaeze Ugwu, UK

Mrs Ugwu's presentation examined the inequalities in health outcomes in Africa which she remarked was a reflection of the social and economic inequalities, across all the domains of health and society. She pointed out that her organization; Women 'n' Children's Health (WNCH) seeks to explore policies, measures and mechanisms for promoting innovation and entrepreneurship to meet development challenges in Africa. She indicated that, it was imperative to build the necessary human capital, STI infrastructure, financial instruments, strategies targeting underrepresented groups (e.g. youth and women) and international collaboration.

4.3.5 Community Impacts and Government Response to the Findings cum Socialization of Fresh Graduates-Led Innovative Environmental Projects Linking Climate Change with Vehicular Emissions in Niger State, Nigeria by Okelola Olumayokun Francis, Nigeria

Mr. Okelola's presentation emphasized on the success story of putting knowledge from classroom into practice which led to the investigation of vehicular emissions and their environmental effects in major cities of Niger state, Nigeria by a group of university students. Their work investigated the presence of fossil fuel combustions sources and emissions of carbon dioxide and other greenhouse gases (GHG) that affect human health and environment particularly on the issue of Climate Change. He pointed out that, the outcome of the project led to the formation of a youth-led advocacy initiative that makes use of environmental research findings to foster advocacy for environmental sustainability as a Millennium Development Goal (MDG) attainment in localities. He indicated that, results and recommendations were communicated to stakeholders and authority for consideration in policy making decisions which influenced the passing of gaseous emissions permit by large scale fossil fuel consumers in the state.

4.3.6 Gender And Desertification Case Study by Hala Ahmed Yousry, Egypt

Mr. Yousry's presentation examined the impact of Bedouin community's activities on desertification which based on gender disposition. He pointed out that, Bedouin women were responsible for harvesting, grazing, fetching water for household uses, as well as the collection of wood to be used as fuel inside the house which is said to be one of the causes of desertification in the region. Men were also responsible for environmental degradation as they engage in all activities outside their homes such as farming, livestock rearing and grazing.

4.4 Presentations in the Parallel Session 4- IP

4.4.1 Introduction - About ATPS/BTA IP Program by Dr. Kevin Urama/Joseph Wekundah

Mr. Joseph Wekundah provided an overview of the ATPS/BTA partnership on IP Programme which aims at strengthening National IP policy and Legal Framework in Eastern and Southern Africa. After summarizing the steps that have led to ATPS/BTA collaboration, he presented the general scope and main features of the ATPS/BTA IP Programme including its background, the rationale behind it, objectives and related project activities as well as implementation timelines. He further outlined key achievements that have been made since 2009 in terms of meeting the core objectives of enhancing knowledge sharing and collaboration, generating and disseminating interactive knowledge on the IP Policy environment and promoting awareness on effective IP systems through different project activities. These achievements mainly include the establishment of a Regional Steering Committee and an evolving Regional IP Network, 8 National Steering Committees established (Uganda, Ethiopia, Tanzania, Kenya, Malawi, Zimbabwe, Lesotho and Swaziland), identification of stakeholders in Kenya to implement a National IP network, case studies commissioned in December 2009 in 5 countries (Tanzania, Ethiopia, Kenya, Malawi and Lesotho) and side events in ATPS conferences held in Abuja - Nigeria (2009) and Cairo -Egypt (2010).

4.4.2 Seed Systems in Africa: What should policy address? by Dr. Joep van de Broek, Embassy of the Kingdom of the Netherlands

Dr. Joep van de Broek presented a paper titled "Seed Systems in Africa: What should policy address?" articulated on the five main issues of formal and farmers' Seed systems, integration of seed systems, seed systems and seed policies, views in history and policies of integrated seed systems. After discussing risks of farmers' seed systems (anti-cyclic seed production, slow advances and adaptation, local ignorance), risks of formal systems (possible high costs for seed, erratic supply, loss of genetic resources and seed-related knowledge, loss of farmers' capacity to take control over their development, etc.) and ways to improve seed supply, he reviewed seed policies in the 1980's and 90's while stressing difficulties to turn to privatization stemming particularly from differences in public/private objectives and in ways to organize seed production. He further presented three sectors of integrated seed systems including fully commercial seed sector which support commercial companies, semi-commercial sector stimulating small seed businesses and food crop seeds for smallholder farmers. Based on differentiated policies in terms of seed laws and regulations, he concluded with recommendations regarding ways to improve horizontal and vertical integration (integrating formal and farmers' knowledge and recognizing the importance of both systems respectively) and to define in a careful balance, the public and private roles in seed systems.

4.4.3 Traditional Medicine: Mental Health and Behavioral Practices, Kenya by Prof. David M. Ndetei, Kenya

Prof. David Ndetei introduced his article on "Traditional healers and their provision of mental health services in cosmopolitan informal settlements in Nairobi, Kenya" with the main objective of determining if there is any evidence for the validity of the mental health illnesses from the perspective of traditional healers in Kenya. The underlying goals stemming from the general objective included documenting the various types of mental illness treated by traditional healers, documenting the treatment modalities of mental illness as well as documenting the knowledge, attitudes and practices in regard to intellectual property by the traditional healers in Kenya.

Prof. Ndetei provided a methodology articulated on the study design (cross sectional), the description of the targeted study sites in Nairobi (Kibera, Kawangware and Kangemi) and the sampling method to be used to identify the traditional healers. After describing data protocol including ethical issues, data quality control and collection instruments, he presented some key findings by study objectives. First, he indicated types of mental illness seen by the traditional healers (madness/psychosis, depression, spirit possession and epilepsy). Second, his results showed to a certain extent, evidence for the validity of mental health illness while using internationally recognized instruments (MINI PLUS). Third, the results also showed that traditional healers had little if any knowledge on intellectual property and preferred to protect and retain their information on treatment within their families. While concluding on key aspects regarding treatment modalities by traditional healers and major policy recommendations, Prof. Ndetei also pointed out challenges faced during the study.

4.4.4 National Policies and Legal Frameworks Governing Traditional Knowledge and Effective Intellectual Property Systems in Southern and Eastern Africa: The Case of Traditional Healers in Tanzania by Shemdoe Georges, Tanzania

The article presented by Mr. Shemdoe Georges was about "National Policies and Legal Frameworks Governing Traditional Knowledge and Effective Intellectual Property Systems in Southern and Eastern Africa: The Case of Traditional Healers in Tanzania". After conceptualizing the notion of Traditional knowledge (TK), he introduced the major issue of how to protect the TK as a product of intellect. From the main purpose of building a body of knowledge in the area of protection of TK in Tanzania, he derived five specific objectives which are: (1) examining the existing legal and policy frameworks relevant to protection of TK in Tanzania; (2) reviewing previous studies on protection of traditional knowledge and synthesizing the recommendations thereof, for the purpose of suggestion possible modalities for the protection of TK; (3) documenting existing protection mechanisms among the communities; (4) gathering the mechanisms in which the traditional healers transfer their

knowledge to others; (5) synthesizing mechanisms of indigenous protection of TK and strategy to adopt them in the system of protection of TK. Mr. Shemdoe further presented the study area (Tanzania) and specific districts within the country (Lushoto and Handeni) as well as data gathering methods (documentary review and focus group discussion, questionnaire survey). In addition to the sampling description and data analysis, he provided key results of the study according to the specific objectives defined.

These included the idea that protection mechanisms among the community is mainly secrecy which cannot be recommended as a means of protecting the TK; there is no policy with relevant issues to TK except the National Healthy Policy of 2007 and the current legal framework do not provide for protection of TK. He finally stressed the need for establishing a comprehensive legal mechanism for the protection of TK in Tanzania and a TK and Genetic Resources Policy, the need for more documentation on TK and outreach programmes to raise awareness on IPR issues.

4.4.5 The Impact of Intellectual Property Rights and Multimedia on Acquiring and Managing Traditional Knowledge Systems by Lebese Lekholoane Lesotho

Mr. Lekholoane presented an article on "The impact of Intellectual Property Rights in Acquiring Traditional Medicinal Knowledge in Lesotho". He emphasized on the strategic objective of promoting stakeholder participation in policy & legal framework development for Traditional Medicinal knowledge with regard to effective IP Systems and defined specific objectives focused on (1) conducting a critical appraisal of existing types of traditional medicine knowledge; (2) carrying out in depth case studies on traditional medicine knowledge in Lesotho; (3) making practical recommendations for protection of traditional knowledge and Access & Benefit Sharing of Medicinal Plants; (4) determining ways to manage and integrate traditional medicine into current education system; (5) incorporating traditional Medicine System in the fight against HIV/AIDS and other communicable diseases.

The presentation of the methodology (survey tools, areas covered by the study, codification of the Pilot survey, etc.) was followed by a comprehensive literature review addressing Intellectual Property Rights issues related to Protection of Traditional Medicinal Knowledge Systems and Medicinal plants as well. After presenting progress to date (completed pilot survey, full survey and literature review), he drew some lessons learnt in terms of ensuring effective protection of Traditional Knowledge while considering IPR systems, international as well as regional and local legal instruments. He concluded with the main recommendations about protection of TM Knowledge & Access Benefit sharing of Medicinal Knowledge and medicinal plants, management of TM and Incorporation into Educational System as well as ways to use TM in the fight against HIV/AIDS and other communicable diseases.

4.4.6 Assessment of Possible Intellectual Property Protection options of Traditional Knowledge System in Ethiopia by Tibebu Solomon

Mr. Tibebebu presented a paper titled "Assessment of Possible Intellectual Property Protection options of Traditional Knowledge System in Ethiopia" which focused on selected categories of knowledge and associated knowledge systems, with the reference to herbal medicine for the livestock. The objectives of the paper were to locate and identify existing traditional knowledge that may be subject for protection under IP rights regimes (identify traditional knowledge claim), to identify who holds the knowledge and stakeholders with direct interest and to identify relevant intellectual property option for the knowledge claim. The paper focused on the pastoralist communities of Afar, Keryu, Shinile, Borana, Dollo, Addo and Wollo in Ethiopia.

The paper revealed that traditional healers have the ethno-medicinal and ethno-veterinary knowledge to treat human and animal health respectively with both male and female traditionalist healers involved; the males being the majority at 93.6%. The majority of the healers also depended on plant extracts. The knowledge on the healing methods is passed down through family lines with a majority of the practitioners learning the practice from their fathers or other relatives. Most of them however did not improve on the knowledge gained but acknowledged that their practice is known by most individuals within the community, the transfer being mainly oral, hence subjecting it to incompleteness, omission, misrepresentation or distortion. The healers also specialize in their fields and this remains as secret within the family. Most of those who specialize do not share their knowledge easily.

The paper recommends for a Systematic cultivation of medicinal plants be introduced in order to conserve biodiversity and protect threatened species, an urgent need to formulate an array of incentive measures to ensure that members of the younger generations can learn, value, adapt and apply the traditional knowledge, the creation of an environment where the traditional healers can communicate with researchers for knowledge sharing, approval of Traditional medical policy, regulations and working guidelines and that Knowledge owners be motivated and given incentive to work in collaboration with modern medicine experts for the benefit of the society.

4.5 Reports from Regional and National Steering Committees

4.5.1 Presentation of Report and Plans from IP- Implementing Chapters – Ethiopia by NSC Chair Ethiopia

The Activity report of the IP program in Ethiopia provided a list of the members of the National Steering Committee (NSC) and their institutions (Ethiopian Intellectual Property Office, Ethiopian Institute of Agricultural Research, Ministry of Science and Technology and Agri-service Ethiopia). Activities performed by the NSC were also reported including the different meeting discussions held by the NSC on major points regarding the potential networking with institutions, communication of the IP case studies outputs commissioned by ATPS and BTA, awareness creation among selected target groups (IP departments of science and technology, industry bureaus of the regional governments in Ethiopia, professional societies, Network for Innovation and Development, Addis Ababa university). The report also described plans from IP program which include a brief on the activities under the IP program, the organization of a workshop for Traditional healers, researchers and government representatives, the deliberation on the use and impact of the model knowledge transfer agreement prepared by the Ethiopian Intellectual Property Office as well as joint project with Ethiopian Intellectual Property Office and other relevant institutions for the promotion of awareness on IP protection and traditional knowledge.

4.5.2 Presentation of Report and Plans from IP- Implementing Chapters - Lesotho by NSC Chair Lesotho

Lesotho Chapter's report presented a summary of activities. These included a workshop held on the implementation of science and technology and setting up structures for the implementation agency in late 2009, the establishment of the national IP committee on indigenous knowledge system. Other activities reported by the Lesotho Chapter included several committee meetings held, submission of research proposals for funding and training activities attended by members. The main challenges summarized by the Chapter were about mechanisms to popularize ATPS, holding AGM to appoint effective and dedicated National Committee members and more involvement in climate change adaptation initiatives.

4.5.3 Presentation of Report and Plans from IP-Implementing Chapters - Malawi by NSC Chair Malawi

The IP Program report in Malawi presented by the ATPS Chapter described the National Steering Committee constituted using protocols defined by BTA/ATPS, the collaboration with IP Focal Point in Malawi and the National Commission for Science & Technology (NCST). The main outcomes reported by the Chapter are an MOU between ATPS & inter alia ATPS Malawi Chapter & NCST signed on September 15, 2010 and a joint meeting on IP

between BTA/ATPS Program & NCST-led IP Program in Malawi which was slated for December 2-3, 2010. Concerning achievements listed, there were essentially based on a checklist of IPR in Malawi – NSC (IP regimes, categories and related institutions), status of legal documents related to IP in Malawi and issues regarding seed and variety protection. The report also identified areas requiring sharing of data and other relevant information from BTA/ATPS/IP GRANTEE.

4.5.4 Presentation of Report and Plans from IP- Implementing Chapters - Swaziland by NSC Chair Swaziland

Dr. P. S. Dlamini and colleagues presented a paper titled "The Intellectual Property Rights baseline study: the case of Swaziland" which aims at documenting the legal framework and policies on IP in Swaziland, and assessing the implementation of existing policies with the view to engender the national IP programme. Following the general background of IPR regimes and the scope of the study described, five key objectives were set out. These were the identification of existing IP and TK legal frameworks, conventions and policies in the country and their custodians, IP related policy operationalization in the country, assessment of the cooperation and coordination of IP policies across relevant stakeholders, identification of the operations of IP related international bodies in the country and their impact on government programmes and finally, recommendations towards the establishment of the national IP programme. The methodology of the study consisted of qualitative study, desk research design, interviews conducted with key informants in government ministries, NGOs and parastatal organizations and a framework for data capturing. The main conclusions of the study are that IPR not widely conceived in Swaziland, IPR laws currently being revised to steer the country to the right path, there is lack of capacity which prevent law enforcement. Most of the recommendations reported to address IPR issues included the need for education to raise public awareness about IPR, strengthening and harmonization of the coordination among stakeholders, IP laws enforcement, policies and bills to support IPR regimes and strengthening the country's commitment on IPR through membership associations.



5.1 African Youth Forum for Science and Technology (AYFST)

5.1.1 Near real-time application and validation of a multi-temporal threshold algorithm in active forest fire detection and monitoring in Zimbabwe using MSG satellite by Tawanda Manyangadze, Department of Sustainable Environment and Development, Saveteck Solutions, Office no. 18, Guni House, P. O. Box 308, Masvingo, Zimbabwe

Mr Manyagadze, managing director of Saveteck Solutions presented his proposal on the use of Meteosat Second Generation (MSG) satellite in near real-time application and validation of multi-temporal threshold algorithm in active forest fire detection and monitoring in Zimbabwe. The project aims at developing a prototype operational system and the main requirement is the Geonetcast station to receive MSG data for early forest fire detection in this era of climate change. He elaborated on the complex relationship between fire and climate change saying, the consequences of climate change may lead to increased outbreak of forest fires due to excessive drought conditions especially in tropical Africa. On the other hand, forest fires have the potential to increase the greenhouse gas emissions in the atmosphere which are responsible for global warming. He emphasized the need for improved methods for detection, monitoring and management of forest fires which are becoming very rampant particularly in the dry season, so as to protect the fragile ecosystems in Africa. He pointed out that the project is unique in the sense that it is based on the multi-temporal algorithm developed by him and has not been tested in other areas besides Portugal where actual fire data is used for validation. Mr Manyagadze was of the view that, a multi-sectorial approach to curbing the incidence of widespread ecological disturbances is crucial and therefore the project will create a platform for collaborations or partnerships with local organizations such as Environment Management Agency (EMA), Forestry Commission, and Rural District Councils in forest fire monitoring and management to facilitate the validation process as well response to fire alarms. It will support the community-based natural resource management programs, by creating early warning detection systems to enable effective combat of active fires. He reiterated that, this project supplements the efforts by other organization in Southern Africa such as Council for Scientific and Industrial Research (CSIR), Fire Information for Resource Management System (FIRMS), Southern African Development Community (SADC), and international organizations such as The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), and National Aeronautics and Space Administration (NASA) in forest fire management in Africa and global level.

5.1.2 Analysis of the role of ICTs in climate change awareness; adaptation and mitigation in rural South Africa and Zimbabwe by Shakespear Mudombi Institute of Economic Research on Innovation (Tshwane University of Technology), 159 Skinner Street, Pretoria, 001, South Africa

Mr. Mudombi's presentation sought to examine the importance and impact of ICTs on rural people's awareness; adaptation to; and mitigation of climate change in two southern African countries namely South Africa and Zimbabwe. He pointed that, climate change presents a major challenge for sustainable development globally and Southern Africa in particular, with adverse impacts expected on the environment; human health; food security; economic activity; and natural resources. He was of the view that Eastern and Southern Africa had perhaps the greatest concentration of poverty in the world, and poverty was predominantly a rural phenomenon. He expounded on the characteristics of rural households in study regions considered to be predominantly subsistence smallholder farmers living in isolated location with small farm size, informal land tenure, low levels of technology and narrow employment options. He hinted that, the negative effects of climate change have further compounded their problems; however, the impacts are dependent on the climate in the respective regions and the resource endowments of the rural households, which determine their adaptive capacity. He highlighted that because of rural households' vulnerability to climate change, there was the need to devise strategies and coping mechanisms to enhance their capacity to adapt and mitigate the impact of climate change. Technologies both old and new can help in reducing the effects of climate change in various ways. He opined that ICTs can play an important role as a medium of information and communication in climate change awareness; adaptation and mitigation strategies. For that reason, the main objective of the study was to analyse the role of ICTs in climate change awareness; adaptation and mitigation in rural South Africa and Zimbabwe. The study would specifically analyse the availability of and access to ICTs by rural people; determine the level of awareness of rural people to climate change and to determine the role of ICTs in informing people about climate change; determine how rural people adapt to climate change and participate in climate change mitigation; determine the linkage between ICTs and sustainable development; and analyse the institutional framework governing ICTs in South Africa and Zimbabwe.

5.1.3 Utilization of the Potential Rain Water Harvesting Technology for Improving Food Security in Dry Areas, The case of Bahi district, Dodoma by Deusdedit Kibassa, Assistant Research Fellow, Ardhi University (ARU), Institute of Human Settlement Studies (IHSS), Survey Area, University Road, P. O. Box 35124, Dar es Salaam, Tanzania.

Mr Kibassa's presentation emphasized on identifying potential technology for harvesting rain water in Bahi district in Dodoma region which is among the driest areas in Tanzania both in terms of rainfall received (total annual rainfall of 400mm to 600mm), and available water

resources. He was of the opinion that climate change has exacerbated the water situation threatening water availability for both domestic and agricultural use. Adopting rain water harvesting technology can be among the alternative ways to curb food security and increase both house hold water availability and agricultural production. This study therefore sought identifies the potential technology for harvesting rain water in Bahi district considering their roofing system and other available materials in the areas to enhance food security and domestic water availability. Traditional houses with flat roof tops dominate large part of Bahi district, which reduce the chances of harvesting rainwater for storage. The above situation prompts the need to identify alternative ways of enhancing food security, raising income to its citizens and fight poverty. He highlighted that the proposed study will examine the available materials and their potentials into suiting to a new technology. Secondly, the study will assess community's willingness to accept and adapt a new technology of rainwater harvesting. Finally, the identified technologies for rain water harvesting will be taken back to the villagers for future implementation.

5.1.4 Developing the Capacity and Improving Access of Small-scale Farmers to Low Cost Artificial Substrate Mushroom Cultivation in South-Eastern Nigeria by Mr. Mkpado, Mmaduabuchukwu, Agricultural Economist Center for Rural Development and Cooperatives (CRDC), University of Nigeria, Nsukka

In his presentation, Mr. Mkpado reiterated the impact of climate change and deforestation on the non-timber forest products such as mushrooms. His proposal aimed at developing the capacity and improving access of Small-scale farmers to low cost artificial substrate mushroom cultivation and marketing in Nigeria. He was of the view that low cost artificial substrate mushroom production and marketing hold some potential to create wealth and reduce poverty as well as improve nutritional status of small-scale farmers. It offers a way to cope with effects of deforestation and climate change in respect to sustainable mushroom supply. He also touched on the methodological approach to be used which will involve the acquisition of sound techniques of low cost artificial substrate mushroom cultivation at South East National Biotechnology Center. Secondly, there will be extension of the incubated innovation for Up-scaling which will involve introduction of the innovation to university of Nigeria, Nsukka farms and Center for Entrepreneurship and Development Research (CEDR) at the University of Nigeria, Nsukka by running a pilot farm, inclusion into curricula and thirdly conduct pilot farm at a Local Government in Imo State. He hinted that, the project will produce an instruction manual to enhance the communication of the technology to trainees.

5.1.5 Detailed Measurements of Vehicular Carbon Footprints Emissions Concentration Level in Minna, Niger State, Nigeria and the Environmental Pollution cum Climate Change Effect by Mr. Olumayokun Francis Okelola Geography Department, Environmental Pollution Management Federal University of Technology, Minna, Niger State, Nigeria.

In his presentation, Mr Olumayokun highlighted the growing evidence of global warming and climate change. He referred to the rise in sea temperatures by an average 0.5 degrees C (0.9 degree F) over the last 40 years [based on study by Tim Barnett, Scripps Institution of Oceanography in La Jolla, California]. He also pointed out that considerable evidence exists that most of this warming has been caused by human activities... that's to say we have altered the chemical composition of the atmosphere through a build-up of greenhouse gases – primarily carbon dioxide, methane, and nitrous oxide. This research is intended to investigate this phenomenon by covering all the regions constituting the major areas of Minna, the capital of Niger state Nigeria. The results gotten will be computed against the international accepted standard safe limits to reveal to what extent the Minna environment is compliant. The research outcome will present the climate change implications of energy consumption and emissions in Minna. He was of the opinion that the outcome of the project will meet legislation needs necessary for proper legislations and enforcements needed for Climate change mitigation in, Minna, Niger state.

5.1.6 Optimization of a Continuous Biodiesel Plant by Mr J.N. Nwakaire (Ph.D. Student) (Power & Machinery System Engineering) Department of Agricultural & Bio-resources Engineering, University of Nigeria, Nsukka

Mr. Nwakaire presented a proposal which focused on establishing an optimized and integrated system of biodiesel production which will in-cooperate the feedstock and fuel production. He pointed out that, the aim of the project was to reduce some of the technical and economic bottlenecks hampering the desired diffusion of biodiesel technology in Nigeria. It was also meant to test the resilience of the rural dweller's adaptation to climate change. He asserted that the accumulation of greenhouse gases in the atmosphere due to human activities from the burning of fossil fuels is contributing to climate change, which is the most important challenge of the 21st Century. He was on the view that there should be cooperation between States and governments to develop mechanisms to adapt and mitigate impacts of climate change since climate system is a shared resource under the international regime. In an effort to mitigate the effects of climate change, he emphasized the need to develop fuel systems that are environmentally friendly. To this effect, he presented biodiesel as a green fuel which does not contribute to the increase of greenhouse gases. He said that, the project intended to develop an automated continuous biodiesel production plant that will focus on bringing together various components that makes biodiesel production sustainable. The system will be used to convert the vegetable oil produced to biodiesel. Fuel produced will be characterized to determine the fuel properties and compare it with international standard. He hinted that, upon successful development of the system, farmers will receive training on the use of the system on small scale basis. At the end, Mr Nwakaire highlighted that various communication strategies will be utilized to create awareness to the government and other investors the need to utilize the optimized plant for biodiesel production. This will be a home grown technology with local content.

5.1.7 Harnessing Indigenous Knowledge on Small-Scale Soil and Water Conservation Innovations to Enhance Farmer Adaptation to Climate Change in Central Malawi by Ms Loma Nyangulu, Research Fellow (Agricultural Economist) Kirk Development Research, Training & Consultancy (KIDERTCO), Plot No. 47/2/264, P.O Box 2716, Lilongwe, Malawi.

Ms Nyangulu presented a proposed project which intended to harness indigenous knowledge on small-scale soil and water conservation. She highlighted that, the proposed project sought to assess smallholder farmers' vulnerability to climatic change and make recommendation on alternative indigenous innovations that can reduce yield risk. This project also sought to understand the potential role that integrated small scale community-based soil and water management innovations can play in strengthening and enhancing household and community resilience to climate change and its impacts. She emphasized the continuous reliance of Malawi on Agriculture as bedrock for economic development, and the impact of climate change which has considerable effect on agricultural production. She pointed out that, lack of resources and access to technology coupled with the high dependence of the majority of the communities on climate sensitive sectors makes them very vulnerable to climate change impacts. She also hinted that little is however known, about how resource-poor, rural Malawian populations understand climate change as well as the associated risks and consequences for their livelihoods. She was of the view that since over 80% of the communities depend on farming as a livelihood strategy, adoption of water conservation innovations may improve their adaptive capacity. She revealed that, the project will document and share best practices of proven indigenous small scale innovations with vulnerable communities to efficiently manage drought environments.

5.1.8 The Integration of Conservation Agriculture to Agro-forestry system as an adaptation strategy to climate change by Mr. Sekaleli Ts'epo Stephen Roma, Maseru, Lesotho

Mr. Sekaleli presented a proposal which involved the integration of two agricultural systems which are Conservation Agriculture and Agro-forestry system to address climate change. He defined conservation Agriculture as a farming technology that promotes minimum disturbance to the soil, keeps the soil covered as much as possible and; mixes and rotates

crops, while agro-forestry is a farming system that integrates crops and/or livestock with trees and shrubs. He was of the view that to adapt to the existing climatic conditions, it is paramount that technologies or practices such as Conservation Agriculture and Agro-forestry system be integrated into a single system. This he believes is because the benefits that can be derived from this interaction are many in terms of yield, reduced land degradation and carbon dioxide reduction in the atmosphere when compared to using the systems separately. As an example, he demonstrated how the system will provide all year round vegetation cover which is important for carbon dioxide minimization in the atmosphere, lower carbon dioxide emission as a result of low decomposition of organic matter, minimum soil disturbance, reduced soil erosion, fodder for livestock (from trees and planted grasses), yield from both crops and fruits.

5.1.9 Evaluation of the CMIP3 Models on the Simulation of the South Atlantic Ocean Dipole by Hyacinth C. Nnamchi (Climate Dynamics) Department of Geography, University of Nigeria, Nsukka 410001, Nigeria

Mr. Nnamchi presented a proposal which sought to evaluate the ability of the coupled oceanatmosphere general circulation models participating in CMIP (Coupled Model Intercomparison Project) to simulate various aspects of the South Atlantic Ocean Dipole. He explained that, the CMIP3 models are state-of-the-art models that much of the materials underlie the future climate projections of the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC-AR4). He pointed out that as the concern for climate change grows, a critical challenge to the climate science community is how to improve the future projections of the climates of the different parts of the world to aid planning of the climate dependent activities. This has led to the establishment of the Coupled Model Intercomparison Project (CMIP). He added that recent work shows that a dipole mode exists in the South Atlantic Ocean (SAO), termed this mode the SAO Dipole (SAOD) and demonstrated that it is a dominant mechanism that determines which year receives unusually high or low rainfall in about 15countries in Africa and the Americas. He indicated that, the final outcome will ultimately lead to improved projections of rainfall especially over the southern parts of West and Central Equatorial Africa. These improved projections will ultimately reduce the adverse effects of climate change while at the same time providing the basis for the opportunities that may be presented for certain climatic events.

5.1.10 Design and Analysis of a 1MW Grid-Connected Solar Photovoltaic System in Kumasi-Ghana by Mr. Ebenezer Nyarko Kumi The Energy Center Kwame Nkrumah University of Science and Technology Kumasi Ghana

Mr Kumi presented a proposal to design and analyze a 1MW grid-connected solar photovoltaic system in the Kwame Nkrumah University of Science and Technology

(KNUST), Kumasi, Ghana. He pointed out that, the provision of reliable and continuous energy supply in Ghana is a major challenge over the past decade. He stated that, lessons from over-reliance on hydro-electric power generation have led the country to explore alternative forms of energy generation to meet the aspirations for full electrification. He was of the view that solar power, one of the many renewable energy options, provides attractive benefits like environmental protection, job creation, and potential for technology transfer and innovation in Ghana. To this effect, he pointed that the proposed project will develop a standard methodology for the development of large scale grid-connected solar PV systems for institutional use. It will also test the methodology in the development of a 1MW grid-connected solar photovoltaic system in KNUST. He hinted that the design and analysis of a 1MW grid-connected solar PV system for Kumasi-Ghana, will seek to reduce the amount of work involved in designing such grid-connected solar PV systems, thereby making it for institutions to adopt. In the long run, he emphasized that the proposed project will help promote the use of these renewable energy systems and eventually contribute to the mitigation of the climate change and its effects.

5.1.11 Climate Change Analysis: Improve Farmers' Resilience to Climate Related Hazards in the Upper Catchment of Blue Nile, Ethiopia by Mr. Bewket Amdu Environment and Development Wondogenet College, Ethiopia

Mr Amdu presented a research project proposal which aimed to support policy makers and development actors to manage climate change risks and strengthen evidence based recommendations, and enhance Ethiopia's capacity to adapt to and mitigate climate change. He was of the opinion that developing countries in general and least developed countries like Ethiopia in particular are more vulnerable to the adverse impacts of climate variability and change particularly poor subsistent farmers whose livelihood depends on rain fed agriculture. He stated that, the proposed research sought to analyze drivers, agricultural adaptation strategies, and knowledge, attitude and practice of climate change and variability at local level. This will help in finding ways to help farmers adapt and to inform policy for future successful adaptation of the agricultural sector.

5.1.12 Assessing Indigenous Climate Change Adaptation and Mitigation, and Improving Resilience and Decision Making Capacity of Smallholder farmers in response to climate risks in Tigray, Northern Ethiopia by Dr Kiros Meles Hadgu, Production Ecology and Resource Conservation, Mekelle University, P. O. Box 231, Mekelle, Ethiopia

Dr Kiros made a presentation on a proposal to develop climate adaptation strategies with subsistence farmers to mitigate current and future impacts of climate change, in particular,

drought (famine and loss of livelihoods and degradation of natural resources). He pointed out that majority of the population of Tigray depends on subsistence agriculture, which is constrained by small farm size aggravated by low technology farming methods, declining soil fertility and increasing soil moisture deficit, crop failure due to recurrent drought, increasingly unpredictable rainfall, extreme climate events such as drought and storms, and difficulty of access to both food processing/storage and marketing opportunities. Therefore, the proposed research sought to provide better understanding of farmers' perceptions of climate change, farming system, on-going adaptation measures, and the decision–making process is important to inform policies aimed at promoting successful adaptation strategies for the agricultural sector. He further stated that the proposed research will bring together poor communities in drought-hit regions of northern Ethiopia with technical and scientific communities in the spheres of land management, agricultural research, agronomy and climatology to assess vulnerability and to enable and support effective adaptation decisions to reduce vulnerability to climate change to address climate change, local agriculture, food security, and community resilience in Tigray, Ethiopia.

5.1.13 Assessment of the vulnerability and adaptation strategies to climate variability and change of the Bos-taurus dairy genotypes under diverse production environments in Kenya by Mr Kiplangat Ngeno, International Livestock Research Institute, Biotechnology theme - ILRI, P. O Box 30709, Nairobi, Kenya.

Mr Ngeno's presentation sought to identify adaptive dairy breed genotypes (DBG) and strengthen their adaptive capacity by exploring, testing and adopting new ways of coping with climate variability in dairy production in Kenya. He stated that, the outcome of successful implementation of the research will enable a profitable and sustainable dairy industry that is able to make decisions in an environment of increased uncertainty and build the confidence to invest for a future.

5.2 African Women Forum for Science and Technology (AWFST)

5.2.1 The Effect of Human Activities on the Role of Forests as a Carbon Sink – The Case of Mau Forest, Kenya by Aliet Ondicho, Dr. Mwangi Kinyanjui and Dr. Ben Mwasi

Ms Aliet Ondicho reported that due to the vital role that forests play in carbon sequestration, their research activity will purpose to document the extent of human influence on the Mau forest located in Kenya. To achieve this goal the study will investigate the carbon stock in undisturbed forests as a basis for estimating carbon lost due to deforestation and forest degradation and to determine the community's conservation involvement in tree planting and how this refers to replacement of carbon losses.

She hoped that the findings of this study will justify initiation of carbon projects in the area and define the beneficiaries particularly women who largely control rural livelihood initiatives. It is hoped that this study will provide useful information for influencing policies on climate change mitigation and will promote better management and conservation of forest resources in Kenya.

5.2.2 Farm-Level Responses to Climate Change and Sustainable Agro-Ecosystem Management in Marginal Lands of Ebonyi State, Nigeria by Ann Ezeh Nnenna

Ms Ann Nnenna presented the research activity to be undertaken in marginal lands of Ebonyi state in Nigeria. The study will focus on farm-level responses to climate change and sustainable agro-ecosystem management in those areas. She pointed out that the study will specifically assess the nature of relationships between climate change and ecosystem services in the study area. It will also analyze farmers' adaptation strategies to climate change, their determinants and constraints towards effective adaptation and sustainable management of agro-ecosystem. The expectation is to make contribution towards enhanced management of the agro-ecosystem for improved human well-being under the influences of climate change.

5.2.3 Strategies for Promoting Sustainable Indigenous Practices in Adaptation, Resilience Capacity Building and Mitigation of Deforestation, Desertification and Drought in Rural African Communities by Barrister Onyeke Kingsley and Okpe Valentine Chijioke

This research activity as reported by Mr. Barrister Onyeke will be focused on exploring the opportunities for promoting green cooking using a sun oven. He stressed that this will act as an example for adopting indigenous practices and technologies in adapting, mitigating and

encouraging innovations and resilience capacity building in addressing the challenges of climate change in Africa.

The sun oven will utilize locally fabricated materials from agricultural waste products such as rice husk, palm kernel shell, coconut shell, palm oil extraction residue, furniture saw dust, polythene materials, cow dung and other 'waste materials' as fuel. It is hoped that eventually this strategy will address specific challenges of climate change like reducing the rate of deforestation, and improving the health of women and children by reducing the risks of contracting respiratory diseases. It will also contribute towards the reduction of the rate of emission of CO₂ into the atmosphere.

5.2.4 Climate Change Awareness and Indigenous Innovative Adaptation Measures Applied by the Maasai Society in Tanzania by Elionorata Mbuya

Making reference to the pastoral community practices and their relationship with climate change, Ms Elionarata Mbuya pointed out that there is scanty research done to document how the pastoral communities' activities impacts on the biodiversity resources which may also have an influence on climate change effects.

To contribute to this research, she indicated that the research study will be focused on assessing the climate change awareness and indigenous innovative adaptation measures applied by the Maasai society who are a pastoral community in Tanzania. Specifically this study will assess gender based consciousness on the role nomadic pastoralism practices have in influencing climate change. Lastly, the research findings will be documented focusing on gender based indigenous adaptation strategies/technologies that have potential to be incubated as adaptation strategies towards the management of climate change within the Maasai society.

5.2.5 Smallholder Rice Farmers in South Eastern Nigeria: Constraints, impact, Mitigation and Adaptation to Climate Change by Dr. Happiness Oselebe, Ms Kate Nnamani V, Dr Andrew Efisue and Prof Donatus Onu

Dr. Happiness Oselebe explained that drought is one of the major constraints of rice production in the rain-fed ecology in Sub-Saharan Africa (SSA). She further highlighted that a major challenge for research and development activities in south eastern Nigeria and indeed SSA region is to develop drought-tolerant varieties with wide adaptability across rice-growing ecologies. To contribute towards enhancing rice production, this research study will focus on increasing the level of awareness of climate change and its impact on rice production among smallholder farmers within the study area. This will increase their capacity to deal with issues arising therein. The project will also investigate and disseminate the high yielding, disease resistant and drought tolerant rice varieties that will ensure increased food production under

stressed environments. It is hoped that this will contribute towards the improvement of agricultural productivity, provide employment, reduce hunger and enhance income of smallholder farmers.

5.2.6 Identifying Indigenous Knowledge and Effective Communication Systems for Adaptation to Climate Change by Smallholder Farmers of Kilifi District, Kenya by Grace A. Achiando and Dr. Rhoda Birech

Ms Grace Achiando explained that it is a well-known fact how farmers have lived with climate variations for many years and have consequently developed their own coping strategies, referred to as indigenous technical knowledge (ITK). She claimed that this local knowledge related to adaptation to climate variability has largely not been recognized or documented and it is now deemed to be critical in formulating policies to mitigate the harsh effects of the rapidly changing climate.

In addition, communication systems devoted to these strategies lack feedback from information users, and have therefore missed out on the benefits of ITK. To address this gap, she reported that this research study will investigate the influence of incorporating ITK in climate change adaptation, and in agricultural communication systems for increased food production in Kilifi district of Kenya. The outputs of the study would be used in the development of an information flow framework to be used by policy makers in climate change management, and development of a database of indigenous knowledge that is relevant to climate change management in Kilifi district. This will contribute towards the development of ITK mainstreaming frameworks in agricultural information and communication systems.

5.2.7 Moving Forward in a Changing Climate: Poverty Reduction Through Sustainable Environmental Management (PRESEM) by Joy Samantha Bongyereire and Mr. Natwijuka Seth Kayombo

Ms Joy Bongyereire indicated that the study seeks to contribute towards the restoration of degraded hills of Gihimbi in Buhozi Parish, Busanza Sub-county and Gishori in Rutaka Parish, Kirundo Sub-county for healthy ecosystems and improved livelihoods of the local smallholder farmers. She stated that the project will empower men and women to grow trees and essential oil herbs and grasses on the bare hills as well as grow fruit and agro forestry trees on their farms as a means of combating climate change and other direct and indirect benefits.

The study will specifically evaluate the degraded ecosystems in Kisoro and their impact on the economy and the environment. This is expected to raise awareness to men and women on the value of environmental restoration and conservation for development and promote the restoration of the degraded hills using income generating projects namely growing highly

valued essential oil grasses and herbs like lemon grass, citronella, geranium, patchouli, and agro forestry trees for soil fertility management, soil and water conservation. Thereafter the project successes will be documented for sharing with stakeholders and replication of the technology.

5.2.8 Effective Dissemination Pathways for Delivering Climate Information and Services to Vulnerable Groups for Adaptation in Semi-Arid Kenya by Viola Kirui and Bockline Omedo Bebe

Ms Viola Kirui declared that access and use of climate information and services are essential for building adaptation to impacts of climate change. These include early warning systems, weather forecasts and research outputs relating to climate change adaptation in relation to food, health and conservation of natural resources. She further stressed that climate information and services would help vulnerable groups (e.g. women, children and the elderly) to increase awareness and build capacity for disaster preparedness and community resilience to a changing climate.

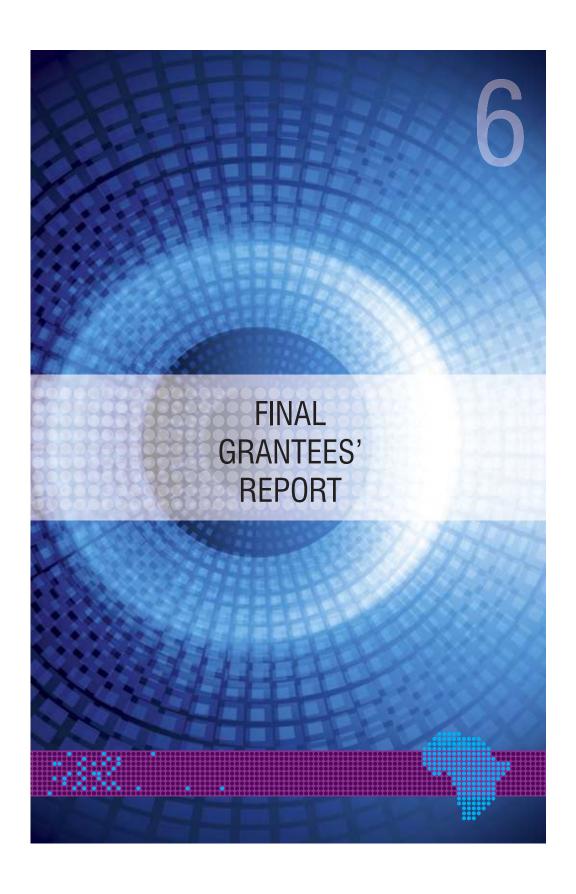
She was concerned that despite concerted efforts by research institutions and climate scientists to generate and disseminate climate-related information and services, millions of vulnerable groups in arid lands continue to experience food, income and health insecurities. Media sources (e.g. mass, print and electronic) and communication via community channels have been used to disseminate vital climate information and services, but their efficiency in reaching vulnerable groups is not well-established. In addressing some of these challenges, she mentioned that the study would seek to characterize dissemination pathways for climate information and services to which vulnerable groups in Semi-arid region in Kenya can access climate information. The major goal will be to determine the preferences and user-friendly attributes to the flow of climate-related information and services to these groups.

5.2.9 Waste Minimisation Programme by Martha Ugwu

Ms Martha Ugwu reported that waste policy has important climate change implications derived from emissions savings from waste prevention through recycling to management of methane emissions from landfills. She pointed out that though a full functioning waste disposal system in developed countries may not cause a lot of anxiety, they introduce legislations that affect everyone to ensure an effective system that prevents high levels of waste generation which emit noxious odour. She sympathized with the waste management situation in Africa which she termed as low and it is characterized by uncollected waste often dumped into the streets, vacant lots, and water bodies etc.

There may be vast open spaces in developing countries but open dumps pollute the air, water and land. Since wastes pose significant risks to human health and the environment, she declared that the study will seek to contribute towards waste management by building the capacity of African healthcare staff. This would be done through training, information sharing, networking and dialogue in relevant topical and developmental issues.

It is expected that the study will build capacity by educating all health staff to manage waste more effectively, by raising awareness on waste management, and compliance with legislation. In addition, the study will sensitize the health workers on correct identification, and segregation of clinical waste to avoid risks to staff, patients and the environment. This will be important in contributing towards the general minimization of the amount of waste going to landfill and in maximizing the benefits of recycling.





6.1 Climate Sense Program (CSP)

6.1.1 Technological and Farming Systems Adaptation to Climate Change in Farming Communities of Enugu State, Nigeria by Emeka Celestine Nzeh and Rita Ogugua

As presented by Mr Emeka Nzeh, this study purposed to examine the level of awareness and understanding of farmers and local communities about the manifestation and impacts of climate change. This involved the identification of the relationships between climate change and adjustments in farming systems and management technologies; and establishing the patterns and manner of livelihood adjustments that have been implemented by local communities and farmers in response to the climate change phenomenon. He was optimistic about the positive impact arising from the research findings in enlightening the stakeholders on ways to manage and adapt to climate change.

6.1.2 Wind Resource Assessmen for Sustainable Development in Rural Ghana: A Science, Technology and Innovation Research Capacity Building Initiative by Mahu Seth Agbeve, Atsu Titiati and Wilhemina Quaye

In his presentation of their concluded study, Mr Mahu Seth explained that the main adaptation strategy that this project sought to explore was the use of wind resource energy to push the drive for climate change adaptation in vulnerable rural communities especially those along the coast of Ghana. This was attained by wind resource assessment at a location in the Danghe East District of Ghana using instrumentation and methodologies based on best industrial practices to obtain data of good quality to stimulate and boost further exploration of wind energy potential in the area. Thereafter, the study sought to raise awareness through sensitization workshops for investment in the environmentally sustainable wind energy generation as an alternative livelihood opportunity for Ghana and entire West Africa region.

6.1.3 Enhancing Crop Yield by Smallholder Farmers through Integrated Climate Change Adaptation Program in Sierra Leone by Teddy Morlai, Dr. Kelleh G. Mansaray and Gibril Vandi

Mr Teddy Morlai presented their study that focused on investigating the state of climate change and climate variability across agro-climatic regions in Sierra Leone. It sought to establish and understand the socio-economic status of indigenous people, their knowledge, perceptions and behaviour towards climate change. Mr Morlai explained that a model would be established on how climate links health, natural disaster, to food security and the local economic growth with an overall aim of building capacity in the area of climate change.

6.1.4 Climate Change Awareness and Indigenous Adaptive Technologies in the Niger Delta Region of Nigeria by Chidi Nzeadibe, Chukwudumebi L. Egbule, Dr. Nnaemeka Chukwuone and Dr Victoria Chinwe Agu

Mr Chidi Nzeadibe group's study sought to determine the level of awareness of local community on impacts of climate change and to identify specific practices contributing negatively to climate change in the area. In addition, the study investigated the available extension services relating to climate change and adaptation strategies and determined the problems associated with adapting to effects of climate change. Mr Nzeadibe further explained that there were further efforts in establishing the government's efforts in promoting sustainable environment and climate change mitigation and adaptation. According to him, one of the major constraints is the gaps in knowledge and information transfers from the government and researchers to the communities. This study would therefore shed light on the information gaps that policy makers and researchers can exploit to ensure that climate change is well addressed in the area.

6.1.5 Assessment of Adaptive Capacity of the Machobane Farming System to Climate Change in Lesotho by Dr S. B. Mekbib, Dr A.O Olaleye, Dr M.N. Mokhothu, Masia Johane and Spirit M. Tlali

Dr Mekbib informed the participants that the study focused on assessing the Machobane and Non-Machobane farming systems to compare their capacity in adapting to climate change impacts in Lesotho. He stated that a thorough analysis had been conducted including dialogue with policy makers with the view to incorporate the Machobane Farming System as a viable farming system for the rural poor in Lesotho.

6.1.6 Tracking Effective Indigenous Adaptation Strategies on Impacts of Climate Variability of Food Security and Health of Subsistence Farmers in Tanzania by Dr. Riziki Silas Shemdoe

According to Dr. Riziki Shemdoe, the study examined the variability of climate variables in selected areas of Tanzania. Further it assessed the impacts of climate variability on food production; and on health of farmers and food security. Out of these findings it determined the short and long term adaptation strategies developed by different rural communities with a view to develop robust framework to support policy decisions in crop/livestock production and human health systems in Tanzania. This will be a useful contribution to behavioural changes and influencing policies on building climate resilience in Tanzania.

6.1.7 Assessment of Indigenous Climate Change Adaptation Practices in Smallholder Agriculture of Southeast Nigeria by Dr. Anselm Enete, Dr. Ignatius A. Madu, Dr. Elizabeth A. Onwubuya, Anthony N. Onyekuru, Mojekwu Josephat Chukwudi, and Fidelis Eze

Dr. Anselm Enete stated that main objective of the study was to examine the level of awareness of climate change and its link with agriculture among farmers in the area. Specifically, the study identified the activities of farmers that contribute to climate change in the area; examined the patterns of climate change impact on agriculture in the area; identified the indigenous adaptation practices used by farmers in the area and thereafter estimated the costs and returns of these adaptation practices. In addition, it identified the factors that are influencing the adoption of these adaptation strategies in the area including the problems encountered by farmers in adapting to the effects of climate change. He was confident that the study would be useful in contributing to the on-going debate on climate change management and particularly in informing robust climate change policies.

6.1.8 Assessment of Incidence of Climate Change, Innovative Adaptation Practices and Livelihood Security in Malawi by Tennyson M. Magombo, Mutisungirire Kachulu, George Kanthiti, Hilda Kabuli and Grace Chawezi Phiri

Mr. Tennyson Magombo stated that the study's main goal was to assess the incidence of climate change and understanding the links between climate change innovative adaptation strategies, farming systems and livelihood security. The study sought to specifically understand the level of awareness of climate change in the area, the nature of the impacts and establish the different practices that exacerbate the impacts as well as the indigenous adaptation practices used by farmers in the area. The major outcomes from the study are expected to be; enhancement of behavioural changes towards climate change adaptation measures at individual and institutional levels, to build capacity of farmers in the area and most importantly to influence policy on climate change resilience at the national level in Malawi.

6.1.9 Sensitizing and Building the Capacity of Women towards Climate Change Consequences in Northern Lakes of Egypt by Manal Moustafa Samra and Ahmed Abdel Hamid

Ms Manal Samra reported that the study aimed to strengthen the capacity of poor local women to adapt to climate change impacts through up-to-date ideas and means of processing of fish products to assist them to adapt to the inevitable impacts of climate change in their community. She was highly encouraged that there were great achievements in supporting communities and institutions in the focus area in identifying appropriate and sustainable adaptation mechanisms. This included support to residents and institutions in selected communities in identifying the methods of minimizing the consequences of climate change such as poverty, unemployment and overpopulation. They also established concrete mechanisms of knowledge transfer in the area of climate change; and also encouraged women to take leadership in climate change and adaptation issues.

6.2 Regional Agricultural Innovations Programme

6.2.1 Agricultural Innovations for Climate Change Adaptation and Food Security in Nigeria, Sierra Leone and Liberia: Empirical Evidence by Agwu Ekwe Agwu, Egbule Chukwudumebi Leticia, Amadu Festus Onesimus, Morlai Teddy Amara, Wollor Emmanuel Topor, and Cegbe Leroy W.

The major aim of the research was to identify and document effective agricultural innovations for climate change adaptation and food security in three West African countries, namely: Nigeria, Sierra Leone and Liberia. The specific objectives of the study were to: promote some agricultural innovations through targeted training and field demonstrations with selected

Agriculture Extension Officers and farmers in Nigeria, Sierra Leone and Liberia; identify and document indigenous innovations and good practices by climate change vulnerable communities for improved food security in Nigeria, Sierra Leone and Liberia; identify and document emerging innovations suitable for climate change adaptation in Nigeria, Sierra Leone and Liberia; establish collaborative network involving researchers, ministry of food and agriculture or its equivalent and farmers to enhance agricultural innovations for increased productivity in the face of climate change in Nigeria, Sierra Leone and Liberia; build capacity of farmers and extension officers from the ministry of food and agriculture or its equivalent in order to enhance behavioral change towards sustainable farming and agri-business innovations in Nigeria, Sierra Leone and Liberia; build capacity of the research team on agricultural innovation systems through participating in an integrated capacity building programme, including hands on case studies and country tours to showcase and learn from good practices; radio jingles, drama, plays, TV shows, etc. all aimed at disseminating evidence based climate change adaptations and resilience methods and food security to vulnerable communities and people in the three countries; and to support the implementation of the NEPAD CAADP programme in the West Africa region through popularization and policy advocacy.

The study adopted the Agricultural Science Technology and Innovation (ASTI) System framework and drew on both primary and secondary data sources using both qualitative and quantitative methodologies. Multistage (random) sampling techniques were used in selecting 1,424 farming households (made up of 624 from Nigeria; 400 from Sierra Leone and 400 from Liberia) for the study. Also, 164 key stakeholders from various organizations involved in climate change and food security issues participated in the study. Percentages, mean scores, standard deviations, trend analysis and exploratory factor analysis procedure using the principal factor model with iteration and varimax rotation were the major analytical tools used in realizing the research objectives.

Key findings from the study showed that respondents across the three countries possessed no special training on climate change adaptation and food security issues. The level of investment in farms from self-generated income sources in Sierra Leone and Liberia showed an increasing trend over the past five years, with an unstable source of government funding over the past five years in Sierra Leone and Nigeria. Farmers from the three countries noted that they experienced delayed shift in onset of farming seasons due to delayed and erratic onset of rains. Though farmers in Liberia experienced the highest level of increase in the trend of extreme weather events and more farming problems than those in Nigeria and Sierra Leone, the farmers perceived a downward trend in extreme weather conditions between 2008 and 2009. Farmers from the three countries noted that human activities are largely the main causes of climate change. These human activities include tree felling, bush burning, gas

flaring from oil companies (in Nigeria), cooking with firewood and burning of fossil fuels, among others. Adaptive measures used in the three countries include: increased weeding, increased use of fertilizers, changes in planting dates and prayers for God's interventions. Similar problems were being encountered by stakeholders in the different countries in their various efforts to adapt to the changing climate. These problems include poor access to relevant information, poor/low extension services, lack of financial resources etc. Again, respondents perceived food situations in their various countries not to have changed considerably. This is evident in the number of times they fed daily, which was mainly twice in Sierra Leone and Liberia. There was perceived non-existence of overseas linkages / collaborations across the three countries in the area of food security and climate change issues. However, there was an increase in linkage between farmers and the R&D institutions in Nigeria, while in Sierra Leone and Liberia, the linkages remained unchanged over the years. The major sources of information on climate change for Nigeria and Sierra Leone farmers were radio, television, other farmers and Ministries of Agriculture. Lastly, respondents' abilities to adapt to the changing climate and domestic environment's support for climate change adaptation and food security issues were poor in the three countries. Hence, given the complexity of the existing socio-political situations as well as the tremendous lack of financial and human resources for development in these countries, it will be imperative for the different governments to work collaboratively with other stakeholders so as to secure the future of their citizens---there lies the importance of the Agricultural Innovation System Framework.

6.2.2 Agricultural Innovations for Climate Change Adaptation and Food Security in Africa: The Cases of Ghana and the Gambia by Gordon Akon-Yamga, Paul Boadu, Beatrice Darko Obiri, Joyce Amoako, Fatou Janha Mboob

The main objective of the study was to support the ATPS Agricultural Innovations Programme on Agricultural Innovations for Climate Change Adaptation and Food Security in Africa by achieving the following specific objectives: Identify and document indigenous innovations and good practices by climate change vulnerable communities for improved food security in Ghana and The Gambia; provide information on agricultural practices and activities of farmers towards food security and climate change adaptation in Ghana and Gambia; identify and document emerging innovations suitable for climate change adaptation in Ghana and The Gambia; promote some selected agricultural innovations through targeted training and field demonstrations with selected agriculture extension officers and farmers in Ghana and The Gambia; establish collaborative network involving researchers, ministry of food and agriculture or its equivalent and farmers to enhance agricultural innovations for increased productivity in the face of climate change; and to provide baseline information to support agricultural innovation programmes and the implementation of the NEPAD CAADP programme in the West Africa region through popularization and policy advocacy. The study was carried out in Ghana and The Gambia. Two methods were employed for this

study. These were field survey and desk research. These methods yielded both primary and secondary data. To allocate the number of household heads for the field survey between Ghana and the Gambia the ratio of the populations of the two countries was used. Therefore relying on the ratio of the population of Ghana (23,350,927²) to the Gambia (1,660,200³) as the basis for allocating the number of households to be selected from each country, 747 households were allocated to Ghana and 53 households were allocated to the Gambia to complete the proposed overall sample size of 800. However it was realized 53 households was too low a sample and therefore during the survey 100 households were selected from the Gambia and 746 from Ghana.

Key findings showed that male farmers dominated (77.5%) the households in Ghana. In the Gambia, the respondents were also dominated by male farmers represented by 91.9%. The survey results from Ghana showed that majority of the respondents (64.7%) had some level of formal education. The results from the Gambia showed that all the respondents had some level of formal education. Majority of the farmers interviewed were mainly engaged in crop cultivation. The survey results showed that majority of famers in Ghana finance their agricultural activities from their own pockets. All the finances that go into farming in the Gambia were self-generated. The results from Ghana showed that 54% of respondents had never benefitted from the services of agricultural extension agents whereas in the Gambia 95% of the respondents reported that they had received visits from Agricultural Extension Agents.

Further results from Ghana showed that many of the farmers interviewed (60%) knew and were able to describe climate change, albeit many times they were describing the changing rainfall season. In the Gambia, the knowledge of climate change issues was very encouraging. About 91% of the farmers interviewed said they were aware of climate change. Farmers perceived the loss of forest resources as the major impact of climate change in their localities. The results further indicated that the trend of forest loss has consistently increased between 2005 and 2009. Additionally the results showed that flooding, long period of dry season, soil infertility, drying of rivers, long period of rains, decrease in farm yields and delays in the onset of rainfall during the rainy season were some perceived impacts of climate change. As an indicator of household food security in the study area in Ghana, famers were asked about the frequency with which they had problems meeting their household feeding. The results from Ghana show that majority of the respondents (45.3%) said they sometimes experienced problems with feeding in their households. Furthermore, 6.3% said they often faced problem with household feeding, 5.4% said they always faced problems, while 14.6% said they seldom encountered problems. Therefore overall 72.6% of the respondents have in some form

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^{2,3} World Bank Data, 2008

experienced problems with meeting household feeding. In the Gambia, majority of the farmers (75%) sometimes find it difficult meeting the food needs of their families.

Farmers' adaptive responses to erratic rainfall patterns showed that in Ghana, 29.8% of farmers did nothing in seasons where they had little rainfall. Other farmers said they regularly weeded their farms (22.7%); applied fertilizer (10.2%); irrigated their farms (8.7%); cultivated early (2.1%); sprayed with agro-chemicals (2.1%); and the application of manure (1.8%). The situation was no different in the Gambia as majority of the respondents there (33%) also did nothing. About 17% of them said they provide water for their livestock whereas 7% consult with the agricultural extension officers and 4% pray to God for relief. When it comes to farmers' response to excessive rainfall, the results show a similar trend in both countries.

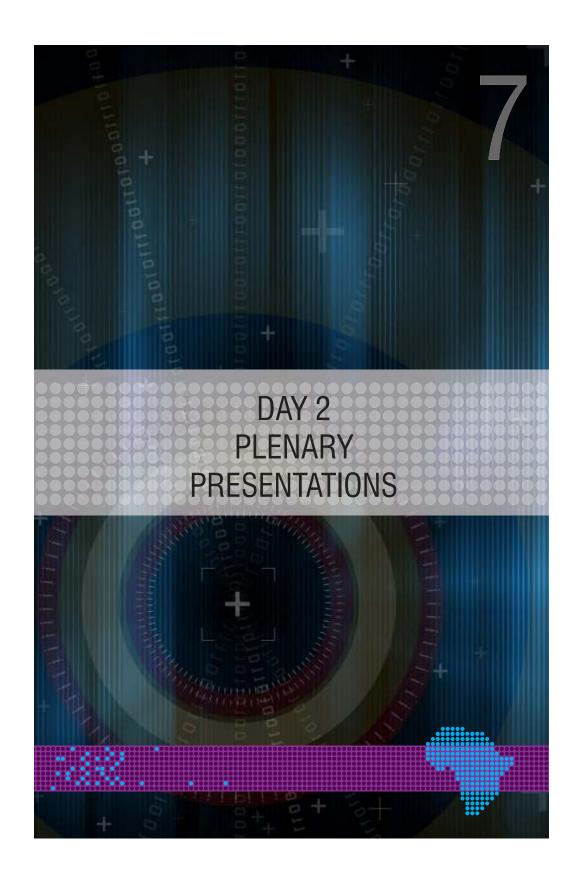
The results from Ghana showed that not many farmers had introduced innovations on their farms. Indeed about 79% of the respondents said they have not introduced any innovations. Similarly, in the Gambia, 72% of the respondents said they have not introduced any innovations. With respect to institutions, about 109 technologies and innovations were identified among 13 research institutions in Ghana. Most of the technologies were crop production related technologies/innovations. In the Gambia, five institutions were covered. The institutions were mostly engaged in extension or information dissemination activities, production, and research and development of agricultural innovations and technologies. Other activities undertaken by the institutions include teaching, policy advocacy and quality assurance of technologies

6.2.3 Agricultural Innovations and Adaptations to Climate Change Effects and Food Security in Central Africa: Case of Cameroon, Equatorial Guinea and Central African Republic by Musongong née Siri Bella Ngoh, Mafany George Teke, Ndeso Sylvester Atanga

The main thrust of the research was to identify, evaluate and document innovative adaptation strategies and their effectiveness in coping with climate change effects in some selected Central African countries. The area of study covered the three Central African countries of Cameroon (CAM), Equatorial Guinea (EQG) and the Central African Republic (CAR). The study area was purposively divided as per the ecological and climatic peculiarities of each zone into ten main zones distributed for each country as follows: Cameroon had five zones, CAR three and Equatorial Guinea two. In Cameroon, a total of 600 questionnaires were administered and 572 questionnaires were retrieved for analysis. The 200 questionnaires distributed in the CAR were all retrieved while only 115 of the 200 questionnaires administered in Equatorial Guinea were recovered for analysis. Purposive, stratified, random sampling methods and some selected Participatory Rural Appraisal (PRA) tools were used for the collection of data. Semi-structured interviews and focused group discussions were used to source information from respondents that were unable to read and fill the questionnaires

themselves. Respondents to the questionnaires were randomly selected from the following target-groups: crop farmers, (market gardeners, cereal farmers, cash crop/permanent crop growers) animal husbandry (piggery, poetry, etc.) and non-conventional farmers (like bee keepers, Non-Timber Forest Products (NTFP) collectors, snail farmers). The collected data were analysed using STATA statistical package.

Key results showed that over 90% of the farms were family or privately owned and operated as small groups in the three countries and that more than 90% of the agricultural funds in all three countries are self-generated capital. More than half of the farmers demonstrated appreciable awareness on climate change issues. On the perceived causes of climate change, more than 55% of the farmers in Central Africa purported that deforestation or cutting of trees, bushfires and pollution were the principal culprits. Some of the main innovative strategies that farmers have devised to cope with climate change impacts were; multiple cropping and planting with different maturity period, late planting, blocking of drainage in rice fields, grazing on leftover straw, harvesting of animal droppings, wood ash application and urban cropping. Other strategies employed were shade tree planting, and river bank farming. Several problems were observed to undermine the efforts of farmers in adapting to the effects of climate change. These include: poor access to information source relevant to adaptation, lack of financial resources, limited access to and high cost of improved crop varieties, non-availability of storage, processing and credit facilities, non-availability and high cost of fertilizers and other inputs and high cost of irrigation facilities. It was recommended that governments should establish financial policies and make available incentives, subsidies and bonuses to farming communities that identify and bring into light new strategies that can effectively combat the perils of climate change and improve food security.





7.1 The African Manifesto for Science, Technology and Innovation by Dr. Kevin Chika Urama, ATPS

Dr Kevin Urama introduced the African Manifesto for Science Technology & Innovation with core aspects regarding its origins and the African Manifesto's overall relevance and impact. He argued that STI is an essential engine of development in Africa just as in other countries where technology transfer solutions and other home-grown initiatives to deploy, harness and utilize science and technology have led to sustainable economic development. The rationale for the African Manifesto for ST&I is that it may help to stimulate a strong political will leading to more opportunities to address poverty, diseases, environmental destruction and other sensitive issues in Africa. Dr. Urama also pointed out that the Manifesto is another opportunity to start thinking of a New Africa where self-rule and democratic governance are fully recognized as pathways to Africa's development. After presenting his new vision on STI for Africa's Development and depicting the socio-economic and political contexts, he concluded on potential opportunities for improvement, coordinated response actions (stimulating new forms of STI, coordination and collaboration, full socialization, etc.) and recommendations (capacity building and utilization, institutional reforms, funding and accountability, investments in STI infrastructure) to be considered.

7.2 Innovation, Sustainability, Development: A New Manifesto by Dr. Adrian Ely



Dr. Adrian Ely outlined a collaborative project on a new manifesto process on Innovation, Sustainability and Development. He stated that the project was not merely about putting forward views and ideas, but it was also concerned with the ways to explore how ideas have changed over the decades and then, to highlight divergent perspectives from other parts of the world. He further argued on the imperative of poverty reduction, social justice and environmentally sustainability that can only be achieved through a radical shift to Science, Technology and Innovation. He also explained that the need for more STI should be accompanied by a new agenda that involves

new politics of innovation and related pathways, possible alternatives as well as political choices and trade-offs. After stating how important the African manifesto is to the new global debate on ST&I, he came up with the argument that there is need to move beyond a view that 'more' and 'faster' innovation will do and to embrace forms of STI socialization (value of indigenous STI systems). Finally, he suggested some ideas for moving forward including duplication of manifestos to celebrate a plurality of ideas, documenting examples of innovation approaches and engagement with main stakeholders and social movements at various levels.

7.3 UNESCO Science Report 2010 by Susan Schneegans



Susan Schneegans provided an overview of the UNESCO Science Report 2010 on the current status of Science around the world. After reporting key figures (shares of researchers, GERD/GDP ratio, world shares of publications, etc.) for the years 2002 and 2007 and for the period 2000–2009 for some data (patents awarded to South Africa inventors), Ms Schneegans suggested some recommendations for Africa which basically include the crucial need for systematic data collection and analysis, national science policies integrated into nations development plans, extensive collaboration between African States and donor organizations for the purpose of

establishing more research centers in key areas of ST&I, active role of African governments to raise GERD to at least 1% of GDP and more involvement of researchers in Africa to increase research publications, implement research programs and participate in the cutting edge of global technological progress. She also put emphasis on other key issues such as the global level of S&T education and ways to improve it especially for some marginalized populations and the brain drain of African scientists. She ended the presentation with the efforts being made in Africa in terms of developing centers of excellence and their networking as well as an overview of policies to promote research and innovation in Africa and some emerging countries like China.

7.4 The Biennial Science, Technology and Innovation (STI) in Africa Report by Dr Nicholas Ozor African Technology Policy Studies Network (ATPS)



In his presentation, Dr Ozor provided the rationale for the proposed biennial report for science, technology and innovation in Africa which includes keeping up-to-date information on the state of science, technology and innovation in Africa. He noted that his experience as a co-author for the sub Saharan Africa Chapter of the UNESCO Science Report 2010 shows that there is dearth of reliable data on STI in Africa. It also showed that we have problem of documentation of data and research evidence in Africa. He further noted that the Biennial Africa Report will be designed in such a way as to feed into the global UNESCO report that is published every

five years. The report will also enable ATPS to:

- > Develop an interactive web-hosted database resource of STI experts in and on Africa (Who is, Who in STI in Africa);
- > Institute an annual award to celebrate performing STI actors in Africa;
- > Develop a donor watch program (DWP) aimed at providing support to Donor Consortia interested in supporting STI issues in Africa; and
- Feed into the Global UNESCO Science Report published every 5 years. The web link for the UNESCO Science Report 2010 is: http://unesdoc.unesco.org/images/0018/001899/189958e.pdf

Dr Ozor further provided examples of what will form the content of the Biennial Science Report for Africa as follows:

- 1. **Background of STI in Africa (country cases):** This will include; brief historical analysis of STI developments; STI policies and legal frameworks; barriers to STI development; and the place of STI in the overall agenda and priorities of country Governments.
- 2. Inventory of STI capabilities in Africa: This will include data on various STI indicators such as; number of scientists in the country, number of research institutions, number of universities, STI publications and reports, budgets to S&T and R&D, training opportunities, enrolments into S&T programmes (BSC, MSc & PhD) in universities, and job satisfaction and security in S&T, etc.
- Evidence-based STI responses to global changes in Africa: This will include specific evidence-based STI initiatives developed in response to the current global challenges such as climate change, food insecurity, economic & financial crisis, and poverty, etc.
- 4. **Perspectives and strategies for strengthening STI capabilities in Africa:** This will include the necessary prerequisites enabling the attainment of sustainable STI

- development, the strategies for tackling the global challenges through STI, and the models and mechanisms for advancing STI development, etc.
- 5. **Emerging organizations driving STI in Africa:** This will include the inventory of actors public and private institutions, ministries, organizations, etc., providing leadership in STI development and their respective mandates, the level of partnerships and collaboration between public and private sectors involved in STI development, national and international collaborations in STI development, and individuals and groups championing STI development (with contacts)

Dr Ozor also described the proposed process for developing the Biennial Report for Africa. He noted that each participating country will nominate at least two representatives who have research capacity to contribute to the process of development of the report. An inaugural workshop of these experts will then be convened to discuss modalities for the report and share responsibilities. Overall, the ATPS Secretariat will handle the editorial issues and logistics. He further noted that detailed arrangements for the nomination and workshop will be communicated to the members in due course.





Report on the One-day Corporate Governance Training Course for the African Technology Policy Studies (ATPS) Network Key Stakeholders by Dr Joshua Okumbe and Ms Judith A Oluoch, The Center for Corporate Governance, Kenya

Introduction

The Center for Corporate Governance conducted a One-Day Corporate Governance training course for ATPS Network key stakeholders at Conrad Hilton Hotel, Cairo, Egypt on November 29, 2010.

Objectives of the Training Course

The main objectives of the Training course were to enable the key Stakeholders of ATPS Network to:

- > Broaden their knowledge and understanding of corporate governance.
- > Understand and interpret the principles and best practice in corporate governance.
- > Be exposed to the challenges of good corporate leadership.

- > Discuss their duties, roles and responsibilities as direction setters.
- > Appreciate the need for effective and timely financial reporting and need for full disclosure and compliance.

A total of 35 key Stakeholders attended this training course. The detailed list of participants is provided as an Appendix at the end of the report.

PROGRAMME AND METHODOLOGY

Monday, November 29, 2010

Participants started arriving at the venue from 0800 hours. Activities of the day began with registration at 0830 hours.

The first session of the day begun at 0900 hours with a welcome address by the Executive Director, ATPS, Dr. Kevin Urama, and opening address by Chairman, ATPS Board, Dr. Samuel M. Wangwe. All Participants formally introduced themselves.

This session was followed by an Introduction to the concept and development of corporate governance and principles of corporate governance which lasted from 0915 to 1045 hours. Participants had tea break between 1045 and 1115 hours.

From 1115 hours, the Mandate and Governance organs of ATPS were highlighted. Thereafter the Roles and Functions of the Members, Board, Chairman, Executive Director and Management of ATPS Network were covered.

Lunch was served from 1330hours.

The afternoon session began at 1430 hours and covered on the making of the Board of ATPS more effective. The session explored aspects such as composition of the Board, Board Instruments, Board Dynamics, Board Committees, Conflict of Interest and Board Evaluation. The session ended at 1600 hours. Thereafter, tea break was held between 1600 and 1630 hours.

The next session, after the tea break, begun at 1630 hours and the session covered various elements of corporate accountability, disclosure and compliance. A review on Controls, Compliance, Reporting and Disclosure at ATPS was covered during the session.

In the last session of the day, which lasted from 1730 to 1800 hours, the participants reviewed the lessons learnt during the day. Likewise, it was noted from the Recommendations (See below) made by the participants that the training captured varied issues in corporate Governance. Thereafter, the participants were given course evaluation forms which they completed and returned. The results of the evaluation are detailed on the next page.

The training course was formally closed with closing remarks from the Chairman, Dr. Samuel M. Wangwe. Thereafter, certificates were awarded to the participants.

RECOMMENDATIONS

Major recommendations made by the participants during the One-Day Corporate Governance training course include the following:

- 1. Ensure that the Board actions are motivated by the interest of ATPS Network.
- 2. Put in place a Board manual/charter to guide the operations of the board and address issues of conflict of interest
- 3. Need to put in place mechanisms for annual board evaluation/self-assessment
- 4. Need to blend skills on the board (look at the different skills that each member brings to the board)
- 5. Appreciate the role of the Board in Strategic Planning and link the annual work plans to the strategic plan.
- 6. Board papers to be availed to members in good time to facilitate preparation.

EVALUATION OF THE INDUCTION COURSE

The table below presents the mean scores of the participants' responses to the evaluation instrument on the topics and the presentations during the training course.

Question	Average	Rating
1. The training administration (handouts)	4.0	Very Good
2. Were the topics clearly presented?	4.2	Very Good
3. Were the topics covered extensively?	3.9	Very Good
4. Do you think the presentations were well organised?	4.0	Very Good
5. Were the presentations informative?	4.3	Very Good
6. What is your rating of the knowledge gained during this training?	4.0	Very Good
Overall rating	4.10	Very Good

Key:

5 Excellent (4.51 - 5.00);

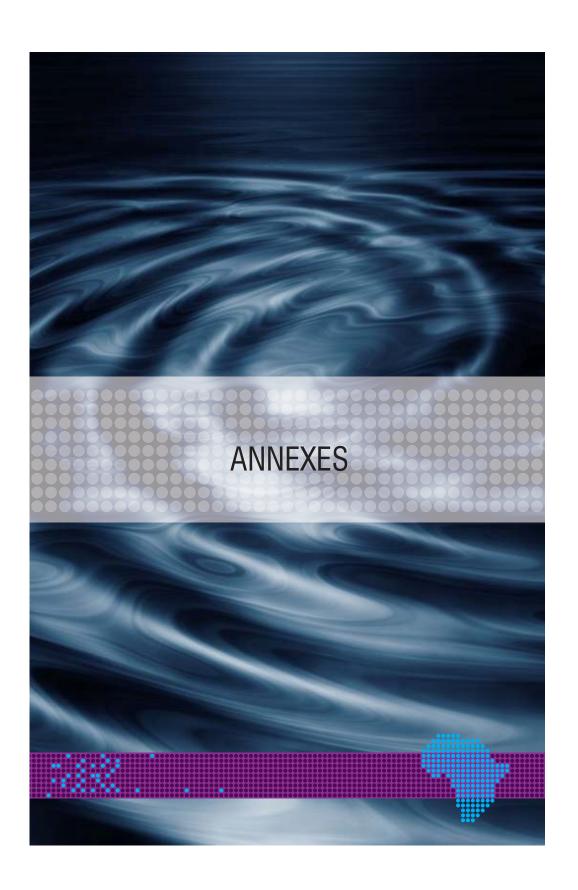
4 Very Good (3.51 - 4.50);

3 Good (2.51 - 3.50);

2 Fair (1.51 - 2.50);

1 Poor (0.51 - 1.50)

The overall rating of the training course had a mean score of 4.10, which is Very Good. This shows that the participants had an impressive rating of the training course.



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11AY 7 -	Friday	7h	November	201711

PLENARY SESSION 3: RECAP OF DAY 1

Venue: Conrad Ball Room, Cairo, Egypt

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Time	Topic/ Presentations	Proposed Presenters	Session Chair/Lead Discussants
08:45 – 09.00 a.m.	Recap of Day 1	Dr Nicholas Ozor, Senior Research Officer, ATPS	Prof. Oyebanji Oyeyinka, Director, Monitoring & Research Division, UN- HABITAT & ATPS Board Member
	Day 2	: PARALLEL SESSION (D2-P1 – P4))
	Topic/Presentations	Proposed Presenters	Session Chair/Lead Discussants
09:00 – 11:00 a.m.	Parallel Session P. 1: (Morning) • Governance of science, technology and innovation in Africa (Subtheme 1); • Investments in STI (subtheme 2) • STI indicators (Subtheme 3)	All delegates that submitted papers under this subtheme (see Annex 2 for time allocations and venue)	Prof. Wiebe E. Bijker, Maastricht University, The Netherlands Dr. George Esseghey, Director, STEPRI-CSIR, Ghana and Regional Council Member, ATPS.
	Parallel Session P.2: STI and development in Africa Knowledge Management & Intellectual Property Rights Parallel Session P.3: Gender Issues in STI Development in Africa	All delegates that submitted papers under this subtheme (see Annex 3 for time allocations and venue) All delegates that submitted papers under this subtheme (Annex 4 for time allocations and venue)	 Prof. Michael Madukwe, National Chapter Coordinator, ATPS Nigeria Dr Musa Dube, National Coordinator, ATPS Swaziland Prof. Agnes Mwang'ombe, Chair, AWFST, and member ATPS Board. Mr Tennyson Magombo, Agro enterprise Development Specialist, African Institute of Corporate Citizenship & Chair, AYFST
	Parallel Session P. 4: IP Program Regional & National Steering Committee Workshop Traditional Knowledge Systems & Increasing Access to benefit Sharing of Intellectual property in Africa (ATPS-CP0209)	All delegates that submitted papers under this subtheme (Annex 5 for time allocations and venue)	Mr. Joseph Wekundah, ATPS IP Program Coordinator Mr. Richard Muriuki, ATPS Finance & Admin Manager
11:00 – 11:30 a.m.	HEALTH BREAK		
11:30 – 13:00 p.m.	Day 2: PARALLEL SESSION (D2-I (cf : Annexes 1 – 4 for time alloca		
13:00 – 14:00 p.m.	LUNCH		

PLENARY SESSION 4: ONGOING RESPONSES TO STI DEVELOPMENT – GLOBAL AND AFRICAN SCALES

Venue: Conrad Ball Room, Cairo, Egypt

Time	Topic/Presentations	Proposed Presenters/Discussants	Session Chairs
14:00 – 14:15 p.m.	The UNESCO Global Science Report 2010: Lessons for Africa and Presentation of the UNESCO Report 2010	Ms Susan Schneegans, UNESCO Paris and Editor UNESCO Science Report 2010	Prof. Shaukat Abdul Razak, National Council on Science and Technology (NCST), Kenya, Member, ATPS Board
14:15 – 14:35 p.m.	Launching The African Manifesto for STI	Dr. Kevin Urama, ED ATPS & SET-DEV Partners	
		Panelists:	
		• Dr Adrian Ely, STEP Centre, UK	
14:35 – 15:15 p.m.	Expert Panel Responses to The African Manifesto (5 - 10 minutes each)	 Prof. Turner Isoun, Former S&T Minister, Fed. Rep. of Nigeria, ATPS Board Member 	
	mates easily	 Prof. Abdul Razak, Executive Secretary, NCST, Kenya, ATPS Board Member. 	
		 Prof Agnes Mwangombe, Chair, AWFST, Kenya 	
	Facilitated O.P. A. by Ctalcabaldara	Facilitators:	
15:15 –	Facilitated Q&A by Stakeholders in Responses to The Africa	 Twalib Ebrahim, ATPS Kenya 	
15:30 p.m.	Manifesto	 Deepa Pullanikkatil, ATPS Malawi 	
15:30 – 16:00 p.m.	HEALTH BREAK		

PLENARY SESSION 5: ONGOING RESPONSES TO STI DEVELOPMENT – GLOBAL AND AFRICAN SCALES CONTINUES Venue: Conrad Ball Room, Cairo, Egypt

16:00 – 16:15 p.m.	Announcing the Process for Biennial Publication on the State of STI in Africa report	Dr Nicholas Ozor, Senior Research Officer, ATPS	Prof. Indira Nath, Institute of Pathology (ICMR), New Dehli, India, Member ATPS Board
16:15 – 16:30 p.m.	ATPS Innovation Incubation Programs: The UniBRAIN project, the Climate innovation Awards, AYFST, and AWFST	Dr Kevin Urama, Executive Director, ATPS	
	Facilitate d International Decord	Facilitators:	
16:30 – 17:30 p.m.	Facilitated International Round table Discussion: Stakeholders Responses to The Africa	 Twalib Ebrahim, ATPS Kenya 	
17.00 p.m.	Manifesto and way forward	Deepa Pullanikkatil, ATPS Malawi	

17:30 – 18:00p.m.	Networking time		
19:00 –	Management meeting of the	Facilitators:	Dr Kevin Urama, Executive Director, ATPS
21:00p.m.	National Chapter Coordinators, Regional Council and Secretariat Management	 Mr. Richard Muriuki, ATPS Finance & Admin Manager 	
		Mr. Marsden Momanyi, Ag. Senior Communications Officer, ATPS	

DAY 3 - Saturday 27 November 2010

DAT O Catalady 27 November 2010			
PLENARY SESSION, Venue: Conrad Ball Room, Cairo, Egypt			
Time	Topic/Presentations	Proposed Presenters	Session Chairs
08:00 – 08:30 a.m.	Recap on Day 2	Mr Marsden Momanyi, Ag. Senior Communication Officer, ATPS	1. Dr Warigia Bowman Assistant Professor, University of Mississippi, U.S.A.
08:30 – 13:00 p.m.	Day 3 Parallel Session 1: ATPS Proposal Tournaments	7.11.0	2. Prof. Atieno Ndede-Amadi Founder / Chief Executive Officer Kenya Kountry Business Incubator
	(See Annex 5 for timing and venue) • African Youth Climate Change Innovation Award 2010 ATPS-CP/0400/10	25 Shortlisted Candidates (see Annex 6 for Details on timing and venue)	3. Dr Abdulkarim A. Obaje, Monitoring & Evaluation Officer & Head, Partnership & Collaboration Unite Science & Technology Education Post-Basic Project (STEP-B)
	African Women Climate Change Innovation Award 2010 – ATPS-CP/0500/10		4. Prof. Femi Olokesusi Nigerian Institute for Social and Economic Research (NISER), Associate National Chapter Coordinator, ATPS Nigeria
			5. Mr Kenneth W. Aduda, Projects & Resource Mobilization Manager, Kenya Industrial Research Development Institute (KIRDI), National Chapter Coordinator, ATPS Kenya.
			6. Tennyson M. Magombo, Chair, AYFST

09:00 – 13:00	Day 3 Parallel Session 2: Final Program Review Workshop for	Shortlisted Candidates (Annex 7 for time	PROGRAM COORDINATORS:
p.m.	ATPS 2009 Grants on:	allocations and Venue)	1. Prof. Michael C. Madukwe , University of Nigeria, National Coordinator, ATPS Nigeria
 Emerging and Indigenous Technologies for Climate Change Adaptation in Africa (ATPS -CP0109); 			2. Prof. Eric Eboh Executive Director AIAE, Nigeria, ATPS Nigeria
	and 2. Agricultural Innovations for		3. Prof. Francis Mutua University of Nairobi, ATPS Kenya
	Climate Change Adaptation and Food Security in Africa (ATPS - CP0309)		4. Dr George O. Essegbey, Director, STEPRI-C.S.I.R., Ghana, ATPS Regional Council Member, Ghana.
			5. Prof. Bob Orskov The Orskov Foundation c/o The Macaulay Institute, Aberdeen, UK
			6. Dr Musa DUBE, University of Swaziland, National Chapter Coordinator, ATPS Swaziland
09:00 – 13:00 ID Program ToT Workshop	IP Program ToT Workshop	All IP program researchers, national steering committee members and ToT	Dr Niels Louwaars Centre for Genetic Resources, Wageningen University, The Netherlands & ATPS/BTA IP Regional Committee member.
p.m.		delegates (see Annex 8 for details)	Mr Joseph Wekundah ATPS IP Program Coordinator
11:00 – 11:30a.m.	HEALTH BREAK		
13:30 – 14:30 p.m.	LUNCH		
15:00 – 18:00 p.m.	Annual General Meeting (AGM) of A (See Agenda in Annex 9)	ATPS members ONLY	- 4 - W - 0 - 4 - 1700 - 1
18:00 – 18:30 p.m.	CONFERENCE CLOSING REMARKS MEMBERS	BY THE ATPS BOARD	Prof. Samuel Wangwe, Chair, ATPS Board
19:00 – 21:30 p.m.	Conference closing dinner hosted t	by ATPS (TBC)	

DAY 4 - Sunday, 28 November 2010

ATPS BUSINESS – NATIONAL CHAPTER COORDINATORS', REGIONAL COUNCIL & RESPONSIBLE STI ACTIVITIES, EXCURSIONS DEPARTURES

Time	DEPARTURES Topic/Presentations	Participants	Session Chair
08:00 – 13:00	Field Visits to historical Sites in Egypt	By private arrangements Contacts for recommeded Tour Guides (TBC)	Notes: ATPS insurance for conference delegates does not cover any injuries or loss of property occurring during privately organized tours, field visits, etc. Delegates are advised to use approved Tour Guides and make private arrangements for insurance etc.
14:00 – 18:00 (Lunch break between 13:00 – 14:00 p.m.)	National Chapter Coordinators, Regional Council, Secretariat Staff, AWFST, and AYFST Executives annual meeting	ATPS National Coordinators; ATPS Regional Council Members; ATPS Secretariat Staff Members; AYFST Executives AWFST Executives	TBC

DAY 5 - Monday, 29 November 2010

ATPS BUSINESS: TRAINING ON COPORATE GOVERNANCE FOR ATPS NETWORK EXECUTIVES, NATIONAL CHAPTER COORDINATORS AND REGIONAL COUNCIL MEMBERS

Time	Topic/Presentations	Participants	Session Chair/
09:00 – 11:00	 Principles and Practice of Corporate Governance The Effective Board Corporate Control Financial Reporting Corporate Accountability and Disclosure 	ATPS National Coordinators; ATPS Regional Council Members; ATPS Secretariat Staff Members; AYFST Executives AWFST Executives	Center for Corporate Governance, Kenya
11:00 – 11:30	HEALTH BREAK		
11:30 – 13:00	 Principles and Practice of Corporate Governance The Effective Board Corporate Control Financial Reporting Corporate Accountability and Disclosure 	ATPS National Coordinators; ATPS Regional Council Members; ATPS Secretariat Staff Members; AYFST Executives AWFST Executives	Center for Corporate Governance, Kenya
13:00 – 14:00	LUNCH BREAK		
14:00 – 16:00	 Principles and Practice of Corporate Governance The Effective Board Corporate Control Financial Reporting Corporate Accountability and Disclosure 	ATPS National Coordinators; ATPS Regional Council Members; ATPS Secretariat Staff Members; AYFST Executives AWFST Executives	Center for Corporate Governance, Kenya

15:30 – 16:00	HEALTH BREAK	ATPS National	
16:00 – 17:30	 Principles and Practice of Corporate Governance The Effective Board Corporate Control Financial Reporting Corporate Accountability and Disclosure 	Coordinators; ATPS Regional Council Members; ATPS Secretariat Staff Members; AYFST Executives AWFST Executives	Center for Corporate Governance, Kenya
17:30 – 18:00	Closing Remarks and Prioritization of Training Needs for 2011	AWI OT EXOCUTED	TBC

DAY 6 - Tuesday, 30 November 2010

ATPS BUSINESS

Time	Topic/Presentations	Participants	Session Chair/
10:00 – 12:00 noon	18th ATPS Board Meeting	ATPS Board Members only	Prof. Samuel Wangwe, Chair, ATPS Board

DAY 2 - Friday, 26 November 2010

PARALLEL SESSION D2-P1

- Governance of Science Technology and Innovation in Africa
- · Investments in STI
- · STI indicators

Rapporteurs:

- Dr. Nicholas Ozor, ATPS Secretariat
- Engr. Lourino Chemane, ATPS-Mozambique

Venue TBA

Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
09:00 – 09:20	D2-P1.1: Sciences, Technology And Innovation In Côte D'ivoire: How Things Are Doing	Coulibaly Lacina, Cote d'Ivoire	Prof. Wiebe E. Bijker, Maastricht University, The Netherlands, Dr. George Essegbey, Director, STEPRI- CSIR, Ghana and Regional Council Member, ATPS
09:20 – 09:40	D2-P1.2: Assessment Of Failure Causes In Medical Research In Africa Case Study Of Morocco	Saïd Boujraf, Morocco	
09:40 – 10:00	D2-P1.3: Tanzania Policy Environment And Legal Framework In Relation To STI Use by SMEs	Mafunda, D., Tanzania	
10:00 – 10:20	D2-P1.4: New Paradigms For Indigenous Health Biotechnology Innovation And Entrepreneurship	Eddy C. Agbo, USA	
10:20 – 10:40	D2-P1.5: The Role Of University Technical Staff In Enhancing Science, Technology And Innovation: Challenges And Opportunities, A Legal Perspective In Tanzania	John M. Wambura, Tanzania	

DAY 2 - Friday, 26 November 2010 **PARALLEL SESSION D2-P1** Session Chair/ Time **Topic/Presentations Proposed Presenters Lead Discussants** As Above 10:40 - 11:00D2-P1.6: Science, Technology John Okuonzi, Uganda And Innovation Indicators: Is Uganda On The Track **Towards Sustainable Economic Development** And Transformation Using Science And Technology As A Vehicle. What Lessons Can Africa Learn From Uganda's Experience? 11:00 - 11:20 **HEALTH BREAK** 11:20 - 11:40 D2-P1.7: Investment In Oguguah. N. M & Research And Development Renner K. O., Nigeria In Today's Africa. Key To Sustainable Growth 11:40 - 12:00D2-P1.8: Strengthening N.B. Saliu & J.N. Research & Development Bisong, Nigeria In Nigerian Universities: A Pre Requisite For The Attainment Of The Millennium Development Goals (MDGs) 12:00 - 13:00 **Facilitated Discussion** Facilitator: Twalib Session Ebrahim Hazara

LUNCH BREAK

13:00 - 14:00

DAY 2 – Friday, 26 November 2010

PARALLEL SESSION D2-P2

• STI Development in Africa

• Knowledge Management & Intellectual Property Rights

Rapporteurs:

- Ms. Mamolise FalatsaATPS-Lesotho
- Mr. Kennth W. Aduda, ATPS-Kenya

Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
Venue TBA			
08:30 - 08:45	D2-P2.1: Poor Integration of Science, Technology and Innovation (STI): Implications for Poor Achievement of the Millennium Development Goals in Africa	Onyenekenwa Cyprian Eneh, Nigeria	 Prof. M. C. Madukwe, ATPS-Nigeria Dr. Musa A. Dube, ATPS- Swaziland
08:45 – 09:00	D2-P2.2: Utilizing Modern Computer Technology To Enhance Safety and Efficiency on the Kenyan Roads by Advancing the System of Monitoring And Implementation of Traffic Rules and Regulation	Fredrick Mulama, Kenya	 Prof. M. C. Madukwe, ATPS-Nigeria Dr. Musa A. Dube, ATPS- Swaziland
09:00 – 09:15	D2-P2.3: Regional Development and Revolution of Technopark	Ahmed Elzatahryand Amr & Farouk Abdelkhalik, Egypt	
09:15 – 09:30	D2-P2.4: The Role Science, Technology and Innovation on Sustainable Biofuel Production and Use	Prof. Francis D. Yamba, Zambia	
09:30 - 09:45	D2-P2.5: The Greening of Innovation Systems for Eco-Innovation: Towards an Enduring Climate Change Adaptation in Nigeria	Prof. Femi Olokesusi, Nigeria	
09:45 – 10:00	D2-P2.6: Intellectual Property law for a Development Trade Agenda	Djims Milius, South Africa	
10:00 – 10:15	D2-P2.7: Stratégie de la Relance de la Recherche et Développment en Afrique Sub-Saharienne: Cas de la Recherche Agronomique en République Démocratique du Congo	Paulin Njingulula, Democratic Republic of Congo	

PARALLEL SESSION D2-P2

DAY 2 – Friday, 26 November 2010			
PARALLEL SESSION D2-P2			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
10:15 – 10:30	D2-P2.8: Indigenous Knowledge ; A Key to Unlocking Malawi's Potential in Achieving Millennium Development Goal 4	Dr Cecilia Maliwichi- Nyirenda, AWARD, Malawi	 Prof. M. C. Madukwe, ATPS-Nigeria Dr. Musa A. Dube, ATPS- Swaziland
10:45 – 11:00	D2-P2.10: Open Innovation, An Innovative Solution to Accelerate the Innovation, to Boost Economy and to Achieve the Millennium Development Goals In Africa?	Narcisse Mbunzama Lokwa, Switzerland	
11:00 – 11:20	HEALTH BREAK		
11:20 – 11:35	D2-P2.11: Implications Of Traditional Knowledge System Of Marine Capture Fisheries On Sustainable Livelihoods Among Fisher Folks Of Ijebu Waterside, Ogun State	Bernadette Tosan Fregene, Nigeria	
11:35 – 11:50	D2-P2.12: Climate Change Mitigation And Adaptation: What Role For Intellectual Property And Traditional Knowledge?	Eliamani Laltaika & Joy Faida	
11:50 – 12:05	D2-P2.13: Farmer Adaptation Measures In Scenarios Of Climate Change For Maize Production In Semi-Arid Zones Of Ghana	Emmanuel Tachie- Obeng, Edwin Gyasi & Gina Ziervogel	
12:05 – 13:00	Facilitated Discussion Session	Facilitator: Deepa Pullanikkatil	
13:00 – 14:00	LUNCH BREAK		

DAY 2 - Friday, 26 November 2010

PARALLEL SESSION D2-P3

• Gender Issues in STI Development in Africa

Rapporteurs:

- Wairimu Mwangi, **ATPS Secretariat**
- Phina Magara, AYFST Secretary

Venue TBA

Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
09:00 – 09:20	D2-P3.1: Enrollment and Performance of Girls on Science and Technology Institutions: A Case of Bunda College Of Agriculture, Malawi	Babettie Abigail Juwayeyi, Malawi	Prof. Agnes Mwang'ombe Chair, AWFST, & Member ATPS Board
			Mr. Tennyson Magombo, Agro enterprise Development Specialist, African Institute of Corporate Citizenship & Chair, AYFST
09:20 – 09:40	D2-P3.2: Are There Gender Differences In Health Production? Testing Associations Between Science And Technology And Health	Divine Ikenwilo, Damiloloa Olajide & Okore Okorafor, Nigeria	
09:40 – 10:00	D2-P3.3: Exploration Of Factors Militating Against Active Participation Of African Women In Science Technology And Innovation Development	Ezeibe, Adaku B. C. (Mrs.) & Nwaoga, Chinyere T. (Mrs.), Nigeria	
10:00 – 10:40	D2-P3.4: Developing The Active Participation Of African Women In Science Technology And Innovation: The Entrepreneurial Approach	Ezeibe, Adaku B. C. (Mrs.), Nigeria	

DAY 2 - Friday, 26 November 2010 **PARALLEL SESSION D2-P3** Session Chair/ **Topic/Presentations Proposed Presenters Time Lead Discussants** 10:40 - 11:00 D2-P3.5: Gender Imbalance Hannah Nyamekye, **As Above** In Science, Technology Ghana And Innovation: The Case Of Agricultural Science Education In Ghana. 11:00 - 11:20 **HEALTH BREAK D2-P3.6:** 'Women Got Talent' Martha Ngozika 11:20 - 11:40 "It Is Not Ability That Is Adaeze Ugwu, UK Unevenly Distributed In Our Society. It Is Opportunity." 11:40 - 12:00 D2-P3.7: Community Okelola Olumayokun Impacts And Government Francis, Nigeria Response To The Findings Cum Socialization Of Fresh Graduates-Led Innovative **Environmental Projects** Linking Climate Change With Vehicular Emmissions In Niger State, Nigeria 12:00 - 12:20D2-P3.8: Gender And Hala Ahmed Yousry, Egypt **Desertification Case Study** 12:20 - 13:00**Facilitated Discussion** Facilitators: Mr. Mohamed Zarkani Session Dr. Alfonso Alfonsi 13:00 - 14:00 **LUNCH BREAK**

DAY 2 – Friday, 26 November 2010

PARALLEL SESSION D2-P4

• IP Program Regional & National Steering Committee Workshop

• Traditional Knowledge Systems & Increasing Access to Benefit Sharing of Intellectual Property in Africa (ATPS-CP0209)

Rapporteurs:

- Engr. John Okuonzi, ATPS-Uganda
- Mr. Richard Muriuki, ATPS Secretariat

Venue TBA

venue IDA			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
09:00 – 09:10	Introduction Aout ATPS/BTA IP Programme	Dr. Kevin C. Urama	Dr. Kevin C. Urama, Executive Director, ATPS
09:10 – 09:25	Traditional Knowledge and ARIPO Protocol on Protection of TK & Folklore	Mr. Gift Sibanda, Director Generan, ARIPO, Zimbabwe	Mr. Joseph Wekundah,
09:25 – 09:40	Access and Benefit Sharing	Mr. Paul Chege, Kenya Industrial Property Institute (KIPI), Kenya	ATPS IP Program Coordinator
09:40 – 09:55	Seed Systems in Africa: What should policy address?	Dr. Joep van de Broek, Embassy of the Kingdom of the Netherlands, Ethiopia	Dr Sean Butler, University of Cambridge, UK
09:55 – 10:10	D2-P4.1 : CP0209/03 - Traditional Medicine: Mental Health and Behavioural Practices, Kenya	Prof. David M. Ndetei, Kenya	Mr. Charles Mugoya ASARECA, Uganda Dr. Victoria Henson-
10:10 – 10:25	D2-P4.2: CP0209/01 - Ascertaining the Nature of Traditional Knowledge and Traditional Cultural Expressions and the Search for Legal Options in Regulating Access in Malawi	Phiri Dorica Suvye, Malawi	Dr. Mohamed Kyari, AU-STRC, Nigeria African Union (AU)
10:25 – 10:40	D2-P4.3: CP0209/02 - National Policies and Legal Frameworks Governing Traditional Knowledge and Effective Intellectual Property Systems in Southern and Eastern Africa: The Case of Traditional Healers in Tanzania	Shemdoe Georges, Tanzania	Prof. Norah K. Olembo, Africa Biotechnology Stakeholders Forum, Kenya

DAY 2 – Friday, 26 November 2010			
PARALLEL SESSION D2-P4			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
10:40 – 10:55	D2-P4.4: CP0209/04 - Assessment of Possible Intellectual Property Protection Options of Traditional Knowledge System in Ethiopia	Solomon Tibebu, Ethiopia	As Above
10:55 – 11:10	D2-P4.5: CP0209/05 - The Impact of Intellectual Property Rights and Multi-Media on Acquiring and Managing Traditional Knowledge Systems	Lebese Lekholoane, Lesotho	
11:10 – 11:30	HEALTH BREAK		
11:30 – 11:40	Presentation of Report and Plans from IP- Implementing Chapters - Ethiopia	NSC Chair, Ethiopia	As Above
11:40 – 11:50	Presentation of Report and Plans from IP- Implementing Chapters - Kenya	NSC Chair, Kenya	
11:50 – 12:00	Presentation of Report and Plans from IP- Implementing Chapters - Lesotho	NSC Chair, Lesotho	
12:00 – 12:10	Presentation of Report and Plans from IP- Implementing Chapters – Malawi	NSC Chair, Malawi	
12:10 – 12:20	Presentation of Report and Plans from IP- Implementing Chapters - Lesotho	NSC Chair, Swaziland	
12:20 – 12:30	Presentation of Report and Plans from IP- Implementing Chapters – Malawi	NSC Chair, Tanzania	
12:30 – 12:40	Presentation of Report and Plans from IP- Implementing Chapters - Lesotho	NSC Chair, Uganda	
12:40 – 12:50	Presentation of Report and Plans from IP- Implementing Chapters – Malawi	NSC Chair, Zimbabwe	
12:50 – 13:00	Work plan for 2011	All delegates	
13:00 – 14:00	LUNCH BREAK		

DAY 3 - Saturday, 27 November 2010

PARALLEL SESSION D3-P1

African Youth Climate Change Innovation Award 2010 - ATPS/CP/0400/10

African Women Climate Change Innovation Award 2010 - ATPS/CP/0500/10

Rapporteurs:

- Wairimu Mwangi, ATPS Secretariat & AWFST Program Coordinator
- Marsden Momanyi, ATPS Secretariat & AYFST Program Coordinator

Venue TBA

venue IBA			
Time	Topic/Presentations	Proposed	Session Chair/
		Presenters	Lead Discussants
08:00 - 08:10	Introduction to the Participatory	Dr. Kevin C.	Dr. Warigia
	Proposal Evaluation Systed	Urama, Executive	Bowman
	(PPES) and the Call for Climate	Director, ATPS	Assistant Professor,
	Change Innovation Award 2010		University of
08:10 - 08:20	D3-P1.1: CSP/0501/10-01-	Dr. Happiness	Mississippi
	Smallholder rice farmers in South	Oselebe, Ebonyi	
	Eastern Nigeria: Constraints.	State University,	Prof. Atieno
	Impact, mitigation and	Abakaliki, Nigeria	Ndede-Amadi
	adaptation to climate change		Founder / Chief
08:20 - 08:30	D3-P1.2: CSP/0502/10-01 - Waste	Martha Ada Ugwu, UK	Executive Officer
	Minimisation Programme (WIP)		Kenya Country
08:30 - 08:40	D3-P1.3: CSP/0504/10-01 -	Elinorata Mbuya, Ardhi	Business Incubator
00.00 - 00.40	Climate Change Awareness	University, Tanzania	
	and Indigenous Innovative	Offiversity, fairzaffia	Dr. Abdulkarim A.
	Adaptation Measures applied by		Obaje,
	the Maasai Society in Tanzania		Monitoring &
	the Maasar Goolety III Tanzama		Evaluation Officer &
08:40 – 08:50	D3-P1.4: CSP/0504/10-02 - Farm	Ann Nnenna Ezeh,	Head, Partnership &
	Level Responses to Climate	Ebonyi State University	Collaboration Unite
	Change and Sustainable Agro-	Abakaliki, Nigeria	Science &
	Ecosystem Management in Marginal		Technology
	Lands of Ebonyi State, Nigeria		Education Post-
08:50 - 09:00	D3-P1.5: CSP/0504/10-05 -	Joy Samantha	Basic Project
	Moving Forward in a Changing	Bongyereire,	(STEP-B)
	Climate: Poverty Reduction	Biodiversity	
	through Sustainable Environmental	Conservation for Rural	Prof. Femi
	Management (PRESEM)	Development, Uganda	Olokesusi
			Nigerian Institute
09:10 - 09:20	D3-P1.6: CSP/0504/10-07 -	Viola C. Kirui, Egerton	for Social and
	Effective Dissemination pathways	University, Kenya	Economic Research
	for delivering Climate information		(NISER)
	and services to vulnerable groups		
	for adaptation in semi-arid Kenya		

DAY 3 - Saturday, 27 November 2010 PARALLEL SESSION D3-P1

Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
09:20 – 09:30	D3-P1.7: CSP/0504/10-08 - Identifying Indigenous knowledge and effective communication systems for adaptation to climate change by smallholder farmers of Kilifi District, Kenya	Grace A. Achiando, Department of Crops, Horticulture and Soil Sciences, Egerton University	Mr. Kenneth W. Aduda, Projects & Resource Mobilization Manager, Kenya Industrial Research
09:30 - 09:40	D3-P1.8: CSP-0504/10-09 - Strategies for Promoting Sustainable Indigenous Practises in Adaptation, Resilience Capacity Building and Mitigation of Deforestation, Desertification and Drought in Rural African Communities	Barrister Onyeke Kingsley, Nigeria	Development Institute (KIRDI) Tennyson M. Magombo, Chair, AYFST Steering Committee,
09:40 – 09:50	D3-P1.9: CSP/0505/10-03 - Mapping poor women's perception and adaptive measures towards the climate change consequences on health conditions in Kafr El-Sheikh area located at the Northern Lakes of Egypt	Manal Samra, AID-ME	Agro enterprise, Development Specialist, African Institute of Corporate Citizenship, Malawi
09:50 – 10:00	D3-P1.10: CSP/0501/10 - The Effect of Human Activities on the Role of Forests as a Carbon Sink - The Case of Mau Forest, Kenya	Aliet Ondicho, Eldoret, Kenya	
10:00 – 10:10	D3-P1.11: CP/0401/10-02 - Assess the rationale and competence ofpastoral community innovative adaptation to the incidence of climate change in Ethiopia	Tibebu Solomon , Ministry of Science & Technology, Ethiopia	
10:10 – 10:20	D3-P1.12: CP/0401/10-05 - The Integration of Conservation Agriculture to Agro-forestry system as an adaptation strategy to climate change	Mr. Sekaleli Ts'epo Stephen Roma, Maseru, Lesotho	
10:20 – 10:30	D3-P1.13: CP/0401/10-06 - Design and Analysis of a 1MW Grid- Connected Solar Photovoltaic System In Kumasi-Ghana	Ebenezer Nyarko Kumi, KNUST, Ghana	

DAY 3 - Saturday, 27 November 2010			
	PARALLEL SESSI		
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
10:30 – 11:00	Discussion		As Above
11:00 – 11:20	HEALTH BREAK		
11:20 – 11:30	D3-P1.14: CP/0401/10-08 - Detailed measurements of vehicular carbon footprints emissions concentration level in Minna, Niger State, Nigeria and the Environmental Pollution cum Climate Change Effect	Francis Okelola Olumayokun, Federal University of Technology, Nigeria	As Above
11:30 – 11:40	P5 D3-P1.15: CP/0402/10-04 - Near real-time applicatin and validation of a multi-temporal threshold algorithm in active forest fire detection and monitoring in Zimbabwe using MSG satellite	Tawanda Manyangadze, Department of Sustainable Environment and Development Saveteck Solutions, Zimbabwe	
11:40 – 11:50	D3-P1.16: CP/0402/10-05 - Optimization of a continuous biodiesel plant	Mr. J.N. Nwakaire, University of Nigeria Nsukka	
11:50 12:00	D3-P1.17: CP/0403/10-01 - Evaluation of the CMIP3 Model on the Simulation of the South Atlantic ocean Dipole	Hyacinth C. Nnamchi, University of Nigeria	
12:00 – 12:10	D3-P1.18: CP/0403/10-02 - Developing the Capacity and Improving Access of Small-scale Farmers to Low Cost Artificial Substrate Mushroom Cultivation in South-Eastern Nigeria	Mr. Mmaduabuchukwu Mkpado, University of Nigeria, Nigeria	
12:10 – 12:20	D3-P1.19: CP/0404/10-01 - Utilization of the Potential Rain Water Harvesting Technology for Improving Food Security in Dry Areas, The Case of Bahi District, Dodoma	Deusdedit Kibassa, Ardhi University (ARU), Tanzania	
12:20 – 12:30	D3-P1.20: CP/0404/10-02 - Harnessing Indigenous Knowledge on Small-Scale Soil and Water Conservation Innovations to Enhance Farmer Adaptation to Climate Change in Central Malawi	Ms Loma Nyangulu, KIDERTCO, Malawi	

	DAY 3 - Saturday, 27 N	November 2010	
PARALLEL SESSION D3-P1			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
12:30 – 12:40	D3-P1.21: CP/0404/10-04 - Climate Change Analysis: Improve Farmers' Resilience to Climate Related Hazards in the Upper Catchment of Blue Nile, Ethiopia	Mr. Bewket Amdu, Wondogenet College, Ethiopia	As Above
12:40 – 12:50	D3-P1.22: CP/0404/10-05 - Assessing Indigenous Climate Change Adaptation and Mitigation and Improving Resilience and Decision Making Capacity of Smallholder farmers in response to climate risks in Tigray, Northern Ethiopia	Kiros Meles Hadgu, Mekelle University, Ethiopia	
12:50 – 13:00	D3-P1.23: CP/0404/10-06 - Assessment of the vulnerability and adaptation strategies to climate variability and change of the Bos-taurus dairy dairy genoty- pes under diverse productin environments in Kenya	Kiplangat Ngeno, Egerton University, Kenya	
13:00 – 13:10	D3-P1.24: CP/0405/10-03 - Les Jeunes moteurs des Communautés résilientes face au changement climatique dans les villes de Karimama et de Malanville	Abdelaziz Lawani, Ingénieur Agronome spécialiste en Economie Rurale, Cotonou Bénin	
13:10 – 13:20	D3-P1.25: CP/0405/10-07 - Analysis of the role of ICTs in Climate Change Awareness; Adaptation and Mitigation in Rural South Africa and Zimbabwe	Shakespear Mudombi, Tshwane University of Technology, South Africa	
13:20 – 14:00	Discussion		
14:00 – 15:00	LUNCH BREAK		

DAY 3 - Saturday, 27 November 2010

PARALLEL SESSION D3-P2

• Emerging and Indigenous Technologies for Climate Change Adaptation in Africa (CP0109) - Small Grants

• Agricultural Innovations for Climate Change Adaptation and Food Security in Africa (CP0309) - Regional Grants

Rapporteurs:

- Dr. Fred Amu-Mensah, ATPS-Ghana Chapter
- Nelson Akenga, IT Assistant ATPS

Venue TBA

venue I BA			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants
08:00 – 08:10	Introduction to ATPS Phase VI Programs on Agricultural Innovations and Emerging Technologies for Climate Change Adaptation	Dr. Nicholas Ozor, Senior Research Officer, ATPS & Agricultural Innovations Program Coordinator	Prof. Michael C. Madukwe University of Nigeria Prof. Eric Eboh
08:10 - 08:30	D3-P2.1: CP0109/15 - Assessment of the incidence of Climate Change and Indigenous Innovative Adaptation Measures in Northern Nigeria	Kaletapwa Farauta, Nigeria	Executive Director AIAE, Nigeria Prof. Francis M.
08:30 – 08:50	D3-P2.2: CP0109/12 - Assessment of the Impact and Adaptive Capacity of the Machobane Farming System to Climate Change in Lesotho	S. B. Mekbib, Lesotho	Mutua University of Nairobi Dr. George O.
08:50 – 09:10	D3-P2.3: CP0109/21 - Tracking Effective Indigenous Adaptation Strategies on Impacts of Climate Variability on Food Security and Health of Subsistence Farmers in Tanzania	Shemdoe Riziki, Tanzania	Essegbey STEPRI-C.S.I.R., Ghana Prof. Bob Orskov The Orskov
09:10 - 09:30	D3-P2.4: CP0109/05 - Climate Change Awareness and Indigenous Adaptive Technologies in the Niger Delta Region of Nigeria	Nzeadibe Chidi, Nigeria	Foundation c/o The Macaulay Institute, Aberdeen, UK
09:30 – 09:50	D3-P2.5: CP0109/22 - Emerging and Indigenous Technology for Climatic Change Adaptation in the Farming Systems of Southwest Nigeria	Adebayo Dr. K , Nigeria	Dr. Musa A. Dube University of Swaziland
09:50 – 10:10	D3-P2.6: CP0109/08 - Wind Resource Assessment for Sustainable Development in Rural Ghana- A Science, Technology, and Innovation Research Capacity Building Initiative	Mahu Seth Agbeve, Ghana	

	DAY 3 - Saturday, 27 I	November 2010		
	PARALLEL SESSION D3-P2			
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants	
10:10 – 10:30	D3-P2.7: CP0109/14 - An Assessment of Indigenous Climate Change Adaptation Practices in Smallholder- Agriculture of Southeast Nigeria	Enete Anselm, Nigeria	As Above	
10:30 – 10:50	D3-P2.8: CP0109/02 - Study of Technological and Farming Systems Adaptation to Climate Change in Farming Communities of Enugu State , Nigeria	Emeka Celestine Peter Nzeh, Nigeria		
10:50 – 11:10	D3-P2.9: CP0109/13 - Knowledge based Integrated Mapping of Climate Change Adaptations: Indigenous Responses, Techno-Scientific Observations and Future Outlook for Food Security, Health and Disaster Management in Sierra Leone	Morlai Teddy, Sierra Leone		
11:10 – 11:25	HEALTH BREAK			
11:25 – 11:45	D3-P2.10: CP0109/11 - Sensitizing and Building the Capacity of Women towards Climate Change Consequences in Northern Lakes of Egypt	Samra Manal, Egypt	As Above	
12:05 – 12:25	D3-P2.11: CP0109/20 - Enabling Rural Innovation for Climate Change Adaptation and Livelihood Security	Magombo Tennyson, Malawi		
12:25 – 12:45	D3-P2.12: CP0309/01 - Agricultural Innovations for Climate Change Adaptation and Food Security in West Africa: The Case of Nigeria, Ghana and Sierra Leone	Agwu Agwu Ekwe, Nigeria		
12:45 – 13:05	D3-P2.13: CP0309/08 - Agricultural Innovations for Climate Change Adaptation and Food Security in Africa: The Perspective of Ghana and The Gambia	Akon -Yamga Gordon, Ghana	As Above	

DAY 3 - Saturday, 27 November 2010 PARALLEL SESSION D3-P2					
Time	Topic/Presentations	Proposed Presenters	Session Chair/ Lead Discussants		
13:05 – 13:25	D3-P2.14: CP0309/11 - Agricultural innovations for climate change adaptation and food security in Central Africa: The case of Cameroon, Central African Republic and Equatorial Guinea	Ngoh Siri Bella, Cameroon			
13:25 – 14:00	Facilitated Discussion Session				
14:00 – 15:00	LUNCH BREAK				

DAY 3 - Saturday, 27 November 2010					
PARALLEL SESSION D3-P3 • IP Program – Trainer of Trainers Workshop Venue TBA		Rapporteurs: Mr. Wondwossen Belete, ATPS-Ethiopia Mr. Benson Zwizwai, ATPS-Zimbabwe			
08:30 – 08:45	Re-cap of activities in IP workshop of 26 November 2010	Mr. Joseph Wekundah	Dr. Niels Louwaars Centre for Genetic		
08:45 - 09:30	Training Methods for ToTs	Dr. Niels Louwaars	Resources, Wageningen		
09:30 – 11:00	Assessment of Data available in each chapter (Ethiopia, Kenya, Lesotho, Malawi, Swaziland, Tanzania, Uganda & Zimbabwe)	National chapter coordinators/ NSC Chairs	University, The Netherlands		
11:00 – 11:30	HEALTH BREAK				
11:30 – 12:15	Promotional materials available or to be developed based on the available data	Dr. Niels Louwaars	Mr. Joseph Wekundah ATPS IP Program		
12:15 – 13:00	Planning for creation of awareness to be fitted with workplan 2011		Coordinator		
13:00 – 13:15	Concluding Remarks	Mr. Joseph Wekundah			
13:15 – 14:00	Way forward	Mr. Richard M. Muriuki, ATPS Finance & Admin. Manager			
14:00 – 15:00	LUNCH BREAK				

DAY 3 - Saturday, 27 November 2010

PLENARY SESSION

• 2010 ATPS Annual General Meeting (AGM)

Venue: Conrad Ball Room, Cairo, Egypt

TIME	Agenda Item	Session Chair
14:00 – 14:10	1. Opening remarks by the Chair, ATPS Board	Prof. Sam Wangwe Chair, ATPS Board
14:10 – 14:20	2. Adoption of Agenda	
14:20 – 14:40	3. Minutes of 2009 AGM and Matters Arising	
14:40 – 14:50	Presentation of Published Report and Audited Accounts for 2009 – ATPS Secretariat Management	
14:50 – 15:30	(1) Presentation of Phase VI Strategic Plan mid-term technical & financial reports by:	
	5.1 The Secretariat Management – The ED, FAM and SCOO to present technical, finance and admin, and communications reports for the period 5.2 The National Chapters – (Each National Chapter Coordinator to Report on Country Activities); 5.3 The Regional Council – (Regional Council Representative to report on activities of the council during the period); 5.4 Program Activity Reports- Each Program Coordinating Team to present specific report on their programs: 5.4.1 Climate Sense Programme – Ms. Wairimu Mwangi, Prof. Francis Mutua, Prof. Eric Eboh, Prof. George Essegbey 5.4.2 Agricultural Innovations- Dr. Nicholas Ozor, Prof. Michael Madukwe, Dr. Musa Dube, Prof. Bob Orskov 5.4.3 Intellectual Property - Dr. Kevin Urama, Mr. Joseph Wekundah, 5.4.4 UniBRAIN- Dr. Nicholas Ozor, Dr. Kevin Urama 5.4.5 SETDEV – Dr. Kevin Urama (2) Matters arising from the mid-term review reports - All 6.1 ATPS membership issues & synchronization of Databases 6.2 Ratification of National Chapter Coordinators and Eols to from new chapters	

DAY 3 - Saturday, 27 November 2010 PLENARY SESSION Agenda Item TIME **Session Chair** 16:00 - 16:30 (3) Ten years since the incorporation of ATPS As above 7.1 Reflections from Dr. Osita Ogbu, former Executive Director (2000 - 2007) 7.2 Reflections from Prof. Norah Olembo, former Chair of the ATPS Board (2000 – 2008) 7.3 Reflections from Dr. George O. Essegbey, former ATPS-Ghana National Chapter Coordinator (2003 – 2007) 7.4 Reflections from a Dr. Musa Dube, National Chapter Coordinator, ATPS Swaziland, 1995 to date (Southern Africa Regional Rep), Dr. Arsène Kouadio, Cote D'Ivoire Chapter Coordinator 2003 to date (Francophone Chapters Rep), Mr. Kenneth Aduda, Kenya Chapter Coordinator 2007 to date. (East Africa regional Rep, Mr. Ndeso Atanga Cameroon Chapter Coordinator 2001 to date, (Central Africa Regional Rep), and. Prof. Michael Madukwe, ATPS-Nigeria National Chapter Coordinator, 1994 to date (West Africa Regional Rep). 16:30 - 17:00 (1) AOB 17:30 - 18:00 Conference Closing Remarks by ATPS Executive **Director and ATPS Board Members**

CLOSING DINNER – HOSTED BY ATPS (TBC)

19:30 - 21:30

Annex 10: List of Delegates

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