

Science Technology and Innovation Theme in Sub-Saharan Africa

Report

By

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Acronyms

ADDs	-	Agricultural Development Divisions
ADLI	-	Agricultural Development-Led Industrialization
ADMARC	-	Agricultural Development and Marketing Cooperation
ALRMP	-	Arid Lands Resource Management Project
AMCOS	-	African Ministerial Council for Science and Technology
AMREF	-	African Medical Research Foundation
ARIPO	-	Regional Industrial Property Organization
ASAL	-	Africa's arid and semi-arid land
ASTI	-	Agricultural Science Technology and Innovation
ASTII	-	Agricultural Science Technology and Innovation Indicators
BARC	-	Bako Agricultural Research Center
CEMIRIDE	-	Centre for Ministry Rights Development
CIAT	-	Centro International de Agricultural Tropical
CIDA	-	Canadian International Development Agency
CIMMYT	-	International Maize and Wheat Improvement Centre
CRI	-	Crops Research Institute
CRS	-	Catholic Relief Services
CAADP	-	Comprehensive African Agricultural Development Programme
CSOs	_	Civil Society Organizations
CAHWs	-	Community-based Animal Health Workers/Systems
CBT	-	Commodity Based Trade
CSIR	_	Council for Scientific and Industrial Research
DUS	_	Distinctiveness. Uniformity and Stability
EASC	_	East African Seed Company
ECOWAS	-	Economic Community of West African States
ESE	_	Ethiopian Seed Enterprise
ECA	_	Economic Commission for Africa
ELTPA	_	Ethiopia Livestock Trade Professional Association
EIAR	_	Ethiopian Institute of Agricultural Research
ESTNET	_	ECA Science and Technology Network
ELMT	_	Enhanced Livelihoods in the Mandera Triangle
FIC	_	Feinstein International Center
FAC	_	Future Agricultures Consortium
FAO	_	Food and Agriculture Organization of the United Nations
FASCOM	_	Farmers Services Company
FBSPMS	_	Farmer-Based Seed Production and Marketing Scheme
GDP	_	Gross Domestic Product
GLDB	_	Grain and Legume Development Board
GGDP	_	Ghana Grains Development Project
HEARPP	_	Horn/East Africa Regional Pastoral Programme
IAR	_	Institute of Agricultural Research
IARCs		International agricultural research centers
ICRISAT		International Crops Research Institute for the Semi-Arid Tropics
IFPRI		International Food Policy Research Institute
KARI	_	Kenya Agricultural Research Institute
KIMC	_	Kenya Livestock Marketing Council
KMC	_	Kenya Meat Commission
KSC	_	Kenya Seed Company
noc	-	Konya Sood Company

KSU	-	KARI Seed Unit
KEPHIS	-	Kenya Plant Health Inspectorate Service
MoFA	-	Ministry of Food and Agriculture
MGDS	-	Malawi Growth and Development Strategies
NEPAD	-	New Partnership for Africa's Development
NCIC	-	National Crop Improvement Committee
NSC	-	National Seed Council
MoA	-	Ministry of Agriculture
MoARD	-	Ministry of Agriculture and Rural Development
MARC	-	Melkassa Agricultural Research Center
MVs	-	Modern varieties
MoFA	-	Ministry of Food and Agriculture
NARIs	-	National Agricultural Research Institutes
NSIP	-	National Seed Industry Policy and Strategy
NSCM	-	National Seed Company of Malawi
NFRA	-	National Food Reserve Agency
NGO	-	Non- Governmental Organization
NCPB	-	National Cereals and Produce Board
NDFRC	-	National Dryland Farming Research Centre
NPT	-	National Performance Trials
NSOCS	_	The National Seed Quality Certification Service
OCDC	-	Oil Crops Development Corporation
OECD	-	The Organization for Economic Cooperation and Development
OAPI	_	Organization Africaine de la Propriété Intellectuelle
OARI	-	Organization of Agricultural Research Institute
PLI	-	Pastoralist Livelihood Initiative
PAIPO	_	Pan-African Intellectual Property Organisation
PCI	_	Pastoral Communications Initiative
RELPA	-	Regional Enhanced Livelihoods in Pastoral Areas
R&D	-	Research and development
RARIS	_	Regional Agricultural Research Institutes
SADC	_	South African Development Corporation
SEEPAG	_	Seed Producers Association of Ghana
SSA	_	Sub- Saharan Africa
	_	Seed Services Unit
SMS		Smallholder Seed Multiplication Scheme
	-	Science, Technology and Innovation
511 58-T	-	Science, rectinology and minovation Science and Technology
SQI	-	Strategy for Devitalization of Agriculture
JNOCUA	-	Strategy for Revitalization of Agriculture
UNUCHA	-	United Nations Office for Coordination of Humanitarian Ald
USAID	-	United States Agency for International Development
UNESCO	-	United Nations Organization for Education, Science and Culture
UNDP	-	United Nations Development Program
КАРР	-	Rural Agriculture and Pastoralism Programme
VSF	-	Veterinaries Sans Frontiers
WSGC	-	Western Seed and Grain Company

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Summary

This report is a result of a scoping study commissioned by IDS/Sussex, UK as part of the launch of the Science, Technology and Innovation (STI) theme of the Future Agricultures Consortium (FAC) and the proposal to launch a cross-institutional 'Innovation Alliance' to facilitate policy discussion around agricultural STI issues in Africa: Ethiopia, Kenya, Malawi, Ghana and Senegal. This initial report highlights key findings from Ethiopia, Malawi, Ghana and Kenya.

The development and application of science, technology and innovation (STI) in many countries have become central and essential means for achieving development of nations. Economic, social and cultural development go-hand-in hand with scientific and technological transformation. Therefore, science and technology policies have been recognized to be integral part of the many policies and strategies contributing to the various national development objectives in addition to being critical to the development transformation of any country.

Although almost all governments throughout the world have developed science and technology (S&T) policies or in some cases such policies and strategic have been drafted or undergone various revisions, there are still significant differences in the science and technology systems. The differences are attributed to many factors among them socio-political histories, geography, political and economic instability, different legacies of colonial science influence, science institutionalization or development process and so on.

This report analyses general STI issues and indicators in Sub-Saharan Africa (SSA) and focuses on Kenya, Ethiopia, Ghana and Malawi with respect to cereal seed systems and pastoral innovation systems. The STI section gives a brief overview of how STI policies have evolved in SSA, highlighting the importance of some of the indicators used to assess the contribution of STI towards economic development. The section also describes the policy issues in the FAC countries and the current initiatives aimed at STI development. STI policies, coupled with lack of reliable and consistent data and weak political appreciation of STI issues in developing countries have hindered the practical use of STI. The positive 'indicator' of STI development are the on-going STI debates, efforts aimed at regional collaboration on STI issues and the packaging of STI information for dissemination.

The cereal seed systems section explores how various institutions, farmers, government departments and agencies, policy makers and seed dealers interlink (or not) to have a coordinated management of seed resources from production to consumption. This section analyses the various cereal seeds systems in the four study countries. It focuses on research, production, distribution and utilization of seed in maize, wheat, millet, sorghum and rice. Key findings in this section point towards the informal seed system being the major source of seeds for farmers despite lack of recognition of farmers' contribution to seed systems. Actors involved in improved seed development are mainly from public and private sector. However, private sector actors appear to be more important compared to the public sector actors as evidenced by seed deficiencies in their absence.

There are also policy challenges in regard to R&D and farmer participation in seed systems. One outstanding example is the lack of pro-farmer policies that impede informal seed system. This situation has often hindered maintenance of farmers' varietals purity or quality. There are initiatives aimed at improving linkages and collaboration among various seed actors along the value chain, however, this may not be sufficient solution, especially where the informal and formal seed systems are not integrated and recognized as complementary systems.

The section on pastoral innovation system highlights concerns on the long term pastoral development agenda which need to be anchored in the national economic and development strategies. The system is faced with different challenges which affect pastoralist livelihoods in addition to making the system unsustainable. One of the key findings of this section is the exclusion of pastoralists in most innovations that take place in pastoral areas. There is little effort made towards pastoral empowerment and pastoral institutional development. Regional approaches and development initiatives have made limited contribution to the development of local institutions. A few initiatives undertaken by Pastoral Communication Initiative (PCI) in Ethiopia have, so far, been considered successful.

Another set of findings revolve around research focus and issues of technological development and deployment in pastoral systems. In this instance, research focuses on developing technologies which are inappropriate and/or inaccessible to pastoralists. Interactions among actors are key to any successful technology deployment. However, in pastoral systems, there are limited forums for pastoralist participation. In addition, the transboundary animal health and sanitary standards for international trade and how this is treated in relation to the OIE set standards has caused debates among many actors therefore calling for other alternatives.

1. INTRODUCTION

Science Technology and Innovation (STI) in Sub-Saharan African counties have different elements, key among them being research and development capacity for agricultural and technology development and multiplication, policy and regulatory issues, commercialization, institutional capacity building, interaction and multi-stakeholder approach to STI issues among others. However, not all countries have to date managed to revise their policies effectively. While the available literature indicates that many countries are interested in furthering their STI policy development and to strengthen structures, achievement of STI goals is still low (Taylor, 2008 and ECA,1998).

This report is set to facilitate policy discussion around agricultural STI issues in Africa, with emphasis being placed on the STI Policy, Cereal seed systems and Pastoral Innovation Systems (See the annexed Terms of Reference). The study is mainly focussed on identifying some of the main elements of STI policies and how they facilitate or impede agricultural innovation within the cereal seed systems and pastoral innovation systems.

This report has, in part, been informed by the innovation system thinking and the analytical framework developed by the World Bank (World Bank, 2006). The latter comprises of elements such as: the diversity of public and private sector actors and the appropriateness of their roles, the habits and practices of the various actors involved in various sectors, patterns of interaction and the enabling environment that includes policies, infrastructure and market incentives for entrepreneurial activity and how they are interlinked to ensure development of any sector.

The methodology used has varied from one section to another. For the STI and Cereal seed system sections, the information has largely been obtained through key informant interviews facilitated by FAC Country Coordinators in Ethiopia and Malawi especially in regard to identification of key themes in STI, gaps in current research and policy challenges and opportunities. Appendix 1 provides the list of people interviewed in the FAC countries for the cereal seed systems.

Regarding the pastoral innovation system, the information was obtained through literature review focusing on East African Countries mainly Kenya and Ethiopia. It has also cited some few examples from both West African and South African countries for the purpose of comparison and illustration. Apart from the literature review, the information is also based on findings from a previous study on innovation response capacity in relation to livestock related emergencies namely drought, floods and recent disease episodes. The previous study employed the innovation systems approach to analyze the capacity of the livestock sector to respond to recent livestock emergencies in Kenya, Ethiopia and South Sudan. The information for the study was sourced through interviews with respondents from NGOs and UN and international agencies that are involved in livestock emergency interventions and the Ministries of Livestock in the respective countries.

The report is organized into three sections namely Science Technology and Innovation Policy, the Cereal Seed System and the Pastoral Innovation System. The STI policy section is divided into three chapters, the first being a description of the STI indicators in SSA countries, the key actors in STI data collection, analysis and synthesis and some of the causes for slow adoption of STI policies in Africa. The next two chapters describe STI policy issues in FAC countries, the current status of S&T in SSA and the initiatives aimed at STI information flow in the countries.

The cereal seed system has various chapters. The first chapter is an overview of the cereal seed systems, their basis for categorization into formal and informal seed systems and the key characteristics of the two seed systems. The next two chapters provide an analysis of the case studies of the seed systems in SSA countries using Kenya, Ethiopia, Malawi and Ghana as the case studies. The next chapter is an elaborate description of the historical overview of the evolution of the seed systems, the key players and actors who are driving the system and their roles, the extent to which research and development at both public and private sectors in these countries have contributed to the development or hindrance of the cereal seed system and the policy challenges and opportunities in the sector. Chapter four discusses the initiatives that can enhance linkages and collaboration among seed sector actors from breeding, production through to distribution and marketing. The last chapter is a summary that gives some of the reflections on the cereal seed systems across FAC countries.

The pastoral innovation system section is a synthesis of some of the opportunities and gaps that exist in pastoral systems and it is subdivided into various chapters to help capture the key emerging issues of pastoral innovation systems. The first chapter is an introduction. The next two chapters provide the overview of pastoralism and key defining features of pastoral system in the East African region, the analysis of the various constraints facing pastoral systems and the perception of the past and present pastoral innovation systems by various actors. The description of actors and their roles in pastoral innovation systems indicating how some of the key stakeholders are responding to the plight of the pastoralists and the specific activities they are undertaking; is provided in chapter four.

Chapter five gives some of the benefits of direct pastoralists' participation in the pastoral issues, examples of initiatives that have supported and empowered pastoralists with their local or traditional institutions in development of pro-pastoralist strategies and regional approaches that have been successful in improving pastoral livelihoods using a holistic and multi-stakeholder approach. The next chapter is on linkages in technological, organizational and institutional innovation. It is a description of the existing and envisaged holistic and integrated approach to interactions among the various actors that are involved in pastoral development. The last chapter highlights the relationship between livestock production, animal health and and livestock products marketing, given that interaction between them is required for realization of quality standards during both domestic and international (or export) trade.

The last section concludes this paper by identifying some key emerging issues in the three sections, the recommendations that can help to establish a well organized STI system that can be flexible and efficient in responding to both cereal seed systems and pastoral systems and set the agenda for the FAC's future STI thematic work.

SECTION 1: SCIENCE TECHNOLOGY AND INNOVATION (STI) POLICY

1. Overview

There is growing evidence that science policy development has undergone different evolutionary pathways in several African countries. These trajectories include science policy development that started in countries after independence, or those that have recently established science policy frameworks after realizing the essence of the science policy goals. For example, in Kenya, the Science and Technology (S&T) Act of 1977 provides the legal framework for managing research and S&T. Through this Act, the National Council for Science and Technology in national development. This Act was amended in 1979 to provide for establishment of semi-autonomous research institutes and was part of the Strategy for Revitalization of Agriculture (SRA) and the vision 2030 development plans.

In Malawi, S&T policies were first developed in1991 and revised in 1997 and aimed at achieving sustainable socio-economic development through the development and application of S&T in order to improve the standard and quality of the population. It was adopted within the Malawi Growth and Development Strategies (MGDS) and as part of their vision 2020 development framework.

For Ethiopia, the National S&T Policy of the country was issued by the transitional Government of Ethiopia in 1993 with due recognition of the need for accelerating the pace of economic development through S&T. The policy follows other strategies that have been formulated and implemented to realize the long-term Agricultural Development-Led Industrialization (ADLI) development strategy.

Ghana's first attempt at STI for national development was in 1964, after realization of science and technology as being central to the country's development efforts. This has been followed later on, in after a long period in 2001, with the changes in STI line ministries such as Ministry of Environment and Sciences, which has since changed to Ministry of Education and Sport and later the Ministry of Education, Science and Sports (MOESS). Subsequent revisions since mid 1990s have been made in line with the medium-term development plan based on Ghana-Vision 2020 development plans. This has led to the formulation of a draft National Science and Technology Policy in 2000, which is to be implemented alongside other government programmes.

Looking at the above descriptions in all the study countries, there is evidence that many efforts are aimed at linking science and technology with national development programmes such as the Millennium Development Goals and there is great interest by many countries to further their science and technology policy development and implementation.

1.1 Science, Technology and Innovations Indicators

Science, Technology and Innovations activities contribute much to a nation's economy in terms of Gross Domestic Product (GDP). For these activities to contribute positively towards economic development and to be sustainable, they need to be supported by favourable policies, both at national and international level. The contribution of STI towards economic development is assessed using STI indicators. The most common ones include: Expenditure

on Research and Development, human resource input - full time equivalents (IFPRI, 2009), patents (Pourris, 2008), research intensity (IFPRI, 2009) and impact indicators (Diyamett, 2003).

A detailed description of these indicators for selected Sub Saharan countries is provided in appendix 1. STI indicators are therefore essential policy tools which guide the policy process through: Regular monitoring of development and trends within the STI system thus guiding the planning process, provision of indicative statistics on the performance of STI system which increases awareness of STI activities and enhances support for relevant policy development and implementation and guiding and justification of budgetary allocations set aside for Science and Technology (S & T) development.

On the global scene, a number of organizations have been established within the last two decades to develop the above indicators, collect relevant data, analyse it and provide information on the progress of STI programmes and projects. These organizations include OECD-NESTI, EU-Euro stat, UNESCO-UIS, ASTI-IFPRI, and NEPAD-ASTII¹. They have served different regions of the world and played different roles. Focusing on Africa at large and SSA in specific, the key organizations that have been involved in collection of data and development of STI indicators have been ASTI-IFPRI and NEPAD-ASTII.

ASTI-IFPRI, established in 2001, compiles, processes, and makes available internationally comparable data on institutional developments and investments in agricultural R&D worldwide. It analyzes and reports on these trends in the form of occasional policy digests for research policy formulation and priority setting purposes, development of a set of country briefs and regional synthesis reports that quantifies, analyses, and discusses the major investment and institutional trends. This is based in East & South East Asia, Latin America and Caribbean, Middle East and North Africa, South and Central Asia and Sub Saharan Africa.

NEPAD-ASTII system established in 2003, however, develops and causes the adoption of internationally compatible STI indicators, builds human and institutional capacities for STI indicators and related surveys enable African countries to participate in international programmes for STI indicators and inform African countries on the state of STI in Africa. Its activities are mainly based in the African countries such as Algeria, Angola, Burkina Faso, Cameroon, Egypt, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Malawi Mali, Mozambique, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zambia².

From the descriptions, it is evident that African continent has been lagging behind in terms of institutions which promote collection, analysis and synthesis of STI statistics which are vital to policy development³. It is only in the late 1990's when African countries in collaboration

¹ Key:

OECD- Organization for Economic Cooperation and Development, NESTI- Network of Experts on Science and Technology Indicators, UNESCO- United Nations Organization for Education, Science and Culture, EU-European Union, UIS- United Nations Institute for Statistics, ECC- Pacific Economic Cooperation Council, IFPRI- International Food Policy Research Institute, ASTI- Agricultural Science and Technology Indicators

² Compiled by the author and from the various websites/links attached in the reference section

³ At the time of the interview with Dr, Adewale Adekunle, on 10th March, 2009, he said that there was no policy on Agricultural STI especially with respect to research in developing countries

with international organisations committed to provision of STI data. However, Africa has been slow in terms of data collection, analysis and synthesis⁴.

Such observations generate thinking about what indicators inform STI policy processes in Africa. Why have the African governments and partners been slow in fulfilling their commitment? Which bodies were charged with monitoring the various commitments towards STI data availability? What are their findings regarding such sluggishness? What are the implications on the stakeholders affected by STI policies? How best can Africa overcome impediments related to establishment of functional bodies/ organizations mandated to provide STI information supported by various governments? According to an interview with Dr. George Owussu, Director STEPRI, CSIR in Accra, Ghana, STI entails a systemic approach and this needs key actors such as policy makers, academia, and private sector, regulatory bodies, law makers, NGOs and international organizations. Although he argues that one of the problems with STI policy making is the little political appreciation of the role of STI, he suggests that sometimes for political expediency, there is need to have a science and technology advisor in one of the highest political offices such as the Office of the President, to influence STI at the highest level. But, he hastens to add that this may necessarily not lead to STI being priority because of fiercely competing political interests.

Some of these issues require learning from the other continents, more so on the benefits of rich STI data base at national, regional and global levels. Other issues require expert opinions and building the necessary capacity to boost access of up-to-date and reliable STI data. With this background, it is clear why Sub Saharan Africa has not made much progress in terms of STI policies as discussed in the next sub-section⁵.

1.2 STI policy issues in Sub-Saharan Africa with reference to FAC countries

At the regional level, UNESCO, IFPRI and NEPAD/Africa Union spearhead STI policy development by synthesizing STI indicators availed to them into reports and country briefs which are then disseminated through print and electronic media. However, such efforts intended to raise S&T profiles are slowed down by lack of reliable and consistent data by majority of African countries. In general, South Africa and Egypt lead in terms of STI indicators and subsequent policy development and implementation (Pouris, 2008).

Taylor (2008) concedes that SSA's slow pace towards great S&T achievements despite improved resource allocation is a result of a mismatch between policy goals and infrastructure which should facilitate implementation of such policies and S&T products. His arguments are presented in Box 1.

⁴ Africa's Limited STI data: A case of UIS web-based data centre and ASTI Time series data: Despite the commitments agreed upon by various governments towards establishment of data bases on STI indicators, few of them have honoured this commitment. For instance, a quick scan through the UIS and ASTI website reveals little has been achieved towards this end! Basing on FAC African countries data in the UIS page, between year 2000 and 2008, only indicators for Ethiopia in 2005 are available. As for ASTI website, no data for any STI indicators is available from year 2001 onwards!- Websites Accessed on 27th April, 2009.

⁵ Asafaa Taa' Wayyeessaa, Deputy Director General, OARI, Ethiopia, in an interview said that STI is not well understood by all actors such as research institutes, universities and the society at large.

Box 1: Five arguments which explain the state of S&T in SSA

- Structural problems hinder sustainability of S&T. For instance, the ability to afford, use and absorb S&T
 products is limited by inadequate materials, technical skills and minimal trade opportunities.
- Competitiveness in terms of locally based S&T innovations is lacking since there is minimal reward for such efforts yet they best fit our surroundings.
- 3. Despite the theme of capacity building cutting across all S&T policy documents, little has been achieved and thus in future, require scrutiny in terms of for what, for whom and in what is capacity building appropriate. This will ensure relevance across the value chain, development of appropriate policies and thus addressing future S&T needs.
- 4. Since S&T is at the core of economic development, there is a need to develop and sustain linkages between economic development plans and S&T progress for enhanced labor performance, improved choice, access to goods and services, job opportunities, improved income and scaled up innovations.
- Strategic government intervention and creation of an enabling environment for private sector participation are key to facilitating S&T progress in SSA yet this has either been lacking, missing or weak.

Source: Taylor (2008): S&T development in Sub-Saharan Africa: Evidence and Experience

The above arguments relate to most countries in SSA and FAC countries are not an exception⁶. For instance, despite the increase in Research and Development expenditure over the years as shown in Table 2, of appendix 1, the FAC countries' Research intensity as a percentage of AgGDP has remained almost stable over the same period. This contradicts the fact that most of these countries' economies are agro-based --implying that an increase in R&D expenditure would translate into an equal increase in agricultural R&D intensity. This has not been the case, moreso for Ethiopia whose agriculture supports above 85% of the labour industry and contributes over 50% of GDP.

Recent trends in these countries show significant efforts towards S&T policies and establishment of national bodies in charge of S&T policy design and implementation. These initiatives were spearheaded by Economic Commission for Africa (ECA) between 1986 and 1998 (ECA, 1998). The ECA's programme on Science and Technology aimed at strengthening Science and Technology policies and institutions among other objectives.⁷ The FAC countries benefited from ECA's missions geared towards strengthening S&T policy institutions and to give country specific advisory services on S&T issues such as legislation, transfer negotiations, the planning of science and technology facilities and institutions.

Upon realization that the African countries' S&T policies lacked effective linkages with other macro-economic policies and mainstream national economic activities, ECA extended their scale of activities between 1996 and 1998 to include, improving advisory services to states; creating a science and technology network for food security and sustainable development, organisation of executive dialogues, and the back-stopping of ECA --sponsored institutions

⁶ FAC countries in Africa include Ethiopia, Ghana, Kenya and Malawi.

⁷ Other objectives of ECA's programme on S&T included i) To increase the awareness of ECA member states on the application of science and technology in socio-economic development and ii) To co-ordinate, collaborate, and harmonize international co-operation efforts among member states; other UN bodies, NGOs, and with bilateral and multilateral donors in the technology policy field.

which have science and technology mandates⁸. Four out of nine such institutions are based in FAC countries⁹.

Currently, ECA operates a knowledge-sharing and learning platform which will help identify and exploit opportunities for co-operation and consultation among African S&T stakeholders and between them and other S&T policy communities (UNECA, 2009). The platform known as ECA Science and Technology Network (ESTNET) is a collaborative policy research network promoting the dissemination and exchange of information related to science and technology management and policy issues in Africa¹⁰.

The idea of regional collaboration in S&T policy matters was also emphasized during the World Conference on Science (Pouris, 1999). The author expressed the need for collaboration in terms of:

- 1. Access to knowledge in order to share costs and risks, promote standardisation, gain access to markets, and facilitate and promote political objectives.
- 2. Design of S&T policy aiming at achieving policy objectives (targets) which has the potential to affect the major S&T policy objectives (such as the size, quality and make up of S&T enterprise, the utilisation of available expertise, and the public understanding and appreciation of science).
- 3. Develop optimum regional policy in tandem with national policies.
- 4. Data collection, synthesis and dissemination of S&T information through various forums and media.

This call for collaboration began to take root when African states through the NEPAD declaration of 2003 pledged to commit 1% of their gross domestic product (GDP) to supporting research and development (R&D) by the year 2010 (NEPAD, 2003). The various heads of states also endorsed a 20-year Biotechnology Action Plan, which calls for cooperation among African nations in specific regions to bolster research in different fields of research according to regional strength.

Considerable improvements in budgetary allocation towards R&D have been achieved and also great research interest in S&T has been building up over the years with even international support. However, FAC countries in Africa are still lagging behind in terms of STI indicators'

⁸ Wondrad Mndesfro, Head of Agricultural Extension Department, Ministry of Agriculture, Ethiopia, suggests that the envisaged role of STI should be fine-tuning of the research system, strengthening the STI and R&D linkages and increasing the capacity of extension workers in addition to having forums for interactive learning. ⁹ The four institutions are: i) Institute for population Studies. Legon, Accra, Ghana ii) Regional African Institute for Higher Technical Training and Research (AIHTTR) Nairobi, Kenya iii) Regional Centre for Services in Surveying Mapping and Remote Sensing, (RCSSMRS) Nairobi, Kenya and iv) African Regional Organisation for Standardization (ARSO), Nairobi, Kenya.

¹⁰ See <u>www.uneca.org</u> on Key ESTNET's activities in relation to S&T policies in Africa

data collation and access, making it difficult to figure out exactly the commitment towards STI and its subsequent contribution to economic development in the respective economies¹¹.

During the Extraordinary Conference of the African Ministers of Council on Science and Technology that took place on 20-24 November 2006 in Cairo, there was a general realization that the existing systems of scientific innovation lacked a well structured reward system which discouraged innovations at all levels. To this end, there arose a need to establish a single Pan-African Intellectual Property Organisation (PAIPO) to protect indigenous innovations. All Member States were required to lend full support for the implementation of such a decision. PAIPO would likely be an "independent organisation under the AU" and a "broad umbrella organisation," covering Organization Africaine de la Propriété Intellectuelle (OAPI) and Regional Industrial Property Organization (ARIPO) states but also the non-members in the northern Africa¹². Its objectives as presented in the concept paper (EXT/AU/EXP/ST/8(II)) are provided in the Box 2 below along with the major concerns which arose regarding establishment of PAIPO, a year later.¹³

Box 2: Pan-African Intellectual Property Organisation (PAIPO) : Objectives and current concerns.
 PAIPO's objectives are to: set IP standards reflecting the needs of member states; set benchmarks for best practices; promote the growth of knowledge-based economies in Africa; facilitate the rationalisation and harmonisation of IP standards; collect and disseminate IP information; facilitate the use of relevant IP information and assist in training and capacity building.
 General concern; Fears that Africa is signing up to stricter IP protection levels than the continent is ready for.
 Concerns from (ARIPO) and (OAPI);
 Fear it will make them redundant. It remains uncertain, whether PAIPO could become reality shortly or if it could

- take years.
 Concerns of a legal nature relate to the fate of the already existing IP rights and the laws that will be applicable in administration of these rights "
- The two regional organisations for some time now have been in the process of trying to harmonise their laws and they have a clear understanding on some of the problems associated with the development of such an organization. OAPI has a regional IP law that applies to all 16 member states and offers regional protection for most IP rights. ARIPO on the other hand does not have a regional law. Instead, its focus is on facilitating the administration of national IP laws through cooperation among its members, including through the pooling the financial and human resources of its members. ARIPO's scope is limited to industrial property, while OAPI also addresses issues of copyright and cultural heritage. Nobody knows which of the "completely different" systems PAIPO would choose.

Source: Excerpt from an Article by (Gerhardsen, 2007) in Intellectual Property Watch. <u>www.ip-watch.org</u> (Gerhardsen, 2007)

 $^{^{11}}$ Dr. Adewale Adekunle during a recent interview on 10^{th} March, 2009, said that currently there is no policy on agricultural STI with respect to research in developing countries.

¹² See Excerpt from an Article by (Gerhardsen, 2007) in Intellectual Property Watch. <u>www.ip-watch.org</u> (Gerhardsen, 2007) on the objectives and current concerns of ARIPO and PAIPO.

¹³ ARIPO has a 16 member states among the English speaking countries (former British colonies, headquartered in Zimbabwe). Ghana, Kenya and Malawi are members of ARIPO. Ethiopia is not a member of either ARIPO or OAPI. OAPI has 16 member states among the French-speaking nations (headquartered in Cameroon).

By mid 2007, the AU had consulted OAPI and ARIPO, but there were no developments at the 28-29 June Eleventh Ordinary Session of the AU Executive Council meeting in Accra. About a year and half later, the African Ministerial Council for Science and Technology (AMCOST) bureau, which met in Abuja, Nigeria, from 3–4 December, 2008 agreed to review governance issues arising from the blue print that proposed setting up of a new ministerial forum, an idea which majority of the delegates felt would lead to bureaucracy in its management (Nordling, 2008). The blue print is still under review and is expected to be tabled in a few months time this year.

Time frames between commitment to action, implementation of action and the subsequent results of action can often be irritatingly lengthy. Reducing these gaps requires substantial financial resources on the part of cooperating states for the attainment of stated objectives for advancement of science and technology across the continent and greater economic prosperity. There is also a need for enhanced cooperation in international STI partnerships just like it happens in other continents.

1.3 Current S&T issues in FAC countries

National level initiatives aimed at S&T development are slowly taking root in FAC countries as various S&T policies are constantly the subject of heated debates in various forums and are also part of national agenda on development. In Kenya, the current S&T hot debate is the Safety of Genetically Modified Organisms products which attract audience from the government, private sector, civil society and international organizations.

Earlier in 2007, the Kenyan government recognized the role of S&T in the economy and committed to support S&T development in the 2007/2008 budget¹⁴. The Kenyan government also aimed at improvement of S&T programmes through promotion of Public-Private Partnerships in tandem with earlier calls towards collaborative S&T programmes and projects. The same government has recognized sector-wide approach towards development by tendering the Kshs 200 Million in the Endowment Fund for innovation and research in S&T. This fund will be disbursed through National Council of Science and Technology (NSCT) and encourages proposals aimed at promoting S&T innovative ideas at micro-level.

Malawi's S&T efforts have gone a step higher towards collaboration, improved access and availability of reliable STI data to better inform policy. This move was documented as follows:

Malawi has become the twentieth country to join an Africa-wide effort to try and measure the impact of science on development. The country joins the African Science, Technology and Innovation Indicators Initiative (ASTII) surveys initiated by the New Partnership for African Development (NEPAD). The agreement was signed in Lilongwe last week (23 September) by Anthony Livuza, principal secretary of Malawi's Ministry of Education, Science and Technology, and Aggrey Ambali, NEPAD's acting head of science and technology (Source: Mkoka, 2008).

Another move towards improved S&T information flow in Malawi relates to establishment of The Malawi Journal of Science and Technology which covers a diverse range of subjects

¹⁴ 2007/2008 Finance Minister Budget Excerpt: "The Ministry of Science and Technology, working together with the private sector players, will implement a comprehensive science and technology strategy to promote efficiency and productivity in the key priority areas of: (i) agriculture development; (ii) expansion of infrastructure; (iii) healthcare and education delivery; (iv) security and crime management; (v) public administration; and (v) industrial production. To demonstrate our commitment to this important area, I have allocated KShs.200 million as start up capital in 2007/08 for the establishment of an Endowment Fund for innovation and research".

within the applied sciences for example, agriculture, engineering, and health. The journal also publishes articles on theoretical issues relating to the natural sciences.

Ghana and Ethiopia have also established Journals to disseminate S&T information. These are: The SINET Ethiopian Journal of Science, which is a peer-reviewed, bi-annual journal of science published by the Faculty of Science, Addis Ababa University, Ethiopia. The Journal is designed for an international readership both within Africa and overseas. SINET publishes original research articles, review articles, short communications and feature articles in basic and applied sciences. The Ghana Journal of Science is published jointly by the Council for Scientific and Industrial Research of Ghana and the Ghana Science Association. It is open to all papers of scientific and technological nature from Ghana and elsewhere, irrespective of the organization to which the authors belong. The topics need not be related to West Africa. The Ghana Journal of Agricultural Science is a national scientific journal which is published by the National Science and Technology Press to serve as an outlet for papers concerning West African agriculture and related disciplines.

In summary, the revelation from literature indicates that the STI policy that exists in some of the FAC countries is not an automatic indicator of their implementation and their practical application. This of course may be attributed to many other factors such as inadequate funding, human resources, and even political support, which hinder the institutionalization of science and technology in these countries. These factors need to be addressed before the STI goals can be achieved.

In conclusion therefore, STI still appears to be a new concept in many developing countries. In addition, little information has been documented on the same. These calls for other comprehensive studies, which can add value to the available data and in the end, integrate science and technology innovation themes in the other development sectors such as agriculture, industry, and livestock.

References

- Diyamett, B. D. (2003). The Status of Science and Technology Indicators in Africa: A Commentary. *DPMN Bulletin*, Volume X, Number 4.
- Gerhardsen, T. I. (2007). Concerns over Pan-African Intllectual Property Organization. Intellectual Property Watch .
- IFPRI. (2009). Agricultural Science and Technology Indicators. Washington, dc: www.ifpri.org.
- Mbaria, J. (2008, October 5). Kenyan government wants to impose GMOs 'by force'. *The East African*.

Minister, F. (2007). Budget Speech 2007/2008. Nairobi: Government printers.

- Mkoka, C. (2008, October 3). Malawi joins Africa-wide Science and Development survey. *Science and Development Network*.
- NEPAD. (November, 2003). Declaration of the First NEPAD Ministerial Conference on Science and Technology. . www.nepad.org.
- Nordling, L. (2008, December 4). Delay to intellectual property plan for Africa. *Science and Development Network*.
- Pouris, D. A. (1999). Current practices in region Science and Technology collaboration-what SADC countries can learn from APEC, RICyT and OECD. Science and Technology in the SADC region for the 21st Century. Pretoria: Science for the twenty-first Century.

Taylor, P. E. (2008). S&T development in Sub-Saharan Africa: Evidence and Experience. Science, Technology and Innovation Policy and Statistics: SADC Regional Conference. Gaborone, Botswana.

UNECA (2009). ECA Science and Technology Network. www.uneca.org.

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SECTION 2: THE POLITICAL ECONOMY OF CEREAL SEED SYSTEMS IN SUB-SAHARAN AFRICA

2.1 Overview

The cereal seed systems involves various institutions, farmers, government departments and agencies, policy makers and seed dealers and how they interlink (or not) to have a coordinated manner of managing seed resources from production to consumption. Rob Tripp describes the system as a chain of processes both formal and informal, following a designated sequence, with a limited number of actors involved in doing or regulating each process¹⁵. The seed system includes the direct seed production and distribution channels as well as market and policy institutions, extension, training, and supportive policy.

The study of the evolution of the cereal seed systems is important especially now when most African countries are experiencing extreme cases of hunger and poverty. Hunger and poverty have been the concern of many African countries resulting into malnutrition and in some cases the death of many people. It has also been the concern of the world through the United Nations which led to putting in place of the food aid programs by the World Food Program. The seed systems and their development have been identified as the channel through which food security can be attained. Research, development and innovations in cereal seed systems are therefore the central focus of this section.

Seed systems can be broadly divided into formal and informal. The informal system is also sometimes called the "local," "traditional," or "farmer" seed system. It has been argued by Niels P. Louwaars and Johannes M.M. Engels that the formal and informal seed systems are not always as distinct or separated as the two labels may imply.¹⁶ The formal seed system is controlled and managed by the various states and government which have put in place state institutions to implement policies, regulations and legislations. Suffice to say however that all over Sub-Saharan Africa, the formal system is not uniform as the laws differ from country to county in the region.

The informal system to the contrary is not controlled and managed by the States. It is mainly the affair of the individual farmers, dealers and various actors who have their own set of local rules which guide them. Whereas both the informal and formal systems have been in existence side by side for some time, there is a current trend by government to encourage farmers to adopt the formal system. The government encourages farmers to use formal seeds because of the main reason that they are certified as to quality. Surprisingly, there have been cases where even the formal seed system has been marred by supply of poor quality cereal seeds that fail to perform as to the expectations of the farmers. Taking an example of Ghana, the major challenge facing the seed industry is lack of synergy between seed producers and farmers. Farmers do not make extra effort to search and find the best seeds and seed support services. In addition, they do not accept non-farmer preferred seed irrespective of their

¹⁵ Tripp R. B. 1997. <u>Between states and markets - Innovations for small-scale seed provision.</u> In D.D. Rohrbach, Z. Bishaw, and A.J.G. van Gastel (eds.). Proceedings of the International Conference on Options for Strengthening National and Regional Seed Systems in Africa and West Asia. ICRISAT, Patancheru , India. Pp195-210.

¹⁶ See article in Thijssen, M.H., Z. Bishaw, A. Beshir and W.S. de Boef, 2008 (Eds.). Farmers, seeds and varieties: supporting informal seed supply in Ethiopia. Wageningen, Wageningen International. p. 307

demonstratable good qualities. According to Dr. Kwame Ameza, acting Director, Directorate of agricultural extension services, Ministry of Food and Agriculture (MoFA), farmers use available seed irrespective of their sources and even though there may be good varieties for researchers and extension workers, they may not be so good for farmers¹⁷.

	KENYA	MALAWI	ETHIOPIA	GHANA
Main cereal	Maize, Wheat,	Maize	Maize and Wheat	Maize, Wheat,
Crops	sorghum and Millet			Sorghum and Millet.
Government	Ministry of	National Seed	Ethiopian Institute of	Ministry of Food and
Sector Players	Agriculture, KARI,	Company of	Agricultural	Agriculture (MoFA),
	KEPHIS, AFC, KSC,	Malawi.	Research (EIAR),	The Council for
	University of	Ministry of	Ethiopian Seed	Scientific and
	Nairobi, Jomo	Agriculture of	Enterprise (ESE),	Industrial Research of
	Kenyatta University	Malawi	Ministry Agriculture	1968
	of Agriculture and		Research and	
	Technology, Moi		Development,	
	University, Egerton		National Varietal	
	University,		Release Committee	
			as a regulator and	
			tester	
Private Sector	Seed Trade		26 private companies	Seed Producers
Players	Association of		licensed to produce,	Association of Ghana
	Kenya, Panner Seed		19 to import, 33 to	(SEEPAG), Eastern
	(K) Ltd, Sygenta K		retail and 4 to export	and Greater Region
	Ltd, Kenya Farmers			Seed Growers
	Association,			Association
	community based			(EGARSGA)
	organisations, etc.			
Non-	World Vision, Action			
Governmental	Aid, Catholic Relief			
Sector Players	Services, USAID,			
	AMREF, ADRA			

Table 1: Key Characteristics in Each of the countries

Source: Authors compilation.

Figure 1 below illustrates how both the local (informal) and formal seed systems network. Whereas in the local system seed exchanges, consumption, marketing, planting, harvest and storage are concentrated within a central network not very far away from the production line, the formal system moves from the source of the seeds to the gene banks. From the gene banks, the seeds are bred by breeders who produce new varieties which are further subjected to quality control before they are released back to the farmers for production.

¹⁷ Interview with Dr. Kwame Ameza, acting Director, Directorate of Agricultural Extension Services, MoFA, on 11th March, 2009.



Figure 1: Formal and Informal seed systems network

Source: Almekinders and Louwaars (1999).

The green revolution and the introduction of the formal seed sector in many developing countries have created specific roles for governments to provide seeds to farmers and seed merchants. It has therefore become very crucial to develop policies and regulations that are to guide the development of the formal seed sector. Whereas in most of the sub-Saharan countries like Kenya and Ethiopia emphasis has been on the formal seed sector, the informal seed sector has been unrecognized and in most instances ignored though most of the farmers continuously use it¹⁸.

Kenya and Ethiopia have already enacted various laws and regulations on seeds and set up mechanisms for breeding, seed variety development and multiplication, seed production, distribution and marketing¹⁹. Other countries are also at an advanced stage of developing their laws and policies. The regulations and laws have enabled both public and private breeders of seeds to produce locally adapted and improved varieties. The varieties are then provided to private seed companies and/or public seed enterprises for distribution to local farmers and commercial seed companies for production and multiplication. The civil society organizations have also been playing a very important role of reaching farmers and distributing the developed seeds to enable them to produce improved crop varieties.

The mechanisms through which all these processes function have been on continuous development leading to a chain of linkages involving various actors and players. These chains of processes involving the institutions and policy makers have created an enabling environment for seed system to function. The public support for agricultural training and field extension is also a major determinant of farmers' access to agronomic, technical and market information. The seed systems can thrive and operate effectively if all the stakeholders

¹⁸ According to an interview with Mr. Alem, Coordinator, Intellectual Property Rights Office, in December, 2008, less than 10% of farmers are receiving improved plant varieties in Ethiopia.

¹⁹ In Kenya, seed production system is governed by the seed Act Cap. 326. The Act is well defined and is being revised to hasten the developments in the seed industry.

involved strike a balance between those processes that hinder its development and that have an influence on its development 20 .

Louwaars (1994) observed that the formal seed system is easier to characterize, as it is a deliberately constructed system, which involves a chain of activities leading to clear products: certified seed of verified varieties.²¹ The chain usually starts with plant breeding and selection, resulting in different types of varieties, including hybrids, and promotes materials leading to formal variety release and maintenance. Guiding principles in the formal system are to maintain varietal identity and purity and to produce seed of optimal physical, physiological, and sanitary quality. Certified seed marketing and distribution take place through a limited number of officially recognized seed outlets, usually for financial sale (Louwaars, 1994:28).

McGuire (2001) observes that informal seed systems, like formal seed systems, can also be seen as managing the flow of genetic material and information, including most of the above processes, although the flow does not typically follow a sequence as clearly defined as the one in formal systems.²² Activities tend to be integrated and locally organized, and the local system embraces most of the other ways in which farmers themselves produce, disseminate, and access seed directly from their own harvest; farm saved seeds, through exchange and barter among friends, neighbors, and relatives; and through local grain markets. Maredia et al (1999) observed that these channels contribute about 90-100 % of seed supply depending of the crop.²³

Asafaa Taa' aa Wayyeessaa, of OARI, Ethiopia, in a recent interview argued that although there is need for basic research for scientific break-through, it is also important to integrate scientific and farmers indigenous knowledge. In other words, he notes that research cannot be done for its own sake. It has to be adaptive and demand-driven by finding out what specific things are demanded especially by the end-users and the challenges for meeting the demands²⁴. This also applies to an efficient seed system from the farmers' point of view.

Encompassing a wider range of seed system variations, what characterizes the local system most is its flexibility. Varieties may be landraces or mixed races and may be heterogeneous (modified through breeding and use). In addition, the seed is of variable quality (of different purity, physical, and physiological quality). ²⁵ The same general steps or processes take place in the local system as in the formal sector (variety choice, variety testing, introduction, seed

²⁰ This is in agreement with an interview with Dr. Joseph Rusike, of IITA, Malawi, who argues that innovations in seed systems requires fulfilment of elements in terms of systems thinking, with the key elements being market access, productivity, management of genetic resources, affordability, accessibility and profitability. He furthetr suggests that the entry point for such elements is producer or farmer organizations. ²¹ Louwaars, N. 1994 Seed supply systems in the tropics: International course on seed production and

Seed technology. Wageningen, The Netherlands: International Agriculture Centre.

Shawn McGuire: (July 2001) Analyzing Farmers' Seed Systems: Some Conceptual Components Technology and Agrarian Development, Wageningen University.

Maredia M., J. Howard, D. Boughton, A. Naseen, M. Wanzala and K. Kajisa. 1999. Increasing Seed System Efficiency in Africa: Concepts, strategies and issues. Michigan State University International Development Working Paper. Department of Agricultural Economics- MSU East Lansing Michigan, pp 12-13.

²⁴ Interview with Asafaa Taa' aa Wayyeessaa, Deputy Director General (DDG), Oromia Agricultural Research Institute on 10-12-2008

Almekinders, C. and N. Louwaars 1999: Farmers' seed production: New approaches and practices. London:Intermediate Technology Publications, Ltd.

multiplication, selection, dissemination, and storage) but they take place as integral parts of farmers' production systems rather than as discrete activities.

Social factors also shape the informal system in introduction and exchange. Exchange of planting material or of new varieties is involved in social relationships, often occurring more within a particular cultural group, family, or local institution. Migration, or marriage exchange, however, may help move seed across different clans or ethnic groups. A survey of the anthropological literature on farmers' varieties suggests that, while there is rarely a monopoly on ownership, there can still be local conceptions of variety "ownership," usually linking this to particular responsibilities (Cleveland and Murray 1997). Though seed is often given as a gift serving to reinforce the social ties but it is rarely absolutely free.

In most developing countries the formal sector is far smaller than the informal seed sector. The latter is the major source of planting materials for smallholder farmers in Kenya and the other study countries. Consequently, there would be very large gains if strategies to improve the quality of seed coming from this sector were properly designed and implemented. NGOs have already made substantial investments in community-based seed multiplication schemes, which are part of the informal sector.

Assistance should be targeted at improving the efficiency of these investments, by helping NGO schemes improve their seed quality control and seed marketing. Specifically, NGO seed programs could be provided with technical support to undertake the role of variety evaluation and selection of the best genotypes, the maintenance of improved varieties currently being grown, as well as newly selected genotypes and the development of training materials to help farmers produce genetically pure seed of cultivars of their choice.

As earlier noted the various actors and players have various roles to play in these systems. For example the ministry of agriculture other than being a policy maker and supervisor of quality, it also undertakes production and distribution of seed of dryland crops (other than maize, sorghum, and beans) at farmer training centers and demonstration farms.

2.2. Seed systems in Sub-Saharan Africa: Case Studies

2.2.1 Seed Systems in Kenya

Kenya is a country located at the equator with varying climatic and weather conditions. Northern Kenya, parts of Rift Valley, some parts of the coastal region and Eastern Kenya experience dry weather conditions. The other regions have fertile soil and enough rainfall providing appropriate environment for the planting and breeding of cereal seeds by various organizations, farmers, companies and research institutes like the Kenya Agricultural Research Institute (KARI).

The cereal seed policies in Kenya date back to the 20th century when in 1939, the colonial Government formed the Maize and Produce Control Board to regulate the operations of the regional Marketing Boards. In pre-independence Kenya, the colonial government set up the Kenya Seed Company in 1956 to handle not only maize cereal but also other cereals like wheat and rice. The development of the policies progressed with the establishment of the quality control and certification process upon the enactment of the Seed and Plant Varieties Act in 1972.

In 1979, the Government established the National Cereals and Produce Board (NCPB) by merging the Maize and Produce Board with the Wheat Board of Kenya in order to streamline the management, handling and marketing of all grains. The NCPB Act, Cap.338, that made NCPB a corporate body, was enacted in 1985. Under the Act, the Board was given monopoly to purchase, store, market and generally manage cereal grains and other produce in Kenya. As a legal monopoly, NCPB was empowered to regulate and control the collection, movement, storage, sale, purchase, transportation, marketing, processing, distribution, importation, exportation, and supply of maize, wheat and other scheduled agricultural produce under a controlled price system.

The government concentrated most of its activities within public institutions providing limited and almost zero chances for the private sector to participate and play a role in seed research, breeding, development, production, certification, multiplication, distribution and marketing²⁶.

Seed systems in Kenya are at an advanced stage of development with various varieties of maize, wheat, rice and millet being bred²⁷. Whereas maize seed is more developed and is the one that has elicited wide research and resulted into many bred varieties, rice and wheat have also undergone varietal development (see figure 2)²⁸. Research in wheat and maize has been done widely with the facilitation and funding from the International Maize and Wheat Improvement program (CIMMYT).



Figure 2: Seed Production for the selected cereal crops in tones in Kenya

Source: FAOSTAT, 2009

Note: In Kenya, maize seed production exhibited a sudden decline in 2001 then a subsequent increase thereafter.

²⁶ The Ministry took steps to retain seed production within the public sector in the Public Research Institutes like KARI. This step was taken because of the need to maintain a reliable supply of good quality seeds and ensure its wide distribution. However these are still are still constraints.

²⁷ The cereal seed production in Kenya in 2003 was 2,783,375 Metric Tonnes (MT) for Maize, 47,748 MT for Rice, 126,433 MT for Sorghum, 64,400 MT for Wheat and 64,023 MT for Millet.

²⁸ According to an interview with Pannar Seed Company in 2008, about 2-3 new seed varieties are released yearly, but there is slow adoption of these new varieties.

	Public Players	Private Actors	NGO's	International Players
1	Kenya Agricultural Research	Monsanto	World Vision	International Maize and
	Institute Seed Unit	Company Ltd		Wheat Improvement
	established in 1997.			(CIMMYT).
2	Kenya Plant Health	Seed Traders	Catholic Relief	Centro International de
	Inspectorate Service created	Association of	Services	Agricultura Tropical
	under Seeds and Plant	Kenya (STAK),		(CIAT)
	Varieties Act, Cap 326 Laws	East African Seed		
	of Kenya to regulate and	Company (EASC)		
	license seed merchants	and the Western		
		Seed and Grain		
		Company (WSGC)		
3	Ministry of Agriculture to	Sygenta Seed	United States	International Crops
	develop policies and	Company Ltd, Oil	Agency for	Research Institute for
	regulations for the	Crops	International	Semi-Arid Tropics
	agricultural sector	Development	Development.	(ICRISAT)
		Corporation		
		(OCDC),		
4	National Cereals and Produce	Kenya Farmers	Action Aid	International Institute of
	Board to distribute and	Association		Tropical Agriculture
	market seeds especially			(IITA)
-	Maize and Wheat.			
5	Kenya Institute of Policy	Community Based	Concern	
	Research and Analysis.	Organizations	International	
6	Kenya Seed Company		Adventist Relief	
			Agricultural	
			program.	
7	Egerton University		Adventist	
			Development	
			Relief Agency	
0	University of Neirobi			
0	University of Ivaliout	1	1	1

Table 2: Players and Actors in the Seed Sector in Kenya

Source: Author's compilation (2009)

Seed research, variety development, breeding, multiplication and production in Kenya are done by both public and private institutions. The Kenya Agricultural Research Institute (KARI) and the Kenya Seed Company (KSC) have been the premier public institutions in the seed sector in Kenya. The KARI Seed Unit was established in 1997 with the mandate of producing, processing, marketing and distribution of good quality breeder, pre-basic and basic seed. It also has responsibilities to maintain all pre-released and released parental lines, populations and varieties as well as vegetative propagated planting materials.

Through its agricultural research capacity with state support and funding, KARI has developed many varieties of cereal seeds especially on maize. In order to have an understanding on the forces that influence production, distribution, and use of seed, it is necessary to categorize the seed sub-sector according to organizational (formal or informal), functional (production, processing, transporting, retailing), or institutional criteria (public, private or voluntary sectors). Charles Bett and his co-authors found out that many different players are active in the seed sector in Kenya.²⁹

²⁹ Bett C., L. Muhammad, W. Mwangi, and K. Njoroge. 1999. The seed industry in semi-arid eastern Kenya. In CIMMYT and EARO. Maize Production Technology for the Future: Challenges and opportunities: Proceedings of the sixth Eastern and Southern Africa Regional Maize Conference, 21-25 September, 1998, Addis Ababa, Ethiopia. Mexico, D.F. and CIMMYT and EARO (Ethiopian Agricultural Research Organization).

Miltone Ayieko and David Tschirley (2006) noted that the overall goal of Kenyan agriculture is to increase agricultural productivity for accelerated economic growth.³⁰ The authors further noted that the main seed challenge is the development of a seed system that encourages wider use of quality seed at all levels to tackle poverty and food security³¹. Whereas they were able to identify these challenges, they we unable to recommend measures to streamline the system to enable even those who use the informal system to have seeds that are certified to be of good quality for use. They observed that in the formal system, farmers purchased hybrid seeds and open pollinated varieties (OPVs). The studies found out that the formal seed sector is dominated by the higher income earners and agro dealers and heavily focused on maize in high potential zones while there were very high shares of retained seed in the informal sector³².

The Ministry of Agriculture of the Republic of Kenya plays an important role of offering extension services to farmers. The service involves the dissemination of information about type, availability, handling of seeds and planting procedures³³. Voluntary organizations such as World Vision, Action Aid, Catholic Relief Services and United States Agency for International Development (USAID) supplement these efforts through distribution. The informal sector made up of smallholders working within the community, handles the bulk of seed used in the semi-arid region. The formal sector handles improved seed varieties whereas the informal sector handles local seed varieties. These roles overlap to varying degrees.

The Ministry of Agriculture has also played a great role in ensuring the development of dry land maize seed varieties in Eastern Kenya. In response to the need for quality seed among smallholder farmers in the region, the Ministry of Agriculture established a seed multiplication and distribution program in 1981 at the National Dryland Farming Research Centre (NDFRC), Katumani.

In recent years KSC has initiated its own breeding programmes, principally in hybrid maize, wheat and Sorghum cereals³⁴. As part of wider economic reform in the early 1990s, the seed sector also underwent significant policy changes and was opened up for increased private sector entry³⁵. A key element of this change was to terminate the exclusive rights that KSC had to KARI varieties and establish a new Memorandum of Understanding with other interested private companies and organizations. Currently, KARI releases its varieties

³⁰ Miltone Ayieko and David Tschirley: 18 May 2006 Improved Access and Utilization of Improved Seed for Food Security in Kenya.

³¹ From interviews with representatives from National Cereal and Produce Board (NCPB), MEA, KSC and Bayer companies, the constraints in the seed system are mainly use of poor quality seed, inadequate and inappropriate use of inputs such as fertilizers and agro-chemicals, poor linkages to service providers e.g. local banks and intermediaries, stockists making decisions for farmers and use of non R&D products or generics by unscrupulous traders.

³² The players in the formal seed sector follow a sequence. The seeds are bred, multiplied, produced and finally distributed for commercialisation and sale. The government institutions mandated to examine the seeds certify the seeds as to quality and freedom from diseases.

³³ In relation to the challenge of promoting technological change in agriculture, it emerged during an interview with respondents from Pannar seed and Cimbria, Kenya, that the attitude of the public officials is positive. The only problem is poor extension service in the sense that extension officials lack current information on the available agricultural technologies.
³⁴ In the past, KSC operated as a quasi-private company and the government had endowed it with a legal

³⁴ In the past, KSC operated as a quasi-private company and the government had endowed it with a legal monopoly to grow process and sell certified maize seed. It also had exclusive rights to the multiplication and production of varieties bred by the KARI.

³⁵ In 1963, with funding from USAID, KSC achieved significant success in producing hybrid maize.

through a tendering process which helps it to earn a 'better' price for its developed varieties. In general terms, the major impediment of maize seed is the monopoly of parastatals such as Kenya Seed Company, Kenya Agricultural Research Institute (KARI), and KEPHIS³⁶.

Kenya Seed Company produces several varieties of hybrid wheat seed suitable for each agro ecological zone. Whereas some varieties are suitable for all altitudes, others thrive well in designated altitudinal range³⁷. The Company has put in place elaborate marketing strategies to promote use of hybrid certified seeds which are not only higher yielding but free from weeds such as wild oats.

Whereas the informal seed system is popularly used by many farmers, the system faces many challenges. Some of these challenges include the unavailability of clean seed, cases of fake seed being sold to unsuspecting farmers, the inability of farmers to afford certified seeds from the formal institutions and marketing problems of linking farmers to markets. As a result of these challenges many farmers are forced to use informal seed that is of poor quality with low yields.

The informal system consists of large number of farmers who produce both traditional and modern varieties, market their own production, and take care of their own research needs. The quality of informally produced seed is guaranteed only by its seller. Thus, there is little guarantee other than knowing and having confidence in the seller, or having seen his/her seed production field, that gives an incentive for paying a higher price for seed than grain. While in Kenya the informal seed system thrives, the players and the actors in the system are little known as they are not recognised by the government. The government does not want the quality of the seeds bred by farmers to be compromised. It considers the informal system a threat to food security in the country as it associates the system with many failures in the food production especially when the farmers use the informal seeds and the production is poor.

KARI Seed Unit (KSU) recorded some achievements between October 1997 and December 2002, among them the development of the total amount of certified seed (maize, sorghum, pearl millet, beans, cowpea, green gram and pigeon peas) amounting to 457 tons of breeder, pre-basic and basic seed. These are crops adapted to semi-arid lowlands.

Another formal seed system player is the Kenya Plant Health Inspectorate Service (KEPHIS) which is the quality controller of seeds, licenser of seed stockists and merchants and seed quality certifier³⁸. The institution is created under the Seeds and Plant Varieties Act.³⁹ The institution is also involved in seed evaluation before varieties are realized; the evaluation at the testing locations has to be done for a period of at least two and preferably three years or seasons before final assessment. The assessments tests include National Performance Trials (NPTs) and a determination of the seed as to distinctiveness, uniformity and stability (DUS).

³⁶ According to an interview with representative of a private seed company, control of distribution by Kenya Seed Company (KSC) is a major impediment for private sector participation.

³⁷ It is interesting to note from various interviews that while Kenya seed Company and other companies such as Bayer, Pannar and Corn Products Kenya Ltd conduct in-house research on seed variety development, processing and distribution, most of these R&D activities in private companies. For example, Bayer Ag in Germany, Cornproduct at the Cornprod Centre of Excellence in Brazil and Cimbria in Denmark). What is done in Kenya is adaptive research in order to adjust the products to local conditions.
³⁸ KEPHIS takes the role of quality control and certification activities in collaboration with KARI, seed

³⁸ KEPHIS takes the role of quality control and certification activities in collaboration with KARI, seed companies, and seed distribution agencies.

³⁹ Seeds and Plant Varieties Act, Chapter 326, Laws of Kenya.

The Seed Policy Act (Cap 326) is well defined and governs the seed system. The Act is being revised to bring it to speed with the developments in the seed industry. For instance, its support for the intellectual property rights for the protection of new varieties of plants has encouraged entry of private seed companies and subsequent development and deployment of new plant varieties. Provision of seed, as part of the government drought recovery program, is undertaken by the Agriculture Department under supervision of the Provincial Administration Department within the Office of the President.⁴⁰ The National Seed Quality Certification Service (NSQCS) centers in Lanet and Kitale perform most seed quality control activities.

The office of the Chief Grader in Mombasa and the Plant Quarantine Station at Muguga carry out seed and plant material inspections at port and border towns, facilitating importation and exportation of seed. To minimize the risk of poor quality seed being sold to farmers, NSQCS carries out post-certification sampling that indicates the quality of seed being distributed just before the planting season. Most dryland crops (maize, sorghum, millet, beans, cowpeas, and pigeon peas) are subject to compulsory certification.

Several international agricultural research centers (IARCs) and public universities are also involved in various stages of seed development, production, and distribution in Kenya. As a general rule, IARCs and universities work in close collaboration with KARI, relevant government departments, and voluntary sector agencies in the area⁴¹. ICRISAT (sorghum and pigeon peas), CIMMYT (maize), CIAT (beans), and IITA (cowpeas and cassava) are major IARCs.⁴² From an interview with Kenya Seed Company (KSC) representative, IARCs provide incentives or support for private sector research. For example, CIMMYT has been providing the germplasm to KSC free-of-charge or under free licensing arrangements and KSC only pays the costs of shipping.

The Non Governmental organizations (NGOs) also play an important role in the seed system processes. There has been rapid growth in NGO participation in seed provision to smallholders (Tripp 1997).⁴³ In semi-arid areas, NGOs provide seed to smallholders as part of their poverty alleviation strategy. World Vision, Action Aid, and the African Medical Research Foundation (AMREF) are some major international NGOs in Kenya active in the area. World Vision identifies needy households and trains them to select maize seed, pigeon peas, cowpeas, beans, and sorghum, with the assistance of research institutes such as KARI and ICRISAT. The African Medical Research Foundation buys seed from KARI and distributes it to women's groups on credit. Women's groups that benefit from AMREF "seed

⁴⁰ Ochuodho, J.O., D.O. Sigunga, and W.A. Songa. 1999. <u>Seed regulation and seed provision options with particular reference to food cereal and legume grains in Kenya.</u> In Proceedings of the Workshop on Linking Seed Producers and Consumers: Diagnosing Constraints in Institutional Performance. Pp. 63-73. 15 June 1999. NDFRC, Katumani, Machakos Kenya. ICRISAT, Bulawayo, Zimbabwe.

⁴¹From interviews with Pannar Seed, Bayer and Kenya Seed Company representatives, it emerged that Universities or technical institutes consult KSC when setting up their strategic priorities in seed technology. However, this is done on an *ad hoc* basis. In addition, there is no formal arrangement for research institutes to consult with KSC and other seed companies such as Pannar Seed in setting their research priorities.

⁴² Bayer East Africa, a company in Kenya, is a member of integrated global platform of companies. This helps the company to monitor global market trends on new and old products.

⁴³ Tripp R. B. 1997. Between states and markets - <u>Innovations for small-scale seed provision</u>. In D.D. Rohrbach, Z. Bishaw, and A.J.G. van Gastel (eds.). Proceedings of the International Conference on Options for Strengthening National and Regional Seed Systems in Africa and West Asia. ICRISAT, Patancheru , India. Pp195-210.

loans" are trained in seed selection techniques. Action Aid has previously negotiated with the University of Nairobi to start seed bulking activities.

A part from the government and non-governmental institutions' roles on the seed systems, the private sector has also been playing a major role. They have for example played an important role in developing dry-land cultivars for planting in low rainfall regions⁴⁴. The KSC, the Oil Crops Development Corporation (OCDC), East African Seed Company (EASC) and the Western Seed and Grain Company (WSGC) are among the few firms that participate in the production of dryland crop seeds (Kimenye 1999). ⁴⁵ However, the amount of seed produced by these companies is small. Kimenye notes that on average, the combined annual production for cereals and grain legume seed is about 1,000 tons and 750 tons, respectively, enough for approximately 18,000 ha of grain legumes and 40,000 ha of cereals. Low and erratic demand and difficulties of contract enforcement with farmers producing seed were cited as reasons for low production.

Following the realization that both the colonial and post-independence governments have emphasized more on development of policies for the formal seed sector, the current seed policy revisions (from 2005) recognize both the formal and informal seed sector systems and further stipulates the framework to govern both systems.

Some of the key policy changes that have been made by the government of Kenya on the Kenyan seed sector since 2005 are related to research and extension services; germplasm utilization and conservation; capacity development; seed production, processing and quality control; seed supplies; seed marketing and distribution and legal and institutional reforms.

The changes relating to research and extension services are geared towards increasing financial support to research, extension, variety and species development and technology transfer by both the private and public sector commensurate with the sector's importance to the economy. Other proposals are streamlining and harmonizing the process of variety evaluation, release and registration and to strengthen modalities for coordination of public and private research and extension service providers for effective transfer and dissemination of seed related technologies.

For germplasm conservation and utilization, the government aims to encourage sourcing and developing variable germplasm to broaden the genetic base of various crops and plant species, ensure that there are clear guidelines on ownership and transfer of varieties developed through collaborative programs with IARCs and restructuring and strengthening the National Gene Bank into a semi-autonomous National Biodiversity Conservation Centre.

As part of capacity development, there are plans to promote sustainable modalities for the production of certified seeds of open pollinated varieties (mostly adapted to drought prone areas) and moreso to build capacity of the informal seed sector players to obtain planting material from breeders and registered seed dealers for example by collaborating with the

⁴⁴ Kenya Seed Company maintains occasional communication with other firms and organizations outside the country. This is done to keep abreast with developments in the seed industry.

⁴⁵ Kimenye, L.N. 1999. Commercial provision of non-hybrid seed in Kenya. In Proceedings of Workshop on Linking Seed Producers and Consumers: Diagnosing Constraints in Institutional Performance. Pp. 6-37. June 15, 1999, NDFRC, Katumani, Machakos Kenya. ICRISAT, Bulawayo, Zimbabwe.

private sector, strengthening the farmer's institutions and establishing mechanisms for the provision of credit facilities to seed growers.

The current changes for seed production, supply and quality control focus on investment in strengthening the capacity of the regulatory bodies including phytosanitary services for efficient and effective seed and service delivery in addition to ensuring that relief supplies are sourced only from registered seed enterprises and that they are of known quality. There is also a proposal to review the law to prescribe stiffer penalties to those who offer poor quality seeds to farmers and to strengthen the extension and advisory services to farmers on the benefits of using good quality seed.

As a policy change measure on seed marketing and distribution, the government proposes to review the law and regulations in line with the liberalized market environment to facilitate the development of a vibrant and competitive seed sector. It will also encourage all registered seed merchants to join the seed associations for purposes of self regulation to assure seed quality and encourage them to market seed in small packages to promote the use of certified seed by smallholder farmers.

On legal and institutional reforms, there are envisaged changes in regulations and procedures which promote private sector participation and coordination of provision of extension services by the various actors in the seed industry. Other reforms include the planned review of the Seeds and Plant Varieties Act, Chapter 326 Laws of Kenya to comprehensively address all legislative issues relating to seeds and plant varieties and harmonize it with other existing related Acts and international agreements where Kenya is a signatory.

2.2.2. Cereal Seed Systems in Ethiopia

a) Historical preview

Ethiopia has a long history of both the informal and formal seed production systems. The formal seed production and distribution in Ethiopia began in the 1940s with the establishment of the agricultural colleges. Researchers in Ethiopia have been developing new varieties of major food crops since the 1950s. In 1966, with some assistance from United Nations Development Program (UNDP) and Food Agricultural Organization (FAO), the government established the Institute of Agricultural Research (IAR) ---now Ethiopian Institute of Agricultural Research, (EIAR).

Table 3: Stakeholders and Players in the Seed Industry in Ethiopia

	Public Players	Private Actors	NGO's	International
				Players
1	National Variety Release Committee	Pioneer Hi-Bred International Co. Ltd	World Vision	International Maize and Wheat Improvement Centre (CIMMYT).
2	Ethiopian Institute of Agricultural Research (EIAR),	Hawas Agro Business Awassa Farm Development Enterprise	CARE International	International Food Policy and Research Institute (IFPRI)
3	Ministry of Agriculture and Rural Development	Awassa Green Wood	United States Agency for International Development.	Promoting Local Innovation in ecologically- oriented agriculture and natural resource Management". PROLINNOVA
4	The Ethiopian Seed Enterprise (ESE) formerly the Ethiopian Seed Corporation (ESC)	Hadiya Trading Enterprise	Action Aid	International Institute of Tropical Agriculture (IITA)
5		Bako Agricultural Research Center	Catholic Relief Services	
6		Ano Agro Industry Anger Farm		

Source: Author's compilation (2009)

The seed programs in Ethiopia were not well developed until later 1970s. In 1976, the National Crop Improvement Committee (NCIC) set up the National Seed Council (NSC) to formulate recommendations for seed production and the supply of varieties released from the national research programs. ⁴⁶ This program has developed and evolved over time and tried to develop the formal seed system in Ethiopia.

In 1979, the Ethiopian Seed Corporation (later renamed the Ethiopian Seed Enterprise, ESE) was established to institutionalize seed production, processing, distribution and quality control of improved varieties. The NCIC initially handled variety release. In 1982 the National Variety Release Committee (NVRC) took over this task; and expanded its activities to evaluation of verification plots, and registration of varieties⁴⁷.

Accordingly, the Agricultural Input Quality Control and Inspection Department and the Agricultural Input Market Department are institutionalized under the MoARD⁴⁸. However MoARD is being reorganized where the main responsibilities and activities will be retained,

⁴⁶ Simane B: (2008) Seed policies and regulations and informal seed supply in Ethiopia

⁴⁷ The NVRC is also required to test and register new varieties of seeds.

⁴⁸ The Ethiopian seed policies require that seeds of various cereals be subjected to quality control and certification by the Agricultural Inputs Quality Control Department. It is also mandated to is sue licenses for seed production, processing, importing, exporting and retailing.

but will be realigned within new coordination offices or organizational units of the Ministry. The ESE is the major player in seed production in the formal system. ESE coordinates the Farmer-Based Seed Production and Marketing Scheme (FBSPMS) and there is some ambiguity as to whether this scheme should be considered as formal or informal seed production.

The main challenge for the Ethiopian seed system lies in the area of technology multiplication. There seems to be inadequate technology developing institutions. This leads to lack of adequate seed in the country. According to Girma Ysef and Abebe Mekuriale⁴⁹, the ESE and farmers have low capacity to produce adequate seed for scaling up operations although the enterprise is working on some of the aspects aimed at scaling up of the seed technology.

The formal seed system only caters for a small population of the farmers⁵⁰. As a result improved seed is only available in a limited number of crops that are produced in significant quantities for distribution to smallholder farmers.⁵¹ Across the entire country, just 5 percent of farmers in Ethiopia have access to these improved varieties, typically through public distribution systems that are often unable to meet their specific needs.

The improved varieties developed by the Ethiopian Institute of Agricultural Research are reviewed by the National Release Committee before they are provided to the Ethiopian Seed Enterprise (ESE) for multiplication. Prior to distribution, seed are further scrutinized under the certification and other regulatory processes by public regulators to ensure good quality of the end product. Only then does seed reach the farmer.

Multiple stakeholders with numerous, often conflicting, interests and objectives make up the formal seed system in Ethiopia. They range from non-market actors, such as public regulatory agencies (MoARD, Regional bureaus of agriculture), research institutes (EIAR, RARIs, and HLI), extension services⁵², and non-governmental organizations; to market actors, including domestic and foreign private firms, cooperative unions, trade associations, private breeders, seed companies, stockists, civil society actors, community- based organizations; and farmers themselves.⁵³

Amongst the private companies, only Pioneer Hi-Bred International is involved in the production and marketing of its own branded maize hybrids developed from breeding materials imported from Zimbabwe and South Africa (Adugna and Melaku, 2002). The size and reach of the private sector is extremely limited in spite of the active participation of Pioneer and other companies in Ethiopia's seed industry.

⁴⁹ Interview with Girma Ysef, Coordinator, Research and Technology Transfer, Abebe Mekuriale, Coordinator, STIP studies, Formulation and Implementation Process and Alem, Coordinator, Intellectual Property Office, Ministry of Science and Technology on 10-12-2008.

⁵⁰ According to Mr. Alem, an IPO officer, at present less that 10% of farmers are receiving improved plant varieties.

varieties. ⁵¹ Alemu D and Spielman D.J: <u>Ethiopian Seed Systems; Regulations, Institutions and Stakeholders</u>, ESSP Policy Conference Brief No. 11, June 2006.

⁵² Regarding extension, it seems the weakest point is linkages between research and extension at all levels from the federal to regional to zonal and to Woreda level.

⁵³ Dawit A, Deressa A, Dessalegne L, Anchala C (2004). Domestic vegetable seed production and marketing. Research Report No. 57. Ethiopian Agricultural Research Organization.

It is only a few other firms that are directly marketing their own products. Most of them work for ESE as subcontractors. Moreover, very few of these companies produce maize varieties that are suitable to the agro-climatic conditions of the Rift Valley area. Other players including international non-governmental organizations such as World Vision, CARE, and Catholic Relief Service are involved in the production, marketing, and distribution of maize seed through a variety of community based projects such as local seed banks and on-farm seed multiplication projects.

b) Research and Development in Ethiopia

The Ethiopian Institute of Agricultural Research (EIAR), a semi-autonomous body under the Ministry of Agriculture and Rural Development (MoARD), represents the main agency responsible for the coordination of agricultural research. Its functions include maize breeding, production of breeder/foundation seed, and supply of breeder/foundation seed to basic seed producers. EIAR's maize-related activities are carried out at the Melkassa Agricultural Research Center (MARC), the Bako Agricultural Research Center (BARC), and several of the seven regional (i.e. state-level) agricultural research institutes (RARIs).

Since the start of formal maize research in Ethiopia, about 27 maize varieties (18 OPVs and 9 hybrids) have been developed by public system, with an additional 3 hybrids developed by Pioneer Hi-Bred International, a US-based multinational company with operations in Ethiopia (MoARD, 2004)⁵⁴. Just like in Kenya, the Ethiopian cereal seed system is dominated by the breeding and development of maize seeds (see Figure 3 for comparisons on the trends of Maize area harvested in all the four countries). Maize is currently grown across 13 agro-ecological zones which together cover about 90 percent of the country. Moreover, it is an increasingly popular crop in Ethiopia.⁵⁵ The area covered by improved maize varieties grew from five percent of total area under maize cultivation in 1997 to 20 percent in 2006.⁵⁶

⁵⁴ According to an interview with Wondrad Mndesfro, Head of Agricultural Extension Department, MoARD on 9-12-2008, there is need to improve the capacity of research on seed systems. In addition, it seems there is a dilemma facing researchers. This is in relation to there being need to improve their capacity to do research and on the other hand there being pressure exerted on them to disseminate what they produce.

⁵⁵ Alemu Et al (2008): The maize seed system in Ethiopia: challenges and opportunities in drought prone areas, African Journal of Agricultural Research Vol. 3 (4), pp. 305, April, 2008

⁵⁶ Byerlee D, Spielman D.J, Alemu D, Gautam M (2007). Policies to Promote Cereal Intensification in Ethiopia: A Review of Evidence and Experience. International Food Policy Research Institute (IFPRI) discussion paper no. 707. Washington, D.C.: IFPRI.





Source: FAOSTAT, 2009

The recent introduction of several new maize varieties in Ethiopia illustrates the potential importance of this seed industry and the contribution of improved maize varieties to Ethiopia's agricultural sector (Figure 4 gives an illustration of the Ethiopian seed production for maize and sorghum crops over years). Several drought tolerant and nitrogen-use efficient maize varieties—namely, Melkassa II, III, IV and V—were developed in the 1990s under the first phase of the African Maize Stress (AMS) project, a joint undertaking of the International Maize and Wheat Improvement Center (CIMMYT) and national agricultural research institutes across Eastern and Southern Africa.⁵⁷

⁵⁷ Banziger M, Diallo AO (2002). <u>Progress in developing drought and N stress tolerant maize cultivars for Eastern and Southern Africa</u>. Paper presented at the Seventh Eastern and Southern Africa Regional Maize Conference, 5-11 February 2002, Nairobi, Kenya



Figure 4: Seed Production for the selected cereal crops in tones in Ethiopia

Source: FAOSTAT, 2009

It is revealed from this study that the lack of health competition in the production, distribution, and marketing of seed contributes significantly to the high cost of seed production and poor coverage of seed distribution in Ethiopia. Recent steps to encourage competition, such as the increased involvement of the private sector and the enactment of a plant breeder rights law, are positive moves in the right direction. But other regulatory and investment policies must also be considered to build a strong, vibrant, and competitive seed sector.

c) Seed Policy development in Ethiopia

The National Seed Industry Policy and Strategy (NSIP) in Ethiopia was formulated in 1992 with the aim of facilitating and regulating the production and marketing of quality seeds. Article 7 of the policy promotes the active participation of farmers in the seed industry and the sustainable use of local cultivars. The seed proclamations, guidelines and seed standards were issued which support the development of a sustainable seed system.⁵⁸

Seed standards, field and laboratory manuals, and variety evaluation and release guidelines are also vital tools for the regulation of the seed industry. Seed Proclamation No. 206/2000 defines the institutional framework with the basic tasks and responsibilities of authorities for seed industry development. The proclamation addresses streamlining the evaluation, release, registration and maintenance of varieties developed by national research systems. It also covers the developing of an effective seed production and supply systems through the participation of the public and private sectors; creating functional and institutional linkages among key players in the seed industry; and regulating quality, import-export trade, quarantine and other seed-related issues.

The participation of farmers in seed production as contract seed farmers to registered seed companies is also covered by the proclamation. However, there is no legal provision for

⁵⁸ Simane B: (2008) Seed policies and regulations and informal seed supply in Ethiopia

farmer-based seed production within the informal system. Article 14 of the seed proclamation, on seed production, processing and marketing, states that "any seed produced and processed locally or imported, or to be exported or to be sold and distributed in the country shall be from a variety registered by the Agency and shall conform to the requirements and seed standards of Ethiopia". This does not give legal status to farmers in producing and marketing their own seed.

Plant breeders' rights, promulgated under proclamation No 481/2006 were established in February 2006. However, these rights have not been operationalized and they aim to provide recognition and economic rewards for those who contribute to the development of high quality improved varieties. Article 27 of the proclamation recognizes the rights of farmers to save, use, exchange and sell both farm-saved seed of local cultivars and protected varieties; this is not in line with the UPOV guidelines.

The opportunities for seed policy improvement are visible in Ethiopia. According to an interview with Mr. Alem, an IPO officer, the role and scope of the private sector has been emphasized and currently the attention has been given to the private sector through the promotion of smallholder enterprises (SMEs). Unfortunately, SMEs are still not well developed and are therefore unable to develop new seed technologies or even adopt existing ones⁵⁹. Some of the sections and articles in the NSIP need to be revisited to encourage small-scale farmers' and cooperatives' involvement in seed production and marketing and moreso ensure the development of the informal seed system⁶⁰. The seed policy needs to accept farmer-based seed production and marketing as an integral part of the wider seed system for ensuring seed availability and seed choice to farmers⁶¹.

On issues of governance and administration, the ESE is involved in both formal sector seed supply and the farmer-based seed production and marketing scheme, with competing interests, particularly as a profit making public seed enterprise. The latter involves a large number of farmers, with a huge task in administration and coordination. In view of the regions' good experience of handling and administering the farmer-based seed production and marketing scheme, there is a need to decentralize the scheme.

2.2.3. Cereal Seed Systems in Malawi

a) Historical preview

Malawi is a small, landlocked Sub-Saharan African country covering about 118,000 km² with a population of about 11 million people. The country's economic base still largely depends on the agricultural sector, which contributes about 35% to the gross domestic product (GDP) and employs about 80% of the population.⁶² The Malawi economy is characterized by a high

⁵⁹ Interview with Mr. Alem, an IPO officer, MOST

⁶⁰ The seed standards that are currently in use are too high even for the formal sector; it is therefore necessary to set achievable and fair seed standards for the farmer-based seed multiplication system

⁶¹ This is in agreement with an interview with Wondrad Mndesfro, Head of Agricultural Extension Department, MoARD on 9-12-2008, who said that the current driving policy for seed systems is that of transformation of smallholder agriculture to commercialization.

⁶² Phiri A, Chirwa R and Haugen J.M: (2004) A Review of Seed Security Strategies in Malawi; p 135 Available on-line at http://www.ciat.cgiar.org/africa/seeds.htm.
dependence on agriculture, a narrow industrial base and weak intersectoral linkages. The country breeds maize and rice cereals as well as bean grains.

Before and immediately after Malawi gained independence, it depended on Southern Rhodesia (Zimbabwe) for their seeds resources⁶³. They imported hybrid maize and tobacco. Therefore in 1976, the Malawi Ministry of Agriculture initiated a crash programme aimed at developing in-country capacity to multiply and certify seeds of all crops, although hybrid maize and tobacco seed still remained the priority seed crops.

The Seed Services Unit (SSU) within the Department of Agricultural Research & Technical Services was established in 1976 to oversee seed quality control. The National Seed Company of Malawi (NSCM) was formed in 1978 to produce and facilitate distribution of certified seeds to farmers; and the Agricultural Development and Marketing Cooperation (ADMARC), another parastatal, was mandated and became involved in seed marketing and distribution. A fully fledged seed certification scheme based on international standards became operational in 1979.

The National Seed Company of Malawi (NSCM) operated as a seed production arm of the national agricultural marketing corporation (ADMARC) until 1989 when Cargill obtained a controlling interest in the company. The bulk of its sales have always been hybrid maize seed. One of the challenges facing the organisation is that it has never been effective in producing or distributing seed. This according to an interview with Dr. Siambi, of ICRISAT also applies to the Ministry of Agriculture in Malawi in which case it takes along time for technology testing and delivery through the ministry.

The preceding institutions are the ones that set the base for a formal seed system in Malawi. The formal seed system is mainly evident in the maize seed while the informal system spreads across all crops in Malawi. In the informal seed systems, the farmers' source their seeds from their own stock, saved seed from the previous seasons harvest and from other farmers⁶⁴. A farmer's reputation is the main reason for another farmer paying a higher price for seed than grain. The widespread use of the informal seed system in Malawi is attributed to the high costs of purchase and use of certified formal seeds from the public institutions and the costs of inputs to ensure higher production.

The formal seed system in Malawi is strongly supported by the centralised approach to hybrid maize development but poorly developed for other crops and beans (see Figure 5 for an illustration on the trends of seed production for maize and sorghum cereal crops in Malawi)⁶⁵. Formal seed exchange schemes are by definition unsustainable as farmers are required to

⁶³ To date, according to an interview with Dr. Siambi, of ICRISAT on 12th January 2009, ICRISAT has existed in Malawi for the last 20 years, where it develops technologies and passes them to NARS. Its main focus has been on pigeon pea and groundnuts. It covers SADC countries but still sorghum and millet are being coordinated from Bulawayo in Zimbabwe.
⁶⁴ Essau Mwendo Phiri, of World Vision, Malawi, in an interview on 16th January, 2009, noted that farmers

⁶⁴ Essau Mwendo Phiri, of World Vision, Malawi, in an interview on 16th January, 2009, noted that farmers emphasize on availability and convenience as the main advantages of keeping their own seed. In some cases, the shortage of cash at planting time and a lack of confidence formal seed sources makes the farmers to continue using the informal seed system.
⁶⁵ Dr. Ephraim Chirwa, the Dean, Chancellor College, emphasized in an interview (on 14th January, 2009) that

⁶⁵ Dr. Ephraim Chirwa, the Dean, Chancellor College, emphasized in an interview (on 14th January, 2009) that foreign companies such as Monsanto and Pannar dominate the maize seed market industry. He further noted that the input subsidy programme which is supported and accepted by the private sector has increased the value of seed. The private sector companies are very positive about the subsidy programme and they have a feeling that it has improved distribution and farmer access to seeds and linkages between companies and agro-dealers.

meet exchange transaction costs, and even projects that support local level seed production do not build elements that ensure sustainability after the end of the project.





Source: FAOSTAT, 2009

Some of partners involved in the formal seed included extension agents from NGOs and government services/development programmes, grain traders and some seed companies, farmer's organizations, national seed services. The partnership members carry out different but complementary seed activities ranging from the variety development, availability of foundation seeds, skills/ and knowledge enhancement and promotion including the dissemination of quality seed varieties⁶⁶. However, Dr. Ephraim Chirwa, the Dean, Chancellor College, noted that the implication resulting from the domination of foreign companies in the maize seed industry is inadequate domestication of the knowledge accrued from the imported seed technologies.

Some of the challenges that affect the formal seed system in Malawi include the inadequate resources to facilitate dissemination and multiplication of new and improved seed varieties. National agricultural research systems and international agricultural research centres have worked together to develop new, stress tolerant crop varieties that are well adapted to smallholder farmers' conditions. Although the public research organisations may want to increase accessibility to new varieties to the smallholder farmers, there is lack of infrastructure and human resource capacity to promote improved access and use. The challenge of limited funding also affects the formal seed systems in Malawi. Due to high cost of producing seeds in large quantities, the seed companies also usually contract small scale seed producers supported by either NGOs/GOs and farmer's organizations to cut on costs.

⁶⁶ From the interview with Mr. Gresham Nhlane, Deputy Officer in Charge, Chitedze Agricultural Research Station, it is evident that there is always shortage of seed where the private sector does not participate.

In 1986 the Ministry of Agriculture (MOA), recognising the problems in seed supply for nonhybrid grains and legumes, initiated a Smallholder Seed Multiplication Scheme (SSMS). The aim was to decentralise seed production for these crops through the organisation of seed multiplication at the level of Agricultural Development Divisions (ADDs) and subsequent sale by ADMARC. However, the scheme was never able to function properly (Chirwa and Aggarwal, 2000).⁶⁷

Table 4:	Players	and	Actors	in the	Seed	Sector	in Mal	awi

	Public Players	Private Actors	NGO's	International Plavers
1	National Seed Company of Malawi (NSCM)	Cargill Limited	World Vision	International Maize and Wheat Improvement Centre (CIMMYT).
2	Ministry of Agriculture and Food Security of the Republic of Malawi.	Malawi Rural Finance Company Ltd	CARE International	International Food Policy and Research Institute (IFPRI)
3	Agricultural Development and Marketing Corporation of Malawi	National Smallholder Farmers Association of Malawi (NSFAM)	Action Aid (Malawi Smallholder Seed Development Project)	Promoting Local Innovation in ecologically- oriented agriculture and natural resource management (PROLINNOVA)
4	National Food Reserve Agency (NFRA) established in 1999	Seed- Co (1941) (currently based in Lilongwe)	Concern Universal	Centro International de Agricultura Tropical (CIAT)
5		Monsanto Seed Company	Total Land Care	
6				

⁶⁷ Chirwa, R. and V. Aggarwal (2000). <u>Bean seed dissemination systems in Malawi: A strategy. Journal of Sustainable Agriculture. Vol. 15 (4): 5-24.</u>

Table 5: A comparison between the formal and local seed systems

	Formal Seed System	Informal Seed System
Means of accessing seed	Only cash and more expensive than the local seed prices	Seed gifts and exchanges with grains and cash
Access of Information on new varieties	Minimum sharing of information by seed stockists, merchants and agents	Information on seeds shares amongst neighbours and social networks
Types of Clients	Non- governmental organisation on seed aid organisations	Farmers, private companies and public organisations. It is based on the farmer's interests
Percentage of seed supply	5%	95%

Source: Authors compilation

b) Challenges facing the seed systems in Malawi

The most serious bottleneck for the diffusion of new crop varieties is the absence of an effective seed system. In most cases the seed companies are unable to operate efficiently. Liberalisation policies have led to the privatisation or closure of many of these companies and have stimulated the emergence of a number of private seed companies. But the private companies also focus on hybrids and often claim to see no market for seed of grains and grain legumes⁶⁸. A number of NGO and donor projects have attempted to stimulate small-scale commercial seed activity at the local level, but this strategy has so far had limited success due to policy related constraints. In an interview with Mr. Gresham Nhlane, Deputy Officer in Charge of Chitedze Agricultural Research Station and Mr. Wilson Makumba, it emerged that the Breeders Act does not protect or reward the rights of breeders or farmers, especially in protecting their germplasm. In addition, the liberalization of market has led to increased abuse of farmers through adulteration of 'formal seed'. The seed Act which would have protected them was established in 1964 and since then, it has not been reviewed, moreover, it is hardly enforced⁶⁹.

The limitations in the formal seed system cause great problems for public sector plant breeding in Malawi. When a new variety is released, there is no obvious way in which to distribute seed. Research and extension agents may help with demonstrations and they can distribute some seed if it is available. This is however still limited by funding thereby curtailing seed diffusion initiatives. NGO and church groups can also help in distributing seed of new varieties. But most of these strategies tend to be organised in an *ad hoc* manner. Phiri et al. note that there is often no clear set of procedures for obtaining seed of new varieties or even for learning of its availability.⁷⁰

⁶⁸ For example, from an interview with Dr. Siambi of ICRISAT, ICRISAT is increasingly working with NGOs for instance, in setting seed banks for seed multiplication, the reason being that research seed is expensive, but the primary focus for them (private sector) is always not on non-commercial seed such as legumes.

⁶⁹ Interview with Mr. Gresham Nhlane, Deputy Officer in Charge, Chitedze Agricultural Research Station and Mr. Wilson Makumba in January, 2009.

⁷⁰ M.A.R. Phiri, R. Chirwa, S. Kandoole and R. Tripp, 2000. Introducing New Bean Varieties with Small Seed Packs: Experience from Malawi. Network on Bean Research in Africa, Occasional Publications Series, No. 32, CIAT, Kampala, Uganda.

An innovative strategy for overcoming some of these difficulties currently involves the provision of small packs of seed of new varieties. The strategy attempts to bridge the gap between farmer interest in seed of new varieties and the commercial potential for seed production. The idea is to sell small quantities of seed through local shops, extension agencies, NGOs, or other local outlets as part of seed production scale-up initiative.

The other policy break-through is the recent efforts by ICRISAT on the regional harmonization of seed trade in the SADC countries. The motivation being that individual national seed policies affect technology dissemination due to the time lag in the approval process⁷¹. Nonetheless, the challenge still remains how each country is going to implement the harmonized regulations given that South African countries unlike West Africa and East Africa have no sub-regional organizations which could champion the whole process⁷².

2.2.4 Cereal Seed Systems in Ghana

a) Historical Preview

Ghana is located in Sub-Saharan African region. The agricultural sector contributes about 70 % of the livelihood to its people. The country is about 99% self-sufficient in the production of maize, the major staple for many low-income Ghanaians. ⁷³ Apart from the maize cereal, Ghana also produces sorghum, millet, rice cereals. Maize is grown in the Southern, Central and Volta regions and parts of the Northern Region, where it is the principal staple food.⁷⁴

Maize has been cultivated in Ghana for several hundred years. After being introduced in the late 16th century, it soon established itself as an important food crop in the southern part of the country. Today, maize is Ghana's most important cereal crop. It is grown by the vast majority of rural households in all parts of the country except for the Sudan savannah zone of the far north.

About 40 percent of cereal production is concentrated in the Northern, Upper East and Upper West Regions and maize, millet and sorghum are the predominant crops in these areas. About 60 percent of maize production is concentrated in Brong-Ahafo, Ashanti and Eastern regions (FAO, 2002).⁷⁵ Wheat products are consumed in large volumes but the agro-ecological conditions do not allow successful cultivation. Therefore, most of the wheat seed is imported to meet local demands. Rice is grown in the Northern, Upper West, Upper East regions and to a lesser extent in the Western and Volta Regions. The Northern Region possesses the greatest potential for the development of the rice farming in Ghana. Unfortunately, the parboiled rice which is mainly produced in the region is not consumed in the big urban centres of the southern part of the country where households feed on imported rice. The inadequate production of rice and particularly the lack of capacity to produce high quality and improved

⁷¹ The harmonization process has taken over 15 years but the harmonized policy is near approval by the SADC Secretariat.

⁷² Interview with Dr. Siambi of ICRISAT, Lilongwe on 12th January, 2009.

⁷³ Nyanteng, V.K., and Asuming-Bempong S. (2003). <u>The Role of Agriculture in the Food Security of Ghana</u> 2003, Paper presented at the "Roles of Agriculture Project. International Conference, 20-23 October 2003

⁷⁴ Tripp, R. and K. Marfo, 1997, "<u>Maize Technology Development in Ghana During Economic Decline and Recovery</u>," in Byerlee, D. and C.K. Eicher (eds.), *Africa's Emerging Maize Revolution*, Boulder: Lynne Rienner Publishers.

⁷⁵ Fynn E.A; Banini G, Croppenstedt and Oduru G: <u>Explaining Success in Reducing Under Nourishment</u> <u>Numbers in Ghana</u>, ESA Working Paper No. 03-10 March 2006

varieties have led to increased imports of rice for the use of most urban Ghanaian residents in the South. $^{76}\,$

It is evident from the agricultural statistics of Ghana that the cereal seed system in Ghana is not well developed both in volumes of production and in its capability and technology for research and breeding of new varieties. Taking an example of rice, Ghana could possibly be self-sufficient in rice but the inadequate funding and lack of political goodwill makes the venture unattainable. The political wing of the government has failed over the years to allocate funds for research and production of rice and to breed new and improved varieties of rice.

The major area given emphasis in agricultural research is the maize variety breeding and production. As a result of the importance of maize, the Ghanaian government had to introduce 50% fertilizer subsidy to encourage the use of certified maize varieties⁷⁷. This may be attributed to the fact that maize has remained the staple food of Ghana over the years. Even the cereal multiplication, production and distribution capacity is not adequate to meet the demands of most Ghanaians. In an interview with Michael Owusu, Seed Officer, Directorate of Crop Services, it emerged that the breeder seeds are small in quantity and hence cannot be given to farmers. As a result, the government set up the Grain and Legume Development Board (GLDB) to receive breeder seeds and produce foundation seeds. But because the quantities are not always adequate, the foundation seeds are given to seed growers (these are private sector people) for multiplication into certified seeds, which can now be purchased by farmers for planting. The certification is done by Plant Protection and Regulatory Division⁷⁸.

There have been several agricultural development projects going on in Ghana since mid the last century. For example the Ghana Grains Development Project (GGDP) was launched in 1979 with funding from the Government of Ghana and the Canadian International Development Agency (CIDA) and led to the release of two new varieties of Maize in 1984, which was later replaced by versions resistant to maize streak virus. Tripp and Marfo state that the launch in 1987 of the Sasakawa-Global 2000 food project and the widespread coverage it achieved helped significantly to spread improved maize technology more widely (see Figure 6 indicating seed production trends for maize and sorghum in Ghana).

⁷⁶ Edache O.A: FAO statement in the National Dissemination Workshop On the Extent and Impact of Food Import Surges: <u>The Case of Rice in Ghana</u>, 1st September 2005, p. 3

⁷⁷ Interview with Mr. Emmanuel Odame, Research Extension Committee, MoFA on 12th March, 2009.

⁷⁸ Interview with Michael Owusu, Seed Officer, Directorate of Crop Services



Figure 6: Seed Production for the selected cereal crops in tones in Ghana

Note: For Ghana, just like in Kenya and Malawi, seed production has remained constant with slight increases or decline. In Ghana, there was a sudden increase in maize seed production, then followed by a decline.

The purpose of the GGDP was to develop and diffuse improved technology for maize and grain legumes. The Crops Research Institute (CRI) and the International Maize and Wheat Improvement Center (CIMMYT) served as the project's primary executing bodies, while three other organizations provided ancillary support.

Prior to the inception of the GGDP in 1979, plant breeders working at CRI had developed and released several modern varieties (MVs) of maize. Under the GGDP, the Ghanaian national maize breeding program was reorganized, and the links between CRI and CIMMYT were greatly strengthened. Each year, CIMMYT maize breeders distribute hundreds of experimental varieties, hybrids, and inbred lines to collaborators in dozens of countries throughout the world. The collaborators grow out the experimental materials under carefully controlled conditions and report performance data back to CIMMYT. On application of the concept of innovation platform, CIMMYT is trying to release drought tolerant maize varieties in Malawi, through the innovation platforms. According to an interview with Dr. Adewale Adekunle, this approach is not viable because it is like 'putting the cart before the horse'. From his viewpoint, it is best to start at the market end of the system by conducting market survey and an engagement of all partners, to assess the acceptability of the variety. This should be followed by engaging all the partners in an all-inclusive process⁷⁹.

The Table 6 shows the various institutions, players and stakeholders involved in the cereal seed system processes from research and breeding to production and distribution.

Source: FAOSTAT, 2009

⁷⁹ Interview with Dr. Adewale Adekunle on 10th March, 2009.

Table 6: Players and Actors in the Seed Sector in Ghana

	Public Players	Private Actors	NGO's	International	
	-			Players	
1	Council for Scientific and	Seed Producers	World Vision	International	
	Industrial Research (CSIR)	Association of		Maize and	
		Ghana (SEEPAG		Wheat	
				Improvement	
				Centre	
				(CIMMYT).	
2	Ministry of Food and	Farmers Services	Action Aid	International	
	Agriculture of Ghana	Company	International	Food Policy	
		(FASCOM)		and Research	
				Institute	
				(IFPRI)	
3	Crops Research Institute of	-	Canadian	-	
	Ghana		International		
			Development		
			Agency (CIDA)		
4	-	-	Japanese	-	
			International		
			Development		
			Agency (JICA)		
5	-	-	Care International	-	
			Ghana		

Source: Author's compilation

Stads and Gogo in their Policy brief on Science and Technology Indicators on Ghana reviewed the major investment and institutional trends in Ghanaian public agricultural research since the early 1970s up to 2003. They observed that Agriculture plays a pivotal role in Ghana's economy, and, by association, agricultural research and development (R&D) is extremely important. However, according to an interview with Dr. George Owusu, Director, STEPRI, there is little political appreciation of the role of STI in development⁸⁰. As at 2001 there were 29 agencies involved in agricultural research in Ghana⁸¹. However those which are involved in cereal seeds research are much fewer.⁸²

b) Agricultural Research and Development in Ghana

The establishment of the Government Botanical Gardens at Aburi in 1890 marked the beginning of agricultural research in Ghana.⁸³ The research focused primarily on oil palm, cocoa, and rubber. The Department of Agriculture established various agricultural experiment stations throughout the country between 1900 and 1910. Thereafter several regional research organizations were established throughout British West Africa in the late 1940s and early 1950s.

⁸⁰ Interview with Dr. George Owusu, Director, STEPRI

⁸¹ From the interview with Dr. A.B. Salifu, Director General, CSIR on 9th March 2009, the key insight coming out especially on rice innovation is that STI needs to go beyond technology delivery of public goods and move towards delivery of private goods, an idea which resonates well with public and private partnership (PPPs) and putting into consideration the needs of private sector in product development.

⁸² Stads GJ & Gogo JO: Agriculture Science and Technology Indicators. ASTI Country brief of Ghana No. 13 of March 2004, p. 1

⁸³ Stads GJ & Gogo JO: Agriculture Science and Technology Indicators. ASTI Country brief of Ghana No. 13 of March 2004, p. 1

In 1968, the Ghana Academy of Sciences, established a few years prior, was restructured as the Ghana Academy of Arts and Sciences, and the Council for Scientific and Industrial Research (CSIR). At that time, CSIR assumed responsibility for the coordination of all scientific research in Ghana. It exists to this day, overseeing 13 research agencies, 9 of which with varying agricultural focuses.⁸⁴

At the time of independence the agricultural research system, in contrast to many other parts of Africa, had been relatively well developed. Between the mid-1960s and the end of the 1970s the number of researchers rose from 90 to 200 with 60 percent of the public research expenditure being allocated to cocoa⁸⁵. Declining revenues and inflation saw government cut costs leading to the abandonment of remote field stations and a near halt to capital development projects. With public sector salaries hardly sufficient to meet subsistence needs many scientists and senior administrators left Ghana.

While government support to agricultural research on Maize after 1984 remained flat, donor support increased. Incentives for scientists improved but attracting and retaining scientists apparently remained a problem.⁸⁶ The impact of agricultural research on increased food production is difficult to assess, but improved research capacity does appear to have, in the 1990s, helped improve yields for key staple crops in the country.

Agricultural research in Ghana is largely funded by the national government, though loans from the World Bank and aid from other donors represent important contributions to research. The World Bank has provided loans to agricultural research in Ghana under two consecutive projects, National Agricultural Research Program (NARP) and Agricultural Services Sub-Sector Improvement Program (AgSSIP), which are also funded by the government and other international donors⁸⁷.

The main objectives of NARP were to enhance collaboration among the various participants in agricultural research, who had previously only worked independently of each other, and to rehabilitate the research infrastructure that had gradually deteriorated from 1970 to 1990 because of persistent under-funding and exodus of large numbers of well-trained and experienced scientists.

The agricultural research component had four main objectives which include enhancing agricultural productivity and reducing poverty through the release of new technologies, promoting intensification of farming systems, increasing demand-driven research by involving farmers and other key stakeholders in the governance and financing of agricultural R&D, and improving the cost-effectiveness of research⁸⁸. Taking an example of the demand-

⁸⁴ Ibid note 27

⁸⁵ In a recent interview with key respondents (Dr. George Owusu, Dr. Godfrey Frempong and Dr. Nelson Obirih Opareh) from STEPRI, Ghana, it was revealed that farmers rejected high yielding cocoa seed varieties because they were not involved in their development, an indication of there being a gap between farmers and scientists. It was also interesting to note that the concern of cocoa farmers is not just the focus on issue of optimizing yields by adopting high yielding varieties, but using varieties that take into consideration their preferred cropping calendar and farming systems.

⁸⁶ Ghanaian Chronicle, 7 March 2003, More Scientists Join Brain Drain - CRI Boss, Accra, Ghana.

⁸⁷ International organizations play a pivotal role of funding research component of research institutes. These organizations include IDRC, DANIDA, DFID, USAID and UN agencies.

⁸⁸ Dr. Kwame Ameza – Acting Director, Directorate of agricultural extension services, MoFA, argues that the major challenge facing the seed industry in Ghana is lack of synergy between seed producers and farmers. For

driven research component, Dr. George Owusu, the Director, STEPRI, noted that, although the role of extension service is to mediate between scientists and farmers, the two seem not to be linked to each other to the level of fostering agricultural development. For such development to be realized, he states that it requires good communication, partnerships in seed production, release, certification, multiplication, distribution and use⁸⁹.

Like counterparts across much of Africa, agricultural R&D agencies in Ghana remained highly dependent on government and donor funding, with the World Bank's NARP and AgSSIP initiatives contributing greatly to the rehabilitation of Ghana's weakened agricultural research infrastructure. Most notable is the shift toward commercialization of agricultural research, heralded by the 1996 CSIR Act requiring that, by 2001, 30 percent of the agricultural research budgets of CSIR agencies be generated from private sources.

Seed producers in the Greater Accra and Eastern regions have been debating and looking for ways in which the Ministry of Food and Agriculture (MOFA) would contribute towards solving the chronic constraints facing seed production, considering that it is one of the most important factors for sustainable food production in the country.

Among the challenges facing Ghana is the inadequate number of inspectors, which is identified as critical in weeding out counterfeit seeds in the sector. The government is however taking steps to increase the number of seed inspectors and to train them. The Ministry of Agriculture is encouraging fertilizer companies in the country to consider marketing certified seeds alongside their traditional products since the two must go hand in hand to achieve the required results. The district assemblies are also being encouraged to sell seeds directly to farmers as part of the poverty alleviation scheme.

The solution to these challenges calls for a union of the research component and the local systems for better and efficient seed systems and agricultural development. Dr. Adewale Akunle, in a recent interview, views research systems as not working because of there being two parallel research systems --that of the researchers and the other of non-researchers. The disconnection of the two systems leads to technologies not being adopted or research not being put into use. As a solution, he says there is need to reward research and encourage innovation through partnerships, regulations and incentives⁹⁰.

2.3 Overall Research and Development in the FAC Focal Countries

The opportunities for private agricultural research depend greatly on the characteristics of the technology. Private research will only be attracted to technology that allows research and development (R&D) firms to appropriate some of the benefits. Private research investment is also more likely where particular products or techniques can be utilised over a range of environments and where future demand for the technology will ensure increasing market size.

There are several possibilities for encouraging more private investment in agricultural research in Sub-Saharan Africa. One way is through national policies that promote private

⁸⁹ Interviews with Dr. George Owusu, the Director of STEPRI, Dr. Godfrey Frempong and Dr. Nelson Obirih Opareh both of STEPRI on 9th March, 2009.

instance, while seed traders/producers want to sell their seed, farmers on the other hand use available seed irrespective of the source. In addition, farmers put little efforts in searching for the best seed varieties.

⁹⁰ Interview with Dr. Adewale Adekunle on 10th March, 2009.

agribusiness, such as regulations on seed imports and variety release, intellectual property regimes, and tax incentives for research and development. In some cases, privatization of the public research services may be of help particularly when the research programme involves few public goods. It is stated that the policies that promote private sector investment must identify specific responsibilities for the public research service, not simply treat it with benign neglect. Public agricultural research will continue to take the lead in areas such as pre-breeding, germplasm conservation, and crop and resource management research.

A second area in which public plant breeding systems must increase their interactions with the private sector is in sharing biotechnology techniques and materials, most of which have been privately developed and patented. Here, the intellectual property rights come into play to protect the rights of plant breeders of new and improved high quality varieties.

Many seed policies and accompanying legal and regulatory frameworks are exclusively targeting formal seed supply, ignoring the informal seed system, even though the latter is the most dominant system in sub-Saharan African countries. Even though their main objective is to contribute to seed and food security, seed policies are often considered a constraint, particularly in targeting the support of informal seed supply. Barriers raised by policy and regulatory frameworks can be counteracted by alternative strategies directed at supporting informal seed supply.

Clearly, whether an improved crop variety reaches farmers through a private or public system depends on the crop (and its commercial potential) and the country or geography in question. Although public extension has suffered from relative ineffectiveness and diminished investment in the past, it remains important as a means of distributing many of the key crops on behalf of smallholder farmers.

2.4 Linkages and collaboration

The Initiative of setting a uniform seed system and policy framework in the sub-Saharan countries would work if there is networking with other partners involved with the seed sector. The networking and collaboration will allow countries and programs to share experiences across African sub-regions and with other regions of the world while also avoiding duplication of effort and will foster a regionally-coordinated and country-driven process of policy reform, institutional strengthening, and innovation.

These linkages are crucial to encourage cooperative action among ongoing and new seedrelated projects and programs in Africa. Looking across all African countries, there are hundreds of donor, government, and NGO initiatives dealing with aspects of the seed industry from breeding through seed distribution. Many of these initiatives already support company entry and development of pluralistic, competitive seed markets. Others may easily be adjusted to do so.

Opportunities for linkages can be found in many projects and organizations. For example, NGO projects that distribute free seed after droughts could be redesigned to distribute vouchers, which farmers could use to buy seeds of their choice from competing seed companies and, to ensure competitive markets and reasonable prices, governments could allow seed companies from regional countries to enter and compete. Whereas distribution of free seeds undermines commercial seed markets, distribution of vouchers can support seed

market development. Other innovative approaches may appear over time, as more donors and governments begin to promote regional competitive seed industries.

Although the Sub-Saharan African Seed Initiative started less than one year ago, already several projects are in various stages of discussion and development. Improving the interaction between farmers' seed systems and the formal seed sector should be based on complementarity and a recognition of farmers as seed-sector participants, i.e., as clients and as seed producers. Better integration of the systems will contribute to the resilience of the entire seed sector.

2.5. Reflections on the systems across FAC countries

It is recommended that institutional capacity building initiatives be sought to offer training to the players and actors in the seed industry with regional centres in the sub-Saharan countries. The Institute will also provide training for seed stockists, seed producers, breeders, farmers, traders and agro-dealers. Many seeds producers, breeders and stockists do not have sufficient training or information to handle sophisticated seed products. Farmers and farmer groups need more training in agro-enterprise development.

NGO activities and other efforts that facilitate variety testing and seed multiplication at the local level should be encouraged, but rather than having each project or NGO attempt to obtain source seed from the NARIs for seed multiplication, these projects should be encouraged to purchase commercial seed that they can then distribute to their participants or use in local seed multiplication efforts. In the projects with aspirations for developing local enterprises, the best way forward is to explore possibilities for the NGOs to be involved in training farmers as contract growers.

There are significant opportunities for better integration of the formal seed systems (and expertise) with the seed/grain market channels. The linkage between farmer groups, farmers, agro dealers and government regulatory agencies with effective coordination will ensure that the seed systems are developed in accordance to the existing policies and law. This will facilitate access of new seed/grain varieties to the markets, provide training in seed production (with an emphasis on higher, but affordable seed quality), and providing business development services to the emerging, smaller-scale enterprises.

Research on improvement of the farmer-produced seeds for multiplication and reproduction is needed. These seeds may be local varieties or they may be improved ones. Direct links needs to be fostered between variety innovators and those who can multiply and distribute seed at a decent price. This links need to be established with small-scale seed enterprises. In addition, there is a need for the provision of business development services to emerging smaller-scale seed enterprises considering that seed systems are geared towards commercialization.

It is also recommended that a reward system be put in place to compensate the researchers who take their time to develop and breed new varieties of cereal seeds. A number of researchers and organizations have developed research materials and new varieties that can be used in various regions. This calls for public support for public goods research in seed breeding, production and variety development. In conclusion, it appears that efforts aimed at variety testing and seed multiplication are limited especially at the farmer or local level. In essence, an important factor missing in the current effort to achieve the balance between formal and informal seed systems is the participation of farmers and attention to consumer education and consumer protection. Traders and farmers' groups need continuing support to enable them to play a greater role in delivering higher quality yet affordable seed to farmers via local channels. In addition, most countries in SSA still exhibit linear type of seed development systems, therefore limiting improvement of farmer-based produced seed varieties. Needless to say that the current regional seed policy harmonization efforts still are thought to favour large multinational companies and other actors in the formal seed systems only, and not the small-scale seed production enterprises. Therefore, the way forward is thought to be the decentralization efforts especially of farmer-based seed production and marketing.

References

- Alemu D and Spielman D.J: <u>Ethiopian Seed Systems; Regulations, Institutions and Stakeholders</u>, ESSP Policy Conference Brief No. 11, June 2006
- Alemu Et al (2008): <u>The maize seed system in Ethiopia: challenges and opportunities in</u> <u>drought prone areas</u>, African Journal of Agricultural Research Vol. 3 (4), pp. 305, April, 2008
- Almekinders, C. and N. Louwaars (1999): <u>Farmers' seed production: New approaches and practices.</u> London: Intermediate Technology Publications, Ltd.
- Banziger M, Diallo AO (2002). <u>Progress in developing drought and N stress tolerant maize</u> <u>cultivars for Eastern and Southern Africa</u>. Paper presented at the Seventh Eastern and Southern Africa Regional Maize Conference, 5-11 February 2002, Nairobi, Kenya
- Bett C., L. Muhammad, W. Mwangi, and K. Njoroge. (1999). The seed industry in semi-arid eastern Kenya. In CIMMYT and EARO. Maize Production Technology for the Future: Challenges and opportunities: Proceedings of the sixth Eastern and Southern Africa Regional Maize Conference, 21-25 September, 1998, Addis Ababa, Ethiopia. Mexico, D.F. and CIMMYT and EARO (Ethiopian Agricultural Research Organization).
- Byerlee D, Spielman D.J, Alemu D, Gautam M (2007). Policies to Promote Cereal Intensification in Ethiopia: A Review of Evidence and Experience. International Food Policy Research Institute (IFPRI) discussion paper no. 707. Washington, D.C.: IFPRI.
- Chirwa, R. and V. Aggarwal (2000). <u>Bean seed dissemination systems in Malawi: A strategy.</u> Journal of Sustainable Agriculture, Vol. 15 (4): 5-24.
- Dawit A, Deressa A, Dessalegne L, Anchala C (2004). <u>Domestic vegetable seed production</u> <u>and marketing</u>. Research Report No. 57. Ethiopian Agricultural Research Organization.
- Gough, Amy E., Christina H. Gladwin, and Peter E. Hildebrand. <u>"Vouchers Versus Grants of Inputs: Evidence From Malawi's Starter Pack Program.</u>" African Studies Quarterly 6, no.1: [online] URL: <u>http://web.africa.ufl.edu/asq/v6/v6i1a8.htm</u>
- Kimenye, L.N. (1999). Commercial provision of non-hybrid seed in Kenya. In Proceedings of Workshop on Linking Seed Producers and Consumers: Diagnosing Constraints in Institutional Performance. Pp. 6-37. June 15, 1999, NDFRC, Katumani, Machakos Kenya. ICRISAT, Bulawayo, Zimbabwe.
- Louwaars, N. (1994) <u>Seed supply systems in the tropics: International course on seed</u> <u>production and seed technology.</u> Wageningen, The Netherlands: International Agriculture Centre.
- M.A.R. Phiri, R. Chirwa, S. Kandoole and R. Tripp, (2000). <u>Introducing New Bean Varieties</u> <u>with Small Seed Packs: Experience from Malawi. Network on Bean Research in Africa,</u> Occasional Publications Series, No. 32, CIAT, Kampala, Uganda.

- Maredia M., J. Howard, D. Boughton, A. Naseen, M. Wanzala and K. Kajisa. (1999). Increasing Seed System Efficiency in Africa: Concepts, strategies and issues. Michigan State University International Development Working Paper. Department of Agricultural Economics- MSU East Lansing Michigan, pp 12-13.
- Melinda Smale and Jayne T.S. <u>Building on Successes in African Agriculture, Maize Breeding</u> in East and Southern Africa, 1900–2000; International Food Policy Research Institute.
- Miltone Ayieko and David Tschirley: 18 May (2006) <u>Improved Access and Utilization of</u> <u>Improved Seed for Food Security in Kenya.</u>
- Ochuodho, J.O., D.O. Sigunga, and W.A. Songa. (1999). Seed regulation and seed provision options with particular reference to food cereal and legume grains in Kenya. In Proceedings of the Workshop on Linking Seed Producers and Consumers: Diagnosing Constraints in Institutional Performance. Pp. 63-73. 15 June 1999. NDFRC, Katumani, Machakos Kenya. ICRISAT, Bulawayo, Zimbabwe.

Seeds and Plant Varieties Act, Chapter 326, Laws of Kenya.

- Shawn McGuire: (July 2001) <u>Analyzing Farmers' Seed Systems: Some Conceptual</u> <u>Components Technology and Agrarian Development</u>, Wageningen University.
- Simane B: (2008) Seed policies and regulations and informal seed supply in Ethiopia
- Sperling, L., Remington, T., Haugen, J.M., and Nagoda, S., eds. (2004), <u>Addressing seed</u> security in disaster response: linking relief with develop
- Thijssen, M.H., Z. Bishaw, A. Beshir and W.S. de Boef, (2008 Eds). Farmers, seeds and varieties: supporting informal seed supply in Ethiopia. Wageningen, Wageningen International. p. 307
- Tripp R. B. (1997). <u>Between states and markets Innovations for small-scale seed provision.</u> In D.D. Rohrbach, Z. Bishaw, and A.J.G. van Gastel (eds.). Proceedings of the International Conference on Options for Strengthening National and Regional Seed Systems in Africa and West Asia. ICRISAT, Patancheru , India. Pp195-210.
- Tripp R. B. (1997). Between states and markets <u>Innovations for small-scale seed provision</u>. In D.D. Rohrbach, Z. Bishaw, and A.J.G. van Gastel (eds.). Proceedings of the International Conference on Options for Strengthening National and Regional Seed Systems in Africa and West Asia. ICRISAT, Patancheru , India. Pp195-210.
- Wekundah J et al: <u>An Assessment of the activities being implemented in Agricultural</u> <u>Biotechnology</u>; Biotechnology Trust Africa, 1993/94

SECTION 3: PASTORAL INNOVATION SYSTEMS

3.1 Introduction

This section draws from the literature on the livestock innovation system with a specific focus on pastoralism and provides a review of the interaction between pastoralism and livestock innovation system using the innovation concept, as part of the continuation of the pastoral policy debates, existing capacities and gaps in pastoral systems. The emphasis on innovation systems thinking is an indication of the possible divergent perspectives on pastoral systems by different actors and therefore becomes an important concept in an attempt to narrow the gap between pastoralists and other stakeholders in the livestock sector.

The section analyses some of the key emerging issues in the pastoral systems, which relate to constraints in areas of equitable access to natural resources against sedentaration policies, regional trade and market integration, pastoralist mobility and conflict resolution, pastoral technology development and access, pastoral indigenous knowledge, transboundary animal health and sanitary standards for local and international trade, inter-linkages or interactions among various key actors, pastoralists' roles and enabling institutional and policy environment.

The section concludes by highlighting the concerns on long term pastoral development agenda which, need to be anchored into the national economic and development strategies. In particular it raises the question of how best the pastoralists could be recognised as the major livestock producers and how well they can be linked to the envisaged pastoral innovation map.

3.2. Background

Different definitions of pastoralism exist, all viewed from diverse perspectives of either the production system or pattern of movement. Several characteristics are used to describe pastoralism in East African region. Many authors use features such as the dependence on livestock for their livelihood, grazing on natural pastures, and adaptation to changes in both ecological and social environment⁹¹ (Ghaffar et al.). Morton and Meadows (2000), defines pastoral communities from the value of marketed and subsistence production---- "as those in which 50% of the combined total value of marketed and subsistence production consumed within the household comes from livestock or livestock-related activities". The above description therefore is also in agreement with Hatfield and Davies (2006) who summarize pastoral systems as livestock production, consumption and natural resource management systems.

Pastoralists are mostly found in Africa's arid and semi-arid land (ASAL) and the system is characterized by a high degree of mobility in search of water and grazing land. The movement pattern brings in other aspects of defining pastoralism as either nomadic or sedentary. The nomads constantly move from place to place in groups in such of pasture and water, while the sedentary pastoralists have fixed/permanent settlements but often move to search for pasture

⁹¹ It is of importance to realize that although these characteristics are more generalized by many authors, this may not be the case in every pastoral system, but may only be applicable to some pastoralists.

and water⁹². There are variations in relation to the moving population, such that in some cases all clan members move in groups and in other instances only a section of the clan, particularly younger men and energetic women move with livestock while the older and weak women and men remain in the settlements⁹³. Pastoral systems can also be defined by the most preferred animal species. For example, cattle are the dominant species in the East Africa region and camels in both North and Eastern Africa⁹⁴.

While climate variability and change, particularly droughts, strongly affect both pastoralists and crop farmers, the impacts are believed to be higher on the pastoralists because of the double effects both to themselves and to their animals. In addition, given that they constitute the majority of the population in the ASAL where there is a greater probability (from history) of drought occurrences, in the event of a climatic anomaly or other disasters such as disease outbreaks, pastoralists are often very vulnerable and the hardest hit.

Given the different constraints that pastoralists in East Africa go through, they are often considered to be among the most economically and socially disadvantaged in their respective country economies. This is often viewed from their kind of subsistence livelihood and their limited access to the government services, isolation from major consumer markets and other development opportunities.

Despite all these challenges, generations of pastoralist producers have demonstrated that livestock production is probably the most viable economic activity for these territories because of pastoralist ability to adapt to and exploit an unpredictable environment⁹⁵. More direct evidence to support these sentiments was provided by Dr. Agol Malak Kwai, from the South Sudan study who concluded on the basis of South African example that pastoralism is a more effective economic activity especially when the environmental constraints are dealt with, say through use of feedlots⁹⁶.

Pastoral systems world over therefore represent an important segment of the livestock sector system from which many people, both from the pastoral and non-pastoral areas, derive their livelihoods. This is especially true for the Horn of African region where the pastoral livestock population is significant (Ghaffar et al., Omiti and Irungu, 2002)⁹⁷.

The focus on a policy framework therefore arises from the need for a mechanism to effectively address, in a more holistic manner, the many challenges confronting pastoral communities.

⁹² The movement is not only determined by water and pasture availability but by other factors such as disease out breaks, banditry and conflicts.

⁹³ This was very interesting policy-wise especially in South Sudan where only the young and energetic people and strong livestock are moved, while the old, some widows and the weak animals do not move hence suffer from food insecurity. In fact, many respondents during our key informant interviews were of the view that there was no effort to link the two groups and also drought response initiatives do not focus on the most vulnerable. ⁹⁴ See http://anthro.palomar.edu/subsistence/sub_3.htm, for the various preferred species in different regions of

the world. ⁹⁵ http://ochaonline.un.org/OchaLinkClick.aspx?link=ocha&docId=1087359

⁹⁶ Interview with Dr. <u>Agol Malak Kwai</u>, <u>Director General Veterinary Services</u>, <u>Ministry of Animal Resources</u>

and Fisheries – Government of Southern Sudan, in April, 2008.

⁹⁷ From the total population, the pastoralists account for about 60% in Somalia, 33% in Eritrea, 25% in Djibouti, 20% in Sudan, 12% in Ethiopia and 30% in Kenya.

3.3 Different perceptions of Pastoral innovation system

From the above description, it is evident that the pastoral innovation system is critical in the process of formulation of national pastoral policies and is an important input for strategy development in pastoral areas. However, its implementation poses complex challenges especially when multi-stakeholder interaction and linkages are intended. Various indications of livestock innovation systems have been in existence over the years, but their effectiveness in knowledge acquisition, generation, diffusion, application and moreso in bringing about policy change has not been fully realized.

The challenges facing pastoral areas in Africa are several and diverse. Poverty, environmental degradation, exposure to climatic risks, diseases, conflicts and civil strife, lack of access to information, lack of skills afforded by formal education and lack of participation by pastoral communities in the decision-making processes that profoundly affect their lives are important challenges⁹⁸. In addition, inadequate governance networks, biased development and trade policies, ineffective institutional settings, uneven market relationships and increased pressure on fragile environments add to their challenges and compound the picture further worsening the socio-economic status of pastoral systems⁹⁹. At this point in time, it is important to note that the poverty perception/economic disadvantage of pastoralism by majority of actors are often based on ownership of other assets (permanent assets/structures) but not on the cattle which is their source of livelihood¹⁰⁰. Little do they realize that it is because of their traditional way of life requiring seasonal movements.

Pastoralism like any social or economic formations is dynamic in organizations. Interventions to address the challenges are equally diverse but do not appear to be succeeding. This is attributed to the interventions being general (not specific to pastoralists) and with a national focus, thus the very reasons why they fail. In Kenya, for example, the Ministry of Northern Kenya and other Arid Lands Development¹⁰¹, a new Ministry recently formed to take care of ASAL areas, has held consultation workshops in the districts to identify the priorities of each individual districts --for incorporation into ministerial national plan¹⁰². This Ministry has been mandated to deal with issues that affect Northern Kenya and its environs such as chronic poverty, drought and starvations, lack of basic infrastructure, marginalization, etc, and help to develop the people from the region. Its mandate includes the development of infrastructure, the planning of settlements, strengthening livestock marketing and livestock related industries, water supply and irrigation, natural resource management, mineral resources exploration, opening up the ASAL regions for tourism and human resources development¹⁰³.

The Ministry using a holistic approach is supposed to bring together multiple actors and through several target groups gather views so that the major stakeholders can set their development priorities.

⁹⁸ See FAO, 2001: Drought Related livestock interventions, FAO Report.

⁹⁹ See Hesse and Odhiambo, 2006 on the Kenyan pastoral stereotype and their perception as a problem

¹⁰⁰ In our view, some pastoralists have more wealth than the other presumed populations in some regions who are described as economically stable only on basis of their permanent assets.

¹⁰¹ This is a new ministry formed in April 2008.

¹⁰² See http://www.farmafrica.org.UK/programmes .cfm

¹⁰³ See www.communication.go.ke/news.asp?id=125

Although the Ministry was formed by the Kenyan government to address the development problems of the marginalized populations as indicated above, there are still unanswered questions that have been raised by the region residents. For example, just like the Kenya Meat Commission (KMC) location, the residents are not in agreement with the rationale for location of the Ministry's headquarters in the capital city (Nairobi) when its formation was specifically targeting drylands of Kenya. Even worse, some members of parliament especially those from the region have also protested on the amount of the Ministry's budgetary allocation in comparison to other Ministries, given the kind of development gaps in those regions¹⁰⁴. This gives an indication that there are still administrative and even worse the legal issues that can affect its functioning or the development and the implementation of its strategies¹⁰⁵.

In West Africa, topical pastoral issues have been tenure security, equity, decentralization and regional integration but the only striking question has been whether the process of dealing with these issues would receive both political support and support from regional organizations such as ECOWAS which are believed to have the clout and able to make policy changes¹⁰⁶.

As a matter of fact therefore, many governments consider pastoralists as occupying large areas of land of low economic potential and practice a livelihood system that is considered to be economically inefficient and environmentally destructive, thus making pastoralists and their interests not to be very high on national policy agenda.

Pastoral systems and livestock systems are two related sectors that are often treated separately by majority of the stakeholders. In more general terms there is always confusion between livestock development and pastoral development in policy discourses. Even though pastoral development and livestock development may be used together or interchangeably, the reality is that little emphasis is always put on pastoral systems. This is mainly attributed to the institutional and policy settings as described by Omiti and Irungu (2002) --in their analysis of the interaction between institutional and policy issues relevant to pastoral development in Kenya versus the physical environment. From these authors' point of view, the formal institutions are always represented by the central government and local authorities with accompanying laws and regulations while the informal institutions are represented by traditional pastoral associations as depicted by pastoralists' values, beliefs, culture, norms and indigenous knowledge.

Musimba and Nyariki (2003) define pastoral development as a social activity aiming at the improvement of the standard of living of pastoralists through the provision of healthcare, education, veterinary care, water and other services together with building institutions for managing range systems. The authors further argue that emphasis has always been given to technical attributes of livestock development mainly done by the formal institutions, implying that the focus has been on production and health¹⁰⁷. This has resulted in many policies focusing on production concerns rather than systems concerns as argued out by Hatfield and Davies (2006).

¹⁰⁴ The Ministry's budgetary allocation for 2008 was 2.4 billion.

¹⁰⁵ See also www.pambazuka.org/en/category/comments/51377

¹⁰⁶ See http://www.reconcile-ea.org

¹⁰⁷ N.K.R. Musimba and D.M. Nyariki, 2003-Development of and Policy on the Range and Pastoral Industry with Special Reference to Kenya.

A good example has been through the recent changes in the land tenure system especially in the pastoral systems in East Africa. Taking an example of Kenya, land systems have adversely affected pastoral systems especially through the creation of livestock ranches, grazing blocks, national parks and game reserves and wheat farms. This has reduced the area available for grazing in addition to blocking migration routes used during the dry seasons. The land sub-division has promoted the sedentarization of pastoralism. In Ethiopia, the case has been exemplified by the government-led transition from traditional land use arrangements where land use and other natural resource use was determined by the clan members/leaders, based on their clan or intra-clan customary principles to the commercial farming systems especially in Afar region 108. This individual tenure and commercial systems in some areas has been taken with little consideration of the pastoral systems 109.

Through the lowering of productivity and resilience, the rangelands are no longer able to offer adequate support for the pastoralists. As a consequence, the pastoralists have been forced to look for other forms of livelihood, mainly non-pastoral income earning activities such as farming, wage employment, rural to urban migration and relief-dependency. In addition, population growth in the high potential areas has led to an exit of cultivators into the adjacent drylands previously used for grazing. This has restricted the movement of pastoralists and in the end pastoralists have been forced to adapt to different ways of life and survival strategies.

3.4 Actors and their roles in Pastoral Innovation Systems in Kenya and Ethiopia

The pastoral systems comprises of a network of various institutions, government departments and agencies, NGOs, learning and research institutes, policy makers and pastoralists who interlink and try to achieve sustainable development of livelihood-based pastoral systems along the entire value chain from production to consumption (see Table 7).

Representing the Kenyan government agencies is the Arid Lands Resource Management Project (ALRMP) and associated units in the Office of the President which is responsible for relief and rehabilitation, conflict and drought management in arid and semi-arid lands. The Ministry of Livestock Development on the other hand is responsible for overall livestock issues especially production and health through provision of services such as seasonal or during disease outbreak vaccinations and treatment of animals.

¹⁰⁸ Bekele Hundie and Martina Padmanabhan: 2008

¹⁰⁹ Land tenure change from communal use to individualization in Kenya has led to restriction of nomadic pastoralism and subsequently limitations in mobility, which has been vital for the survival of the pastoralists and their herds. This has had an effect on the well-being of the pastoralists.

Table 7:	Kev	stakeholders	in F	Pastoral	Innovation	Systems	in	Kenva	and	Ethiop	ia
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	KENYA	ETHIOPIA	REMARKS
1. Government	Ministry of Livestock	Ministry of Agriculture and	
and other	Development	Rural Development (MoARD).	Policy incoherencies
Public Players	Arid Lands Resource	Ministry of Federal Affairs	exist among these
	Management Project	Parliamentarian Pastoral Affairs	ministries and most of
	(ALRMP), in the Office of the	Standing Committee	them work in isolation.
	President	Ministry of Water Resources and	
	Ministry for the Development	Ministry of Trade.	
	of Northern Kenya and other	Ethiopian Live Animals	
	Arid Lands	Exporters Association	
2. Private	Oxfam GB, FARM-Africa,	Oxfam GB, CARE Ethiopia,	Oxfam GB also works
Actors and	VSF Germany, VSF Belgium	Institute of Biodiversity	in pastoral areas of both
NGOs	and VSF Suisse, Kenya	Conservation,	West Africa (Burkina
	Livestock Marketing Council,	SOS Sahel Ethiopia, Livestock	Faso, Niger, and Mali)
	Pastoral Forums in Kenya,	Meat Marketing Project, FARM-	and the Horn/East
	Reconcile	Africa, SOS Sahel UK	Africa.
	Centre for Ministry Rights	GTZ, Save the Children US	
	Development (CEMIRIDE)	(Ethiopia), CARE International	
		and Mercy Corps, Pastoral	
		Forums in Ethiopia, Pastoralist	
		Communications Initiative	
		SNV, SCF, SREA/PANOS	
3. Research	International Livestock	Tufts/FIC, Ethiopian Institute of	
organizations	Research Institute-ILRI,	Agricultural Research, National	
	Kenya Agricultural Research	Veterinary Institute	
	Institute- KARI		
4. Donors	World Bank, EU, DFID	USAID, DFID	
5. UN and	FAO Livestock Policy	FAO Livestock Policy Initiative,	
Bilateral	Initiative, UNDP Dryland	UN OCHA	
agencies	Centre in Nairobi,		
	UN OCHA		
6. Regional	COMESA, Inter-	COMESA, IGAD, EAC, , DFID,	
organizations	governmental Agency for	International Institute for	
	Development, East Africa	Environment and Development	
	Community, World Initiative	(IIED)	
	for Sustainable Pastoralism	African Union Department for	
	(International Union for	Rural Economy and Agriculture	
	Conservation and Nature)		

Source: compiled by the authors from literature and field notes.

The newly formed Ministry of Northern Kenya and other Arid Lands Development during its inception work, recently organized consultation workshops in all districts from the arid and semi-arid regions. Being a new Ministry, this was aimed at collecting views from the residents and capture priorities of each pastoral district. Top on the priority list are sectors such as livestock health and marketing, water, poor infrastructures, education, human health, environment and insecurity all corresponding to most of the constraints in the pastoral system. These priorities are supposed to be incorporated into national plan of the Ministry in order to effectively outline its interventions.

In Ethiopia, however, the Ministry of Agriculture and Rural Development (MoARD) is aimed at promoting livestock production and trade. The Ministry of Federal Affairs (MoFA) at national and regional levels is responsible for the administration of pastoral development programmes. The mandate of the Ministry is to strengthen the regional governments which are perceived to be weak¹¹⁰. Although the MoFA role covers the promotion of good governance and pastoral development policies, its operations are centralized at the federal level thus limiting the understanding of pastoralism or dryland systems¹¹¹.

For the private sector that seem to be doing much of the pastoral development work, are trying to influence pro-pastoralist policies in individual countries or by regional approach. For instance, Oxfam is helping pastoralists to develop their own local or traditional organizations through which they can represent themselves and their values and in the end influence capable actors to become more responsive to their needs and concerns.

As part of the regional approach, Oxfam has initiated an innovative policy-oriented research project with the aim of identifying and promoting the necessary changes to reduce pastoral poverty as another step towards achieving the Millennium development goals (Swift, 2004). This project is designed to improve the quality and accessibility of information on pastoralism in four countries namely Ethiopia, Kenya, Tanzania, and Uganda.

Oxfam's role in this regional approach will be to facilitate the building of linkages and networks between various actors who need to use information on pastoralism thereby bridging the information flow and management gaps in addition to creating a policy-oriented information database¹¹².

In Ethiopia, FARM-Africa is working to reduce poverty and raise the living standards of pastoralists through improved management of their natural resources and advocating for policy change within government and international donors¹¹³. Still in Ethiopia, the SOS Sahel UK and IIED are working together to contribute to poverty reduction, conflict resolution and long-term sustainable economic development of dryland areas in Africa in the context of climate change. The organizations focus on safeguarding livestock mobility at local, national and regional levels in East (Ethiopia) and West Africa and in turn improve pastoral and agropastoral livelihoods¹¹⁴.

Using the participatory approach, VSF Germany has promoted the use of indigenous knowledge in resource use planning by the pastoralists from northern Kenya. This is in addition to the regional livestock emergency guidelines and standards that were developed to be used by all actors during livestock emergency intervention (LEGS, 2007).

Closely linked to the above VSF Germany roles is Practical Action through its Rural Agriculture and Pastoralism Programme (RAPP) in Eastern Africa. The programme is undertaken in both pastoral and agro-pastoral areas and is also concerned with local institutional development. The projects' major area of interest has been decentralization of animal health services, traditional veterinary knowledge as a complement to modern medicine and research and development in marginal areas. This has resulted in significant contributions to policy debates in animal health, indigenous knowledge in development, improvement of technological capabilities and biodiversity¹¹⁵. The future plans are geared towards integration of a minimum of three new technology strategies in any of the following

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¹¹⁰ See http://wikis.uit.tufts.edu/confluence/display.

¹¹¹ Berharnu Admassu, Yacob Aklilu- Towards Pro-Pastoralist Policies in Ethiopia.

¹¹² See also Amrik Heyer, 2006: Comparative study for the Report on the status of pastoralism project by Oxfam

¹¹³ See http://www.farmafrica.org.uk/programmes.cfm

¹¹⁴ www.sahel.org.uk/policy.html

¹¹⁵ See http:practicalaction.org/?id=region-east-africa-programmes

areas: agro-processing, disaster reduction, shelter, transport, energy, ecotourism, biodiversity, manufacturing and small enterprises.

Kenya Livestock Marketing Council (KLMC) uses their grassroots members and structures to provide a reliable and sustainable market information system to the pastoralists. The Northern Kenya Pastoralist Capacity Building Project, a FARM Africa programme also provides pastoralists with the necessary skills and opportunities to manage their resources and influence policy effectively. The skills include training on entrepreneurial skills and opportunities, implementation of community micro projects and basic animal health service provision ¹¹⁶.

Other initiatives are those initiated by the research institutes such as Tufts/IIED. Tufts and IIED are best known for the development of the Pastoralism and Policy Course. The course aims at addressing the perceptions and negative attitudes of most actors towards pastoralism and to strengthen the local organizations on advocacy for pro-pastoral policies¹¹⁷. This is an improvement on the existing Pastoralist Livelihood Initiative¹¹⁸.

The UN agencies are represented by FAO, UNDP, UNEP, and Office for the Coordination of Humanitarian Affairs (UN OCHA) among others. UN OCHA has already launched a process to promote preparedness and to mitigate the current and future vulnerability of pastoralists to climate change in the East and Central African region¹¹⁹. UNEP on the other hand is focusing on the support to the pastoralists during their adaptation to climate change-related constraints and capacity building.

For donors, the World Bank is active in the pastoral areas of Ethiopia and its undertaking baseline studies in many pastoral woredas/districts. DFID funds the Pastoral Communications Initiative (PCI), whose role is to better equip pastoralists to negotiate on their own behalf.

3.5 Pastoralist participation and Regional approaches to pastoralism

The involvement of livestock communities (read pastoralists) in policy making processes is relatively new in most East African countries. In Kenya for example, there is little evidence of direct pastoralist participation in pastoral related activities. Pastoralist participation, like any other rural people involvement tends to build confidence at the community level through participatory learning approach which is a two-way process where other actors learn from the pastoralists to understand their way of life and knowledge systems and vice versa.

Few initiatives support processes of pastoralist empowerment and participation, particularly in a pastoral context. Most participatory projects although are designed and used by external stakeholders to solicit greater local participation, they are not specifically developed to enable local people to analyze their own situation outside the context of the project. In many of the cases, little attention is paid to the dimensions of pastoral institutional development, but rather the management of rural service delivery programmes such as decentralized animal

 $^{^{116}} See \ http:www.farmafrica.org.uk/region.cfm?RegionID{=}4.$

¹¹⁷ See https://wikis.uit.tufts.edu/conference/display/FIC/Feinstein+international+center.

¹¹⁸ PLI project seeks to mitigate the impact of drought and other shocks by sustainably improving preparedness, livelihoods and incomes of pastoralists.

¹¹⁹ Pastoralist Voices, Bulletin February, 2009, Vol 1. Issue 13.

health systems. Less attention is given to helping pastoral groups themselves articulate the rationale of their livelihood.

Through these participatory approaches, some actors have tried to address various pastoral issues. VSF/Germany for example has facilitated pastoralists through their own indigenous technical knowledge to plan for the sustainable use of their resources and hence effectively address their problems--with the pastoralists themselves taking the lead role in disaster management¹²⁰. In this approach, the initial stages involved awareness creation through various forums and initiatives followed by resource plan development and then interventions. Such initiatives include the reciprocal grazing agreements among different communities.

The Arid Lands Resource Management Programme (ALRMP) established in 2003 has also worked closely with pastoral civil society organizations in an effort to create a national network for Kenvan pastoralists and their organizations. The Centre for Ministry Rights Development (CEMIRIDE) on the other hand, has advocated for inclusion of pastoralists and other minority groups issues into the new constitution. Through workshops, it has stressed the need for a sector wide approach to pastoral development¹²¹.

In regard to regional approaches to improvement of pastoralism, Regional Enhanced Livelihoods in Pastoral Areas (RELPA) has been in the forefront by playing a synergistic role in transforming the way populations in pastoral areas are supported and encouraged, through system-wide coordinated actions, involving many organizations, hence contributing to economic development in the region.

Enhanced Livelihoods in the Mandera Triangle (ELMT), a project under RELPA carries out activities on the ground in order to increase the self-reliance and resiliency of the targeted population through improved livelihoods in drought prone pastoral areas of the Mandera Triangle¹²².

The ELMT Consortium¹²³ together with around 30 partner organizations has significant experience and expertise in the Mandera Triangle¹²⁴. The key strategies of ELMT in the pastoral areas focus on building on their experience and that of other actors in the region, by improving their best practices and developing pathways that feed into the various policy initiatives in the Horn of Africa region. All this is aimed at improving pastoralist livelihoods through improved livestock production, health, marketing, natural resource management, institutional strengthening of traditional institutions and advocacy.

Oxfam GB, since 2003 has also been engaged in the process of implementation of its Horn/East Africa Regional Pastoral Programme (HEARPP) in East and North East Africa with programmes being implemented at the local, national and regional levels (Morton, 2006) ¹²⁵. The programmes address policy, coordination and organizational issues. The programmes' goal is to achieve improved integration of pastoralists into political, social and

¹²⁰ Participatory Resource Planning with Pastoralists (PRP): The VSF/G experience in Northern Kenya and Southern Ethiopia.

¹ http://www.reconcile-ea.org.

¹²² This mainly refers to the Kenya, Ethiopia and Somali borders.

¹²³ ELMT consortium comprises of CARE (from the three regional countries), Save the Children (SC/US and UK), Vétérinaires Sans Frontières Suisse (VSF-S)

 $^{^{124}}$ It is worthy noting that the majority of the actors in this project are NGOs and donors, with no direct mention of the government. ¹²⁵ The specific countries are Kenya, Tanzania, Uganda, Ethiopia, Sudan and Somaliland.

economic systems at national and regional levels, with emphasis on a coherent regional approach to pastoral development¹²⁶.

Other remarkable examples include that of Feinstein International Center (FIC). FIC has several pastoral system development initiatives in East African countries. The activities are related to pastoral research such as importance of traditional authority systems in the Karamoja family. Others are related to conflict and livelihood and policy and institutional initiatives, the latter being an improvement on the initial Tufts programs which links community level experiences to pastoral policy reforms and development, and often incorporates both national and regional policy actors¹²⁷.

The results have included the development of the AU policy framework for pastoralism (continent level), facilitation of the regional and pastoralist forums, capacity building support on review of scientific and policy options on pastoralism by the Ethiopian Ministry of Agriculture and Rural Development (MoARD) and the capacity building support through COMESA that led to the inclusion of pastoral issues into the framework for African food security (Under Comprehensive African Agricultural Development Programme, CAADP). The approach used in all cases will be that of multi-stakeholder and livelihood analysis approach.

The outputs will include review of the livestock marketing policies in some COMESA member states and improvement of cross-border and international trade. It is anticipated that the program will improve pastoralists' livelihoods in Africa through African institutions policy and institutional reforms and in the end achieve long term pastoral system development.

Specific example of successful pastoral initiatives is that of Ethiopia where there are some degree of direct pastoral involvement. This was initiated through the poverty reduction strategy paper process which allowed civil society organizations (CSOs) to participate in the formulation of national policies, especially those on development of pastoral systems. However, there is still limited influence of CSOs in policy formulation (Halderman 2004).

To improve on pastoralist participation and response to livestock emergencies in pastoral areas, initiatives were started, some of which linked livestock communities to policy makers. Remarkable among them was the Pastoralist communication initiative (PCI). The PCI works with the pastoralist to connect them amongst themselves and with the policy makers at the national and UN Levels¹²⁸. The PCI plays a mediating role by linking the two and hence enhances the relationship between the livestock communities and the policy makers.

¹²⁶ See also Jeremy Swift, 2004: Report on the state of pastoralism report (ROSP); Monitoring poverty trends in pastoral areas of East Africa and the Horn. ¹²⁷ https://wikis.uit.tufts.edu/conference/display/FIC/Feinstein+international+center

¹²⁸ The PCI project was funded by DFID and implemented by IDS Sussex. Other partners were UNICEF, IFAD, World Bank, MoFA, SC -UK and CARE.

Box 3: Pastoral Communication Initiative

PCI looks at new approaches to pastoralist development and relief issues by developing new knowledge and innovation and building linkages among the actors involved in pastoral issues.

The initiative uses several approaches which among other things creates forums for knowledge and information exchange, promotes research and training and pastoral linkages to sources of information and more so maintaining good relations among all the actors.

One of the defining features of PCI is the recognition of pastoralists and pastoral institutions as the ones to determine the direction of their development. Through this, the initiative supports activities which are acceptable by the pastoral communities.

Source: Authors compilation and PCI phase 2 Project Memorandum.

Success of the initiative was due to discussions that took place between pastoralist groups and the government at all levels but more so at local level. The initiative facilitates consultations which bring together actors involved in pastoral systems, enhances communication and linkages between pastoralists and their representatives¹²⁹. This helps to build trust of the pastoralists and to make the programs sustainable. The initiative is more focused on Ethiopia and therefore may not be better placed to deal with regional issues.

In summary, the PCI initiative has achieved much in terms of creating proper linkages between pastoralists and policy makers. This has been due to the close consultations and good communication among the stakeholders¹³⁰. The unique aspects of the initiative is that, unlike most NGOs which brought together stakeholders in urban cities, PCI ensured that policymakers and researchers came together and met in the pastoral communities, where they set and controlled the agenda and discussed issues of importance to them. The weakness of the initiative has been the inability to have an influence up to the regional level and also the difficulties in estimation of the costs and benefits of the initiative¹³¹.

3.6 Linkages in technological, organizational and institutional innovations

A large number of actors have been involved in developing and implementing adaptation strategies to reduce the vulnerability of pastoralist groups to the adverse impacts of the constraints they face. These actors include the pastoralists themselves, the governments some of which have enacted some policies and instituted relatively favourable measures, multi-lateral and bilateral aid agencies and NGOs.

Literature informs us that an innovation system represents the set of interrelated agents, their interactions and the institutions that condition their behaviour with respect to the process of generating, exchanging and utilizing knowledge (OECD, 1997).

Many authors are in agreement with the fact that there is need for strengthening linkages and interactions between key actors in any innovation system and during policy formulation. This approach in case of pastoral innovation processes is supposed to assist policy makers,

¹²⁹ For the first time in the long history of Ethiopia, through new initiatives and the political will of the current government, the rights of pastoralists are now formally protected by the Constitution and even pastoral issues have been debated in the Federal Parliament through the efforts of PASC and advocacy.

¹³⁰ Interview with Alistair Scott-Villier of PCI during our previous study.

¹³¹ <u>http://dfid</u> web.gov.UK/prismodcs/ARCHIVE/ETHIOPIA/A50014 PG. Doc- (PCI – Phase 2 Project Memorandum).

researchers, entrepreneurs, donors and other actors in identifying new initiatives of improving pastoralism as a system. This will further provide a better understanding of innovation processes at all levels especially the local level where the majority of the actors (pastoralists) are found¹³².

According to Spielman et al. 2006, general agricultural innovation system is complex and often undergoing frequent changes (in terms of new policies, structures and actors). In addition, the policies are diffuse; often creating new opportunities while sometimes overlaps which then creates confusion.

3. 6.1 Livestock technology systems

Looking at technological innovations in pastoral systems, there is growing evidence that there is a mismatch between technology development or availability and technology access. This technological constraint in pastoral systems of the study countries was exemplified by the need for a system to encourage wider access to animal health services, through the community animal health delivery systems.

The establishment of the community animal health delivery system followed the realization that provision of these services to cover vast areas including remote areas required the intervention of community based approaches (Halderman 2004; Catley *et al* 1998). Historically, animal health challenge in pastoral areas has been addressed through government managed, seasonal and *ad hoc* vaccination campaigns, with pastoralists having only limited access to clinical services other than those provided by untrained or slightly experienced fellow pastoralists¹³³. However, government managed vaccination campaigns are expensive, capital intensive and rarely comprehensive (FAO, 2001). This limits the capacity for disease control strategies.

The success of the system was mainly attributed to the development of thermostable vaccines, notably for rinderpest, that did not require cold chain facilities, and community involvement through their rich indigenous knowledge of livestock communities on livestock diseases and the well organized indigenous pastoral institutions (Catley et al 1998), thereby opening up new options for vaccine delivery.

The shift toward private sector involvement in the delivery of clinical services and veterinary drugs combined with the rapid expansion of CAHWs networks, private veterinary practices, and increased NGOs and donor support¹³⁴ is now leading to the development of more appropriate policy and legislative frameworks for CAHWs.

In terms of social capital, this has built good trust relations between local communities and the CAHWs (Hopkins and Short)¹³⁵. Because of this, the system has also emerged as an entry point to other benefits unrelated to drought such as conflict resolution. Their approach has integrated animal health with other forms of interventions during drought and livestock disease emergencies (Catley et al. 2002). On the contrary, the community animal health

¹³² David J Spielman, Martha Negash, Kristin Davis and Gezahegn Ayele, 2006- Reversing Rural Poverty in Ethiopia: Dilemmas and Critical Issues- Agricultural Innovation in Ethiopia: A systems overview of opportunity and constraints.

¹³³ Ethno-veterinary medicine has also been in use, but largely non-validated from a scientific point of view.

¹³⁴ Further reading from- http://www.oie.int/eng/pulicat/RT/2301/PDF%20A-F-E/18.Catley.pdf.

¹³⁵ http://www.iied.org/NR/agbioliv/pla_notes/documents/plan_04505.pdf.

workers base their services on the modern ways of animal health delivery and hence the appreciation and use of traditional knowledge has significantly reduced (Hopkins and Short).

Over time, the approach has taken different forms. Different NGOs and other actors have taken it differently. Experience has shown the importance of establishing CAHW systems as partnerships for purposes of sustainability. The argument therefore is that CAHWs approaches have done very well and need to be institutionalized as an alternative to formal veterinary services, other than the government and private veterinarians. In an effort to achieve sustainability, the current focus from our recent study is on how best this system can be changed to respond to the emerging needs for the development of livestock markets especially in pastoral areas, by strengthening their entrepreneurial capacity and linking their animal health services with livestock trade. Other development aspects include provision of incentives and the continuous training.

3.6.2 Institutional Linkages and Interactions

The pastoral problems and constraints as already outlined earlier are clearly complex and intertwined. Notwithstanding these problems, there is also poor understanding of the holistic nature of the problems facing pastoral systems (See the diagrammatic illustration in Figure 7 and the notes for more details).

Figure 7: Current pastoral picture¹³⁶



Many authors although acknowledge the role of several actors in the pastoral innovation system, they however stress the lack of coordination among several actors but more specifically between Governments/Ministries, NGOs, research institutes, donors and the pastoralists themselves.

Pastoralists have considerable expertise and know-how, developed over many years of practical experience. They are however ignored in most development plans. They are never

¹³⁶ Sourced from our previous interviews and discussions with Andrew Adwera of African Centre for Technology Studies (ACTS).

recognized as the producers or the source of livestock for the local and export market. In addition, their traditional knowledge system is rarely given emphasis during emergency response approaches. The other actors do not find time to give the pastoralists feedback on the results of projects they do on the ground.

The Government on the other hand is involved in different roles during interventions to livestock emergencies, under the different line ministries, but mainly the livestock ministries. Its roles include providing the leadership and coordination functions especially during emergencies and making appeals for humanitarian aid. They are also involved in policy and pastoral development strategies. The ministries are limited to their mandates and therefore may not be involved in some pastoral innovation initiatives.

Research institutes (such as ILRI) introduce new techniques to the pastoral communities without pastoralist consultation and in disregard to their traditional practices and culture. They rarely realize that they have to develop technologies which help to strengthen the pastoralists' useful traditional practices and not those that are perceived to be harmful to their way of life.

Donors and NGO interventions in pastoral systems follow a project development approach and hence are never sustainable, causing continuous deterioration of pastoral livelihood. Donors are involved in funding of emergency intervention programmes in pastoral regions. NGOs role include provision of animal health services through treatment and vaccination, participation in livestock coordination meetings, capacity building such as training of CAHWs and most importantly participation and advocacy for the development/formulation of policies or even livestock emergency guidelines and standards. Donors give priority to relief funding as opposed to pastoral livestock development activities hence the interventions become short-lived. NGOs even though are in transition from relief response to pastoral development, many of them are limited by funding. Many of them have adapted the community participatory approaches with a focus on the needs of the most vulnerable.

Even though the actors do their activities targeting improvement of pastoral livelihood, some do it in isolation, or as competitors, and in fact on the basis of the projects to be done. The binding factor between them except the pastoralists is often the funding and the individual benefits that accrue from the projects. This ends up not achieving improvement in pastoral livelihood. Thus, it is of paramount importance to follow a holistic development approach for sustainable development in pastoral areas (See the illustration from Figure 8).

As already indicated, pastoral development efforts by all actors should be integrated and coordinated, with all actors participating in the process. The need for a combination of both grass-root/bottom-up participatory approach and the top-down approach in the design as well as implementation of pastoral development initiatives is the most critical and possible way forward to achieving sustainable pastoral livelihood.

In this case, although multiple actors will have different initiatives and practices, the most important fact will be that they will be linked and all their efforts will be aimed at strengthening the weaknesses and filling the existing gaps in the pastoral systems.

Figure 8: Envisaged Pastoral Innovation Map and Development Approaches



Source: Previous interviews and discussions with Andrew Adwera of African Centre for Technology Studies (ACTS).

Pastoral System

3.7 Pastoralist production, animal health and trade initiatives

Policies in East Africa are mainly developed by experts but, require approval by the respective governments. This is because of the simple reason that most policy formulators lack the clout to push for policies beyond the formulation stage. This in essence implies that the countries spend a lot of resources formulating good policies but this end up gathering dust on the shelves because of the existing gap between policy initiators and the governments.

One of the hindrances to pastoral policy environment in East African region especially Ethiopia is always the incoherence of policies between the line ministries such as MoARD and Ministry of Federal Affairs (MoFA) or even between Ministries and other actors. Aklilu and Admassu in their contribution to pro-pastoralist policies, for example, argue that MoFA which has some aspects of promotion of pastoral development policies in its mandate lacks full understanding of the pastoral systems and hence end up with some policies such as sedentarization policies with minimal participation of the pastoral communities¹³⁷.

Following this realization, efforts have been initiated with the support of FIC/Tufts and USAID (PLI), to try to facilitate pastoral policy development at both federal and regional levels, bringing together government/Ministry actors and community level actors (Civil Society groups)¹³⁸. Some of the projects' output have been the development of pastoralism and policy course¹³⁹ at federal (for government policy makers and NGOs) and regional levels, with the aim of phasing out negative perception of pastoralism and further empower CSOs to lobby for pro-pastoral policies. The future plan is to institutionalize the course in learning institutions and even in other CSOs in Ethiopia.

Despite this progress, there are still fears of possible constraints related to habits, attitudes and beliefs of some key policy makers whose decisions are often influenced by ethnic and cultural backgrounds rather than the evidence based policy making process. Hatfield and Davies (2006) argue that pastoralism is more productive under the same conditions than commercial ranching and further categorizes policies affecting pastoral systems as pastoral production, pastoral marketing, rangeland and social policies. Pastoral production systems as earlier stated, depends largely on water and pasture availability. Related to production and grazing initiative has been the reciprocal grazing agreement (mentioned earlier) and exchanges between different pastoral communities as one of the sustainable pastoralist strategy. This was initiated by VSF/Germany. It involved agreement between two pastoral communities on intercommunity land use and planning and has been important in coping with drought and conflicts¹⁴⁰.

Other actors such as SOS Sahel UK, an NGO in Ethiopia and International Institute for Environment and Development (IIED) have since 2007 activities related to economic and ecological development of dryland areas in East and West Africa. The two organizations have tried to influence policy on livestock mobility. The organizations improve pastoral and agropastoral livelihoods by securing livestock mobility at local national and regional levels given the importance of mobility during trade and as a coping mechanism in cases of climate change. Their activities included identification of other actors working on livestock mobility and learning from their experiences, analysis of livestock mobility trends, review of livestock mobility policies and legislations at all levels and discussions with other stakeholders on the future of livestock mobility¹⁴¹.

An improvement of the above has been an example of the collaboration and sharing of grazing lands across international borders that exist in West Africa, where the Economic Community of West African States (ECOWAS) has created a system where pastoralists from one nation can easily cross the border of another nation for grazing purposes without experiencing legal problems thus promoting mobility.

¹³⁷ Berharnu Admassu, Yacob Aklilu- Towards Pro-Pastoralist Policies in Ethiopia

¹³⁸ This is still ongoing and has to continue up to 2011.

¹³⁹ The course was first run in March 2008.

¹⁴⁰ This was practiced by the Toposa people (Sudan), Turkana people (Kenya) and Nyangatom people (Ethiopia) all in Karamoja family

all in Karamoja family. ¹⁴¹ See www.sahel.org.uk/policy.html

Given that the market requirements in the region are dynamic, national and international NGOs, government and private agencies have come together to ensure that the health of livestock and pastoralists is ensured in line with the market quality standards. Animal health has particularly been addressed through vaccinations and feed and water supply with the aim of improving the condition of the animals before getting to the market. This has however not achieved much because of the limited government capability to meet all the requirements especially feeding before the market and therefore the need for private sector involvement in the entire value chain.

Entrepreneurship has been evident in the pastoral livestock system. However, collection and dissemination of livestock market information is still understood to be done during a project or on its own often with no continuation thereafter. According to Aklilu 2002, institutional and structural constraints resulting from individual project performance hinder livestock markets and the rest of the livestock production value chain.

In essence, livestock trade has a significant role during response to drought and livestock emergencies, through destocking and restocking which is a way of protecting pastoralists' livestock assets. Livestock trade in Kenya is either through pastoralists own initiatives or through the Kenya Livestock Marketing Council (KLMC). Available abattoirs in Kenya despite being located far from the pastoral areas, are in addition operated as a cartel --- hence reducing profits for pastoralists. One shocking revelation about pastoralist as sources of livestock for slaughter has been the fact that during the past good operating times by Kenya Meat Commission (KMC), it is said that they made higher profits because of the pastoral sources for their livestock but in contrast, best prices were paid to non-pastoral livestock enterprises¹⁴². This indicates the negative perception by many actors against pastoralists.

On the other hand, Ethiopian livestock trade is through livestock traders and trade associations. Ethiopia Livestock Trade Professional Association (ELTPA) was formed by livestock traders mainly fatteners, butchers and live animal exporters. The livestock trade associations had a combination of technical constraints and a general lack of information either on the marketing systems or on the livestock sector in general. Further more, in the past, there was a misunderstanding between the livestock marketing Authority (LMA) and the veterinary department especially on issues related to licensing, quality control and certification.

This therefore gives a picture of trade related policies having negatively impacted on the livestock trade. According to Hatfield and Davies (2006), pastoralism economic policy instead of investing in markets, it favours taxation and regulation polices. This together with the association of pastoralism with border areas has resulted in emergence of cross-border informal trade especially between Ethiopia, Somalia and Djibouti. The formal government-led trade has declined because of issues related to market infrastructure constraints, political interference and quality standards¹⁴³.

It is true that market provides the economic support to pastoralists. However, this is done mainly in terms of trade in live animals. Many authors agree that there is still a big room for marketing improvement in the pastoral livestock sector through value addition given the increasing demand for livestock and livestock products. It is important to note that there are

¹⁴² See http://www.irinnews.org

¹⁴³ When imports are officially banned, the same animals are allowed for trade informally through Somalia and Djibouti because of unrealistic quality standard demands by the export market.

still poor links between the pastoral producers and livestock traders, as opposed to the emerging market linkages between the private sector mainly NGOs with the community associations.

Borrowing from the argument by Aklilu and Wekesa (2002), that the efforts that are aimed at reducing the transaction costs during livestock marketing in pastoral areas have a resultant positive impact of increasing off takes during livestock emergency periods, it equally follows that marketing methods that are less demanding in terms of transportation, feed and taxation, can be effective for pastoralists given good marketing infrastructure.

From the above argument, coupled with the severe food security concerns in the region, several organizations led by some of the regional bodies are trying to improve food security of pastoral communities through enhancing the development of pro-pastoralist regional food security policies. COMESA, a regional body which aims at promoting international and intraregional trade through development of free trade areas and promotion of cross border trade has aspects of pastoral food security policy development¹⁴⁴. The only hindrance has been COMESA's limited technical capacity to analyze and develop regional trade policy options. Its main focus has been the integration of international standards and animal health in pastoral areas¹⁴⁵.

COMESA's specific activities include:

- Facilitation of the regional livestock and pastoralism forums (multi-stakeholder forum bringing various actors together),
- Review and analysis of the emerging policy documents under CAADP and ensuring inclusion of pastoralism issues in them,
- Review of livestock marketing policies and
- Training on pastoralist livelihood.

The outcome of this initiative is expected to be the dissemination of COMESA policy briefs on pastoral food security to policy makers, inclusion of pastoral issues into all member countries at all levels, search for new markets for livestock and livestock products in Africa/within COMESA region. This initiative also has an advantage of possibly having impact on several countries within the region at the same time, although it is not yet clear whether all governments will accept such initiatives originating from such regional membership blocks/organizations.

The current thinking on pastoral livestock trade support programme is pointing towards value addition. This thinking has been influenced by the few successful examples of commodity based trade (CBT) where trade is based on animal product such as beef and relates to standards of the commodity/product itself rather than the location from which the commodity has been produced¹⁴⁶. This has been applicable to some pastoral areas (for example in South Africa) through good hygienic processing and preservation methods and even in other internationally-traded commodities.

¹⁴⁴ Other partners include Tufts/FIC, AU Commission, IGAD, EAC, World Initiative for Sustainable Pastoralism, NGOs (Oxfam GB, SC/US-Ethiopia, CARE International), UN and bilateral agencies (FAO-LPI, UNDP, UNOCHA, and donors such as USAID, DFID, SIDA).

¹⁴⁵ See https://wikis.uit.tufts.edu/conference/display/FIC/Feinstein+international+center

¹⁴⁶ This has been tested on small-scale in Southern Ethiopia by CARE and in Kenya by VSF- Belgium.

FICs' contribution to the growing international trade has been through reviewing the alternative to quality control standards along the production value chain. This has been done since 2003 and through partnership with AU^{147} , much awareness has been raised on the concept of CBT. This implies that trade in livestock product can still be safe without necessarily considering the disease situation in the geographical area of product origin (Aklilu and Catley).

This method has not formally been operationalized because of the need for creation of standards by the international animal health and trade organizations (OIE and World Trade Organization) that have the only mandate on Sanitary and Phytosanitary measures. However, these cannot be effectively undertaken unless the market is streamlined to give pastoralists returns that support the innovation and enhance the capacity of the innovation in pastoral systems either during response to livestock emergencies or even during normal times.

In conclusion, pastoral systems still remain to be a viable livestock production system, despite the various constraints they face and the exclusion from direct and active participation in pastoral development issues. In an effort to recognize pastoralists and their livelihoods, proper re-definition of pastoralism is required with emphasis being given to their livelihood assets and the greater contribution to the entire livestock development. This then calls for other better alternatives to ensure sustainable development of pastoral systems. Such efforts include the current innovation systems concept which has been developed but still not adopted by many stakeholders in the pastoral systems, and which still poses some challenges in regard to the intended interaction.

In conjunction with the innovation systems approach, is the need for decentralization of some of the initiatives that target the drylands and other pastoral areas, thereby giving an opportunity for the major stakeholders who are the pastoralists to participate in the development of their systems. In addition, there is need for integration of the pastoral systems and the livestock systems into one sector with all development efforts targeting the two simultaneously.

References

- Amrik Heyer, (2006): Comparative study for the Report on the status of pastoralism project by Oxfam
- Andrew Catley and Yacob Aklilu: Alternative Approaches to International Livestock Trade (Commodity Based Trade)
- Andrew Catley, Patricia Delaney, Hunt McCauley: (1998); Community-Based animal health services in the Greater Horn of Africa: An assessment.
- Andy Catley, Dewit Abebe and Yacob Akililu (2007): Regional Policy Support on Food Security in Pastoral areas with the COMESA: https://wikis.uit.tufts.edu/conference/display/FIC/Feinstein+international+center
- Andy Catley, Stephen Blake way and Tim Leyland (2002). Community-based Animal Health Care: A practical Guide to improving primary veterinary services. ITDG Publishing London.

¹⁴⁷ Other partners are COMESA, IGAD, DFID, East African Community (EAC) and national governments in some East and South African countries.

Bekele Hundie and Martina Padmanabhan: (2008)- The transformation of the Afar Commons in Ethiopia- Collective action and property rights (CAPRI) working paper No. 87 – June 2008.

Berharnu Admassu, Yacob Aklilu- Towards Pro-Pastoralist Policies in Ethiopia

- Ced Hesse and Michael Ochieng Odhiambo- Strengthening pastoralists' voice in shaping policies for sustainable poverty reduction in ASAL regions of East Africa, Conference on Pastoralism and poverty reduction in East Africa: A policy research conference-27-28 June 2006, Nairobi, Kenya
- Charles Hopkins and Alistair Short 2002: Participatory impact assessment in Ethiopia: Linking policy reform to field experienceshttp://www.iied.org/NR/agbioliv/pla notes/documents/plan 04505.pdf.
- David J Spielman, Martha Negash, Kristin Davis and Gezahegn Ayele, (2006)- Reversing Rural Poverty in Ethiopia: Dilemmas and Critical Issues- Agricultural Innovation in Ethiopia: A sytems overview of opportunity and constraints.
- Drought Related livestock interventions, FAO Report
- Ethiopia sustainable Development and Poverty Reduction Program, (2002), Addis Ababa, Ethiopia
- Jeremy Swift, 2004: Report on the state of pastoralism report (ROSP); Monitoring poverty trends in pastoral areas of East Africa and the Horn.
- John Morton- A review of Oxfam GB's Horn/East Africa Regional Pastoral Programme, 2006
- John Omiti and Patrick Irungu- Institutional and policy issues relevant to Pastoral development in Kenya Discussion paper no. 031, (2002), February 2002
- Livestock Emergency Guidelines and Standards (LEGS), 2007
- M. Abdel Ghaffar Ahmed, Alemayehu Aleze, Mustafa Babiker and Diress Tsegaye. Post-Drought Recovery Strategy among the Pastoral Households in the Horn of Africa: A Review
- Michael Halderman, (2004) Pro-poor livestock policy initiative (PPLPI) working paper No. 19 The political Economy of pro-poor livestock Policy making in Ethiopia.
- Ministry of Finance and Economic Development (MOFED), Federal Democratic Republic of Ethiopia (FDRE)
- N.K.R. Musimba and D.M. Nyariki-Development of and Policy on the Range and Pastoral Industry with Special Reference to Kenya
- Organization for Economic Cooperation and Development (OECD), (1997): National Innovation Systems.
- Participatory Resource Planning with Pastoralists (PRP)- The VSF/G experience in Northern Kenya and Southern Ethiopia.
- Pastoral Civil Society Quarterly Newsletter of RECONCILE/IIED Programme on Reinforcement of Pastoral Civil Society in East Africa: Issue No. 4 October December, (2003)- http://www.reconcile-ea.org

Pastoralist Voices, Bulletin February, 2009, Vol 1. Issue 13

- Richard Hatfield and Jonathan Davies -Global Review of the Economics of Pastoralism: Prepared for the World Initiative for Sustainable Pastoralism, IUCN, Nairobi (2006)
- Sara Pantuliano and Mike Wekesa (2008) Improving drought response in pastoral regions of Ethiopia-Somali and Afar regions and Borena Zone in Oromiya Region.
- Victor A. Orindi, Anthony Nyong and Mario Herrero- Pastoral Livelihood Adaptation to Drought and Institutional Interventions in Kenya, Human Development Report (2007/2008), Fighting climate change: Human solidarity in a divided world Human Development Report Office, Occasional paper

- Yacob Aklilu and Mike Wekesa (2002): An audit of the livestock marketing status in Kenya, Ethiopia and Sudan. Volumes I and II. OAU/IBAR Interafrican Bureau for Animal Resources(IBAR);
- http://www.eap.gov.et/content/files/Documents/Marketing/An%20Audit%20of%20the%20Li vestock%20Marketing%20Status%20in%20Kenya,%20Ethiopia%20and%20sudan%20vol ume2.pdf

http://anthro.palomar.edu/subsistence/sub_3.htm

- http://dfid web.gov.UK/prismodcs/ARCHIVE/ETHIOPIA/A50014 PG.Doc. (PCI Phase 2 Project Memorandum).
- www.communication.go.ke/news.asp?id=125
- www.pambazuka.org/en/category/comments/51377
- www.sahel.org.uk/policy.html
- https://wikis.uit.tufts.edu/conference/display/FIC/Feinstein+international+center
- http:practicalaction.org/?id=region-east-africa-programmes
- http:www.farmafrica.org.uk/region.cfm?RegionID=4

SECTION 4: CONCLUSION AND RECOMMENDATIONS

4.1 Science Technology and Innovation

Africa has largely been sidelined by the modern day technological revolution, and has thus not shared in the STI revolution whose benefits are evident the world over. Partly, this state of affairs could be blamed on lengthy processes through which STI policies are designed, not forgetting diverse political viewpoints which tear apart such endeavours. Despite numerous commitments to collate STI indicators with international comparability, few nations have taken this stride which makes it difficult to properly articulate the state of STI in Africa and FAC countries in particular. No wonder there are claims that STI policies are not in tandem with neither macro-economic policies nor major economic activities in various nations.

The existing STI policies in SSA and FAC countries are regrettably not keenly implemented which has seen underutilization of STI potential in the respective countries. There is dire need for FAC countries through the respective ministries to cooperate with CAADP and international organizations such as UNESCO and IFPRI/ASTI and projects such as ASTII to collect and synthesize STI data which will inform policy reviews in future.

4.2 Cereal Seed System

On cereal seed systems, it is known that seed policies are there to guide the development of seed systems. When translated into investment decisions and regulatory frameworks, they can create conducive environments for securing the availability of good seed to farmers. However, the linear paradigm for the development of seed systems underpins the basic assumptions behind conventional seed policies, which are not in line with the farmers' reality. This therefore calls for integrated approaches to seed system development.

Considering the existing political, agro-ecological, institutional and policy frameworks of the countries in Sub Saharan Africa, there are strong grounds for supporting the current farmerbased seed production and marketing activities and establishing a sustainable seed system in the country. The regulatory capacity of public sector agencies should be strengthened to enforce quality control standards at the point of sale. Infrastructure development and training farmers to produce and sell their seeds effectively should be both the short-term and medium term strategies a strong informal seed system. This calls for opening up the existing regulatory framework and to stimulate positive actions by organizations within the formal system to support farmers', or informal seed systems.

There is, throughout Africa, significant pressure and momentum towards sub-regional and regional harmonization of seed laws. This is largely based on a typical globalization argument, where harmonized rules will facilitate cross-border trade in seed, allowing for greater economies of scale and wider access to technology. It does seem highly likely that harmonization will promote the activities of large seed companies and benefit high input farming, and therefore may not be the optimal solution. A more positive stance towards integrated seed systems may include a much more diverse set of policies, and not only those that are translated into regulations. One such example is the development of community-based or small-scale seed enterprises which may require a gradual phasing in of seed quality controls and supportive rather than a policing role for the seed certification officials.
Seed genetic change is a necessary but not a sufficient condition for improving the welfare of African smallholders. Continued development of improved seeds and seed markets and a realistic understanding of farmers' needs remain critical. Therefore, successful seed systems in the future will continue to depend not only on strategic breeding improvements that fit specific environmental and disease problems and enhance the stability of net returns to farmers but also on long-term commitment to agricultural research.

Support to participatory seed production and variety development requires explicit strategies for public sector and private sector partnership. In view of this, and with recognition of farmers as key actors in seed systems, approaches aiming at decentralization of seed production are of utmost importance just as support that focuses on the multiplication of locally adapted varieties and other broader range of varieties. Supporting farmers in reducing bottlenecks in their seed production practice may include the development of appropriate technologies and clear extension messages on diverse technologies related to such issues as seed-transmitted diseases, seed storage methods, and maintenance of selection in varieties.

Finally, positive action and support may be needed to empower farmers to optimally develop their seed systems, for example, through village seed banks, community genebanks, seed fairs and the organization of farmer field schools to share, extend and further develop farmers' experiences.

4.3 Pastoral Innovation System

Regarding pastoral innovation systems, although a number of programs could be designed to deal with problems of the pastoral communities, one of the most important innovation challenges is how best to expand opportunities and means for resource poor pastoralists to become actors and major stakeholders in the pastoral innovation systems. Most innovations take place in exclusion of the pastoralists who are the majority of producers in the livestock sector.

In addition, provisions of the necessary infrastructure for sustained development and radical transformation and protection of their livelihood is a real challenge that needs a long term development agenda. Such a development agenda could be achieved only if many stakeholders realize that pastoralism could be the only viable options for sustainable production of livestock and livestock products in the long run.

In realizing this pastoralism potential, it follows that major stakeholder participation to promote, build and strengthen result-oriented partnerships between pastoral communities, government, private sector, and external support agencies is of paramount importance. This could be through committees, professional and civic associations, public awareness campaigns and workshops as a means to provide forums for different stakeholders to contribute their views on how to strengthen these partnerships for purposes of improving pastoralism.

Finally, integration of pastoral systems into national and economic development agendas, acceptance of pastoral culture and traditions as their way of life and increased funding for pastoral development programmes by governments and donors will ensure that pastoralists are not just a forgotten lot but will go along way in ensuring that they achieve their livelihood objectives of improving food security and enhancing their income earning capabilities.

4.4 Emerging Issues

From the foregoing analyses, there are emerging issues that we present under Science, Technology and Innovation, Cereal Seed Systems and Pastoral Innovation Systems.

(a) Science Technology and Innovation Policy

- Policies needed to support STI activities
- Quantification of the impacts of STI
- Local level development of STI and packaging of STI information and data
- Regional collaborative programmes in STI policy issues

(b) Emerging Issues in Cereal Seed Systems

Some of the emerging issues which need further discussion and which can set the agenda for the next FAC planning and methodology workshop to be held at IDS/Sussex, UK in July 2009, include,

- Domestication of knowledge accrued from imported seed technologies.
- Linkages between research-extension and farmers and weak interactions between stakeholders during seed variety development and production.
- Policy and regulatory frameworks for smallholder seed enterprises and farmer empowerment to demand technologies and to make use of existing research systems.
- Technology development, testing and deployment constraints and rethinking of the extension services delivery systems because of changing landscape of technology delivery.
- Challenges of post-harvest grain/seed storage and handling.

(c) Pastoral Innovation System

- Pastoral local institutional development and importance of indigenous pastoral knowledge.
- Research focus and issues of technological development and technology availability and access in pastoral systems.
- Transboundary animal health and sanitary standards for international trade versus the OIE set standards.
- Inter-linkages or interactions among actors and forums for pastoralist participation in innovation systems.
- Enabling institutional and policy environment -- and pastoral policy emphasis at the highest political level.
- Comparative pastoral development and impacts of climate change studies.

Given the complexity of the studies on pastoral innovation systems, coupled with limited available literature on pastoral innovation system, it is important that a further comprehensive study on pastoralism in other African countries be done for comparative purposes. This may require a thorough literature review and where no literature is available, it may be necessary to engage policy makers (NGOs, International agencies and Governments) especially those who have played an important role in bottom-up/pro-pastoralist innovation system, and the pastoralists who are the major actors.

All these emerging issues in the three sections will help to develop an analytical framework and research design for future STI work and studies in agriculture and livestock sectors and more so, for the development of diversified policies that fit different social, political and economic contexts.

References

- ASTII Workshop (2008). Report of the first training workshop on African science, technology and innovation indicators and surveys. Centurion Lake Hotel. Gauteng, South Africa. 10-14 March, 2008.
- Beintema, N.M and Stads, G (2004). Sub-Saharan African agricultural research.Recent investment trends. Outlook on Agriculture Vol 33, No 4, 2004, pp 239–246 239
- Beintema,N, Adhiguru, P, Birthal, P. S, and Bawa, A. K (2009). Public Agricultural Research Investments: India in a Global. Policy Brief. Indian Council of Agricultural Research (ICAR). www.**asti**.cgiar.org/pdf/PolicyBrief27.pdf

MDG (2003). Malawi: Development context. MDG report. www.sarpn.org.za/docs

- Mugabe, J (2009). Knowledge and Innovation for Africa's Development. Priorities, policies and programmes. A paper prepared for the World Bank Institute. www.info.worldbank.org.
- Pouris, A and Pouris, A(2008). The state of science and technology in Africa (2000–2004): A scientometric assessment. Jointly published by Akadémiai Kiadó, Budapest Scientometrics, Vol. 79, No. 1 (2009) 000–000 and Springer, Dordrecht DOI: 10.1007/s11192-009-0419-x.
- Spielman, David. J and Kelemework, D (2009). Measuring Agricultural Innovation System Properties and Performance: Illustrations from Ethiopia and Vietnam IFPRI Discussion Paper 00851. www.ifpri.org

Appendix

Appendix 1: STI Indicators for Ethiopia, Ghana, Kenya And Malawi

Science, Technology and Innovations (STI) indicators provide unique strengths and weaknesses of a country's or a region's STI system. These indicators also monitor the commitment of various countries in Africa in terms of increasing public expenditure on research development. According to NEPAD declaration, member countries committed to increase R & D funding to at least 1% of Gross Domestic Product (GDP) (Pouris, 2009).

STI indicators can be compared across regions to assess the dynamic changes taking place around the globe, a factor which needs to be put into consideration so that future STI systems appropriately address the issues at hand. Indicators should be accurate, timely, reliable and complete to guide dialogue between policy makers and producers of knowledge (ASTII Workshop, 2006).

The STI indicators included in this report fall into four broad categories—Research expenditures, Researchers' full time equivalents, Research intensity, Scientific publications and patents as reported by IFPRI (2009) and Pouris (2009).

1. Researchers (full-time equivalents)

Beintema and Stads (2004) describe a full-time-equivalent researcher as a person who holds a full-time position as a researcher during the whole year. For government agencies and higher education agencies, adjustments to full-time equivalents are made to estimate the average time professional staff spent on research.

Full time equivalents for Future Agricultures Consortium member countries in Africa viz. Ethiopia, Ghana, Kenya and Malawi are shown in figure 1 and 2 below. On average, all FAC countries show an increasing trend in full time equivalents both in government agencies and institutions of higher learning. At the time of research, Kenya was leading followed closely by Ghana, which could be associated with intensified government investment in agricultural R&D in combination with increased donor-funded projects.



Figure 1: FTEs for government agencies

Figure 2. FTEs in Higher Education Agencies



However, researchers from the private sector were still few in number in all the FAC countries as shown in table 1 below. Similar observations were made for all the other Sub-Saharan countries (IFPRI data sets, 2009). This is in tandem with the weak funding incentives for private research in the developing world. Beintema and Stads (2004) argue that the private sector plays a greater role in supporting research activities by contracting government and higher education agencies and also involvement in technology transfer.

Year	Ethiopia	Ghana	Kenya	Malawi
2001	-	0	-	0
2000	2	0	11	0
1995	3	0	9	0

Table 1: FTEs in the Private sector between 2000 and 2004.

2. Expenditures

R & D expenditure of a country can also gauge the Agricultural Research and Development efforts and thus, its technological capability. For FAC countries, ASTI indicators for government expenditure are presented in the table below.

Table 2: Government expenditures

Expenditures (2000 U.S. dollars) Government Agencies					
1971	1.6	2.2	16.1	3.9	
1975	2.1	4	17.6	4.1	
1980	3.2	7.7	18.2	5.5	
1985	3.4	6.3	20.2	3.3	
1990	8.2	6.9	26.2	4.2	
1995	7.8	-	37.4	2.2	
2000	10.2	-	33.8	1.4	
2001	-	-	-	2.2	

Kenya and Ethiopia are on the lead, committing public funds on an increasing rate over the years towards R and D. The outcome of this effort can also be traced in the high numbers of researchers in the public sector between year 2000 and 2004 and also improvement in economic growth rates in the respective FAC countries. For instance, Malawi's GDP growth rate declined in mid 1990's but has been on an upward trend recording 0.5% in 1999 and 1.8% in 2002 (MDG report, 2003).

The data provided above is aggregated for the entire agriculture sub-sector. It would be more informative to gather information on government's priorities for allocation of research expenditure across sub-sectors such as crops, livestock, fisheries, natural resources and agrobased industries. Such information could strengthen policy debates and guide future policy making processes.

3. Research and Development intensity

The research intensity indicator measures total public agricultural R&D spending as a percentage of agricultural output (AgGDP). This indicator is vital for African countries and

serves to inform the African Peer Review Mechanism the success of the African countries in the "effort to commit 1% of Gross Domestic Product (GDP) in public funds to research and development."¹⁴⁸ Research intensity helps to compare R&D spending of a country with other countries around the globe. Research intensity ratios for the FAC countries have remained fairly stable (see table below) despite overall higher growth rates in agricultural R&D spending discussed above.

Research Intensity Public expenditures as a % of AgGDP					
1971	-	0.34	2.05	1.74	
1975	-	0.39	1.6	1.68	
1980	-	0.22	1.34	1.77	
1985	0.21	0.42	1.31	1.32	
1990	0.44	0.63	1.57	1.49	
1995	0.37	0.47	1.98	-	
2000	0.38	0.47	2.68	-	
2001	-	0.44	-	-	

Table 3: Research intensity in FAC countries (2000-2004)

The 1% target of R & D intensity in the NEPAD declaration has not been achieved by many African countries. Mugabe (2008) notes that many African countries commitment of public funds to research falls below 0.5%. Ethiopia and Ghana were in this category between year 2000 and 2004 while Kenya and Malawi have surpassed the set target. However, going by the World Bank's target of 2%, the data above reveals that no FAC country in Africa achieved the set intensity ratio.

4. Scientific Publications and patents (2000-2004)

In general, the African continent has been lagging behind in producing and disseminating science and technology indicator reports. For instance, between year 2000 and 2004, Africa contributed 68,945 scientific publications, of which over 26% were agriculture-related. This represented 1.8% of the world's publications. The table below shows how the FAC countries faired between 2000 and 2004.

 $^{^{148}}$ In addition to NEPAD, the 1% of GDP expenditure on knowledge production (R & D) is also supported by African Union, SADC and other forums.

No. of publications	Ethiopia	Ghana	Malawi	Kenya
Life sciences	573	491	488	1376
Traditional sciences & technology	69	85	11	168
Land and primary resources	580	314	110	1382
Social sciences & Multidisciplinary	99	115	36	305
Country Totals	1321	1005	645	3231
Share of agric (Land and primary resources)	0.43	0.31	0.17	0.42
Share of country in Africa	0.02	0.01	0.009	0.05
Number of patents	_	_	_	29
Number of patents in Africa	633			

Table 4: Scientific Publications and patents (2000-2004)

South Africa and Egypt produce over 50% of scientific publications in Africa while 80% of these publications are published by eight African countries. Patents represent the innovative capacity of a nation or a country. It is important to note that for international comparability, only patents awarded by the United States Patents and Trade Office (USPTO) to residents of African countries (Pouris, 2009).

Appendix 2: List of Respondents

Ethiopia

1. Wondrad Mndesfro, Head Agricultural Extension Department, MoA

2. Girma Ysef, Coordinator, Research and Technology Transfer

3. Abebe Mekuriale, Coordinator, STIP Studies, Formulation And Implementation Process,

Ministry of Science and Technology

4. Alem, Coordinator, Intellectual Property Office.

5. Mr. Ato Belayhun Hailu, Pastoral Community Development Project

6. Asafaa Taa' Aa Wayyeessaa, Deputy Director General (DDG), Oromia Agricultural Research Institute

7. Tesfahaun Fenta, Coordinator, Prolinnova Ethiopia;

8. Solomon Lagesse, Training Agri-Service Ethiopia

9. Andy Cartley, Tufts University

10. David Spielman, IFPRI/ ISNAR

11. Jonathan Naper, Country Director, Farm Africa Ethiopia

Malawi

1. Dr. Siambi, Icrisat, Lilongwe

2. Mr. Gresham Nhlane, Deputy Officer in Charge, Chitedze Agricultural Research Station

3. Mr. Wilson Makumba

4. Gloria Kamalizeni- Kasongo, National Smallholder Farmers Association Of Malawi

5. Mr. Victor Mhone Civil Society Agricultural Network (CISANET)

6. Henry F. Mbeza, Director, Of Science and Technology, Ministryof Education Science and Technology

7. Dr. Joseph Rukike, Iita, Outcome/Input Socio-Economics/Agricultural Economist, IITA P.O. Box 30258

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8. Ms. Clodina Chowa, Deputy Director (Extension) Methodologies and Systems,

Department of Agriculture

9. Mr. Msonda, National Research Council, Ministry Of Education, Science and Technology

10. Dr. Sibale, Research Into Use (RIU)

11. Ephraim Chirwa, Dean, Chancellor College,

12. Dr. Kenneth Wiyo, Director, Centre For Agricultural Research And Development at Bunda College.

13. Essau Mwendo Phiri, World Vision, Malawi

Ghana

- 1. Dr. George Owusu, the Director of STEPRI
- 2. Dr. Godfred Frempong, STEPRI
- 3. Dr. Nelson Obirih Opareh, STEPRI
- 4. Dr. A.B. Salifu, Director General, CSIR
- 5. Sari, CRE

6. Dr. Adewale Adekunle

7. Frank Larbi – Senior Accountant, Grain and Legumes Development Board

8. Michael Owusu -Ficer For Seed (Cell Phone: 0242256180),

Directorate

- of Crop Services
- 9. Dr. John Amin Head, Crops Science Department, University Of Kumasi
- 10. Issoufou Kapran, Programme Officer, Seed Production and Dissemination AGRA, PASS, West Africa
- 11. Professor Danquah, Director, Wacci University Of Ghana, Legon
- 12. John, Ghana National Association of Farmers And Fishermen (Gnaff).
- 13. Dr. Kwame Ameza, Acting Director, Directorate of Agricultural Extension Services, MoFA
- 14. Emmanuel Odame Research Extension Committee Mofa
- 15. Professor Kojo Amanor, African Studies Centre University of Ghana, Legon
- 16. Milly Boammar
- 17. William D. Kukah,
- 18. William D. Kukah, Seed Inspector and Analyst, PPRSD, MoFA