ASARECA
Transforming Agriculture for Improved Livelihoods

Feeding our region in the 21st century

First ASARECA General Assembly

Volume 1: Proceedings

Association for Strengthening Agricultural Research in Eastern and Central Africa

Where is the food basket?

Albert B. Mukundame

Where is the food basket?
Planted among farmers
Moving in the cargo of suppliers
Sinking in the turbulent lake
Protected in the hanging granaries
Hospitalised by non-governmental organisations
Where is the food basket?

Is it at the altar table
Sport kicked by sports personnel
Scrambled by politicians
Centred amidst food crisis
Accounted with financial statements
Where is the food basket?

Is it established by traditional norms?
Inspected by the hungry souls
Managed and maintained in serious investments
Integrated in professional programs/plans
Launched by the big honourable
Where is the food basket?

In modern supermarket of modern era
In decentralised units of common man
In fragmented land tenure investments
Inherited lands of no value for money
In marginalised hidden territories
Where is the food basket?

Is hidden in informed journalist records
Education centre of high production
Mushrooming business units of the global world
In go-back-to-land policy in urban areas
In tribal granaries for food security reserves
Where is the food basket?

Torn apart by scavengers
Rebuilt in visionary leaders manifestos
Master minded by the research units
Advertised by the sweet aroma ingredients
Kept by the viable traditional norms and practices
Where is the food basket?

Is it being designed by the artist?
Authorised by forces of nature
Valued like a dollar
Memorised like a creed
Protected like environment
Where is the food basket?

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Preface

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) was established in 1994. It comprises eleven member countries: Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan, Tanzania and Uganda.

ASARECA is a sub-regional not-for-profit organisation whose mission is: To enhance regional collective action in agricultural research for development, extension, training and education to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in Eastern and Central Africa (ECA). The mission commits to overcoming poverty and hunger in the ECA sub-region.

ASARECA sees improved delivery and impact of scientific knowledge, policy options and technologies as a powerful instrument to drive the sub-region towards meeting the Comprehensive African Agricultural Development Program (CAADP), which is the agricultural agenda of the New Economic Partnership for African Development (NEPAD) and the Millennium Development Goals (MDGs).

ASARECA serves as a forum for promoting regional research and strengthening relations among National Agricultural Research System (NARS), in ECA, as well as with the Consultative Group for International Agricultural Research (CGIAR). ASARECA links agricultural research in the region to the political dialogue possible in COMESA, FARA and AU/NEPAD. It monitors political and institutional change in the global research system and represents member countries in such fora.

From December 14 to 16, 2011 ASARECA held its First General Assembly in Entebbe, Uganda, under the theme: Feeding our Region in the 21st Century. The Assembly follows the approval of ASARECA's new Constitution in 2010, providing for the establishment of Patron Ministers and a General Assembly. These were established to offer strategic guidance to ASARECA in order to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in Eastern and Central Africa.

The objectives of the General Assembly were to:

- Create a forum for developing a shared vision and shared goals to enhance sustainable agriculture to bring about economic growth and improved livelihoods in our region.
- Introduce ASARECA; its strategic regional objectives, challenges, opportunities and successes to the Patron Ministers and members of the General Assembly
- Provide an enabling environment for the General Assembly to play its oversight role in accordance to the provisions of the Constitution and Governance Manual
- Receive from Patron Ministers and the General Assembly, in line with ASARECA's mission, recommendations and strategic guidelines in agricultural research for development, extension and agricultural training and education which will contribute to feeding our region in 21st Century.

This document presents the proceedings of the First General Assembly which was a big success because of the collective efforts of all the ASARECA stakeholders. I would like to thank the ASARECA Patron Ministers, ASARECA General Assembly, Business Committee, the Board of Directors, our partners from the NARS, the CGIAR and the staff of ASARECA secretariat for making the General Assembly a success. Last but not least, I would like to thank our development partners whose support made this possible. The partners include the African Development Bank (AfDB), Department for International Development (DFID), Canadian International Development Agency (CIDA Canada), European Union (EU), International Development Research Centre (IDRC), Swedish International Development Cooperation Agency (SIDA-Sweden), United States Agency for International Development (USAID) and the World Bank – Multi Donor Trust Fund (MDTF).

Dr. Seyfu Ketema
Executive Director, ASARECA

1 OVERVIEW

1.1 Background to ASARECA

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a sub-regional not-for-profit association established in 1994 by 10 member countries: Burundi, the Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. During the first ASARECA general assembly meeting (14–16 December 2011), the new Republic of South Sudan was admitted as the eleventh member country.

> **Vision**: To be a regional leader in agricultural research and development for improved livelihoods in eastern and central Africa (ECA)
>
> **Goal**: Enhanced sustainable productivity, value added and competitiveness of the sub-regional agricultural system
>
> **Purpose**: Enhanced utilisation of agricultural research and development innovations in eastern and central Africa
>
> **Mission**: To enhance regional collective action in agricultural research for development, agricultural extension and agricultural training and education to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in ECA.

The eleven ASARECA member countries, which now includes the Republic of South Sudan, cover an area of 8.5 million sq. km, with a total population of more than 280 million people, most of whom are rural dwellers pursuing agricultural livelihoods. Roughly one-third of the 300 million hectares of total land area of ECA is devoted to agriculture. Agriculture is, therefore, the bulwark of the national economies throughout the region.

Overall, agriculture accounts for 43% of the regional GDP. The bulk of the region's population resides in the rural areas and depends on agriculture for income and sustenance; however, given the low levels of growth in the sector, hunger and malnutrition have deepened in ECA in

recent years. Climate change adds to the list of problems, demanding extra effort in the fight to overcome important agricultural, socio-economic and environmental development challenges.

Seventy percent of ECA cropland lies in areas with high and medium agricultural potential; therefore the region has great potential to spur economic growth and improve livelihoods. With the right strategic guidelines, this potential could be harnessed to ensure food and income security. ASARECA sees improved delivery of scientific knowledge, policy options and technologies as powerful instruments to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in ECA. The new ASARECA Constitution, approved in 2010, provides for the establishment of patron ministers and a general assembly to offer strategic guidance to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in ECA.

1.2 First ASARECA general assembly

Guided by its new Constitution, ASARECA held its first general assembly from 14 to 16 December 2011 at the Imperial Resort Beach Hotel, Entebbe, Uganda. The theme of the meeting was: **Feeding our region in the 21st century**. The general assembly was officially opened and closed by Uganda's Minister of Agriculture, Animal Industry and Fisheries (MAAIF), Hon. Tress Buchanayandi.

Objectives of the general assembly

1. Create a forum for developing a shared vision and shared goals to enhance sustainable agriculture to bring about economic growth and improved livelihoods in the ECA region.
2. Introduce ASARECA and its strategic regional objectives, challenges, opportunities and successes to the patron ministers and members of the general assembly.
3. Provide an enabling environment for the general assembly to play its oversight role in accordance with the provisions of the Constitution and Governance Manual.
4. Receive from the patron ministers and the general assembly, in line with the mission of ASARECA, recommendations and strategic guidelines in agricultural research for development, extension and agricultural training and education, which will contribute to feeding the region in the 21st century.

1.3 Participants

The general assembly was attended by over 275 delegates representing: National agricultural research institutes (NARIs) and national agricultural research systems (NARS); sub-regional associations responsible for the coordination of agricultural research; extension and agricultural training and education and related associations; farmer's associations; associations of processors of agricultural products; associations representing agricultural service providers; associations of agricultural products; associations of agricultural businesses and related marketing agents; consumer associations; organised women's groups and youth groups working in agriculture-based associations and non-governmental associations (NGOs) working in agricultural research for development; investors and donors; international research centres belonging to Consultative Groups on International Agricultural Research (CGIAR); universities and advanced research institutes and academies of science among others. Annex II includes a complete list of delegates.

1.4. Conference approach

The general assembly held plenary and parallel sessions. To focus deliberations on the critical issues related to agricultural research, extension and training, a thematic approach clustering related presentations and discussions was used. The accent was on sharing success stories of stakeholders and partners.

1.5. Key elements of day-to-day proceedings

The first day's plenary session was divided into two parts: the opening and scene setting; and presentations and discussions under sub-theme I (Agricultural Development Challenges and Opportunities).

The first part comprised the official opening, keynote paper presentations and ministerial statements from the ten member countries.

The keynote presentations were:

- Agricultural science, technology and innovation: Feeding ECA in the 21st century.
- Managing current and future climate change-induced risk in ECA agriculture.
- ASARECA strategy, regional challenges and opportunities in the context of the theme: Feeding our region in the 21st century.

The second part comprised presentations and discussions under sub-theme I. The topics discussed under this theme included:

- Emerging impact of Comprehensive African Agricultural Development Programme (CAADP) as a planning and partnership platform to accelerate growth and poverty reduction
- High volatile food prices: drivers and impacts on food security in ECA
- Governance and policy imperatives for transformation of agriculture in ECA
- Harnessing livestock resources for food security in pastoral areas of ECA Proven technologies for feeding the region

The presentations were followed by a panel discussion on the issues raised, and provided a space for alternative views.

The second day started with a plenary session on the role of gender mainstreaming in agricultural R&D and its contribution to feeding the region in the 21st century. Thereafter, the assembly split into parallel sessions running under sub-themes II, III and IV. In each parallel session, a lead presentation was followed by discussion and proposals outlined for recommendations to the general assembly.

Outline of sub-themes and topics

The following were the presentations under each of the general assembly sub-themes:

Sub-theme I: Agricultural development challenges and opportunities

- Agricultural science, technology, and innovation: feeding ECA in the 21st century
- The emerging impact of CAADP as a planning and partnership platform to accelerate growth and poverty reduction
- High and volatile food prices: drivers and impacts on food security in ECA
- Governance and policy imperatives for transformation of agriculture in Eastern Africa
- Managing current and future climate induced risk in ECA Agriculture
- Harnessing livestock resources for food security in pastoral areas of ECA,
- Proven technologies for feeding ECA region

Sub-theme II: National and regional institutions perspectives

- Role of farmers, the regional farmer organisations and their strategic partners in feeding the ECA region in the 21st century
- Emerging issues under food insecurity in the ASARECA region
- The role of universities and their strategic partners in attaining food security in the ECA region in the 21st century
- The role of NGOs, the regional NGO forums and their strategic partners in feeding the region in the 21st century
- The role of agricultural extension, the regional extension organisations and their strategic partners in feeding the region in the 21st century

- The role of the private sector, the regional private sector associations and their strategic partners in feeding the region in the 21st century.

Sub-theme III: Partner institutions perspectives

- CGIAR perspectives
- Integrated bio-economy systems for food security and sustainable development in Africa
- The East African Agricultural Productivity Programme perspectives
- International Centre of Insect Physiology and Ecology (ICIPE) perspective

Sub-theme IV: Advances in research for development and ASARECA success stories

Overcoming seed potato quality constraints to tackle food security and poverty in the ECA region in the 21st century

- Utilisation of beans for improved health and nutrition
- Crop-livestock integration for sustainable management of natural resources in ECA
- Genetic engineering of maize for drought resistance in ECA
- Promoting sustainable natural resource management (NRM) through effective governance and farmer-market linkages: lessons and opportunities
- Evolution of seed sector policies in ECA
- Promoting farmer-led seed enterprises of African indigenous vegetables to boost household incomes and nutrition in Kenya and Tanzania
- Improving capacity of agricultural research in ECA
- Harnessing agro-biodiversity for food security and sustainable development: conservation and sustainable utilisation of plant genetic resource (PGR) in Sudan.

In addition to the parallel sessions, there was also a Business Committee meeting to discuss the following:

- ASARECA annual performance report
- ASARECA annual work plan and budget for 2012
- General assembly rules of procedure
- Recommendations to the general assembly

Half of the third day was devoted to open space and side meetings; later the general assembly was convened to receive the recommendations from the Business Committee, followed by the official closure.

> "ASARECA should commission studies to understand the underlying bottlenecks to technology adoption; review and critique the extension approaches and their relevance; widen its scope of capacity building to include extension and contribute to building the capacity of pluralistic extension services delivery system encompassing public; private and farmer-based extension."
>
> *One of the key recommendations to ASARECA General Assembly*

2 RECOMMENDATIONS FROM THE GENERAL ASSEMBLY

The first ASARECA general assembly adopted the following recommendations from the ASARECA Business committee:

2.1 Agricultural development – challenges and opportunities

ASARECA should:

- Work with national governments to increase investment in science, technology and innovation (STI), particularly advances in biotechnology, and ICTs.
- Support mechanisms and approaches that encourage participation of targeted technology users in the development of new technologies for relevance and easy uptake.
- Strengthen the mechanisms for member countries to tap into existing opportunities (including technological options) to enhance regional agricultural production and productivity.
- Increase focus on scaling out of best practices informed by a dynamic inventory of proven technologies and innovations that will contribute to enhancing production, food security and adaptation to effects of climate change.
- In addition to increasing agricultural production and productivity, increase efforts towards regional market integration and trade, removal of non-tariff trade barriers, infrastructural development to enhance access to markets and trade within the countries.
- Increase efforts towards addressing food price volatility.

2.2 Climate change

ASARECA should:

- Make climate change a focal and crosscutting issue in its programmes and projects
- Support its member countries to generate reliable weather data through building the capacity at national and regional levels for dependable weather forecasts to aid decision-making and appropriate responses to climate change.
- Sensitise its membership and promote best practices that enhance production, food security and adaptation to effects of climate change.

- Play a key role in raising awareness on climate change to minimise post-harvest losses and address the issue of access to food. Emphasis should also be put on post-harvest handling and storage (warehousing).

2.3 Policies and political commitment

Policies and political commitment are the most critical success/failure factors for advancement and use of science, technology and innovation for agricultural development. ASARECA should:

- Strengthen its engagement and that of its stakeholders in policy advocacy and dialogue to solicit political will and development of supportive policies for agricultural development.
- Facilitate mechanisms for effective coordination of research, extension and training to effectively deliver services to a wide-range of stakeholders in the agricultural sector.
- Lobby for government support to smallholder farmers to access inputs and credit services to invest in more productive technologies and practices.
- Strengthen its collaboration with Regional Economic Communities to influence political support to the CAADP process.

2.4 Disconnect between NARIs and the faculties of agricultural sciences

To address the disconnect between agricultural research in the NARIs, and the various faculties of agricultural sciences (FAS) in ECA, ASARECA should:

- Initiate and or strengthen national institutional frameworks that coordinate and consolidate agricultural research in NARIs and training in faculties and schools of agriculture and related disciplines.
- Support universities to undertake reforms that make them more relevant to current and future needs.
- Champion the establishment of a new generation of agricultural universities that integrate agricultural research and university training. Such a university should be anchored in the ministries of agriculture but linked with other relevant sectoral ministries like education, environment, roads, and so forth.
- Influence and lobby for new policies that nurture universities that keep pace with change.
- Mobilise more resources and extend more funding to universities as a strategy to strengthen the relationship between the private sector and the national research institutions.
- Support and foster collaborative research between universities and NARIs, and engage with the private sector to commercialise the research output.

2.5 Contribution towards CAADP

ASARECA should:

- Strengthen its collaboration with Regional Economic Communities to garner political support for the CAADP process.
- Ensure that all stakeholders (NARIs, universities, extension organisations, NGOs, the private sector and farmer organisations) fully participate in the CAADP process through increased support for their capacity building.
- Engage more with the private sector to develop the agricultural value chain.
- Provide directions and guidelines to advance science and technology, particularly biotechnology.
- Adopt English and French as official languages to enable the various stakeholders interact and communicate more effectively.

2.6 Supporting farmers and their organisations

ASARECA should assist farmer organisations:

- To build their capacity and that of their partners to engage in post-production activities in the value chain, like value addition, marketing and enterprise development and develop entrepreneurial skills such as record keeping, business planning, market intelligence, negotiation, and M&E.

- To establish strong governance and leadership structures that represent the needs and interests of members; manage their organisations in an efficient and accountable manner and solicit and/or access support services such as credit, advisory services, and market information.
- To lobby, advocate and influence policies (such as land reforms) that favour investment in their development plans, including agricultural technologies.
- To create an innovative platform and network for information and knowledge management, including indigenous knowledge and information sharing to promote continuous learning and adaptation among the different stakeholders. Multiple approaches to the dissemination of information and technologies should be encouraged, including the use of electronic media such as radio, TV, mobile phones and the internet.
- To articulate and pursue their needs and priorities.
- To develop systems that guarantee access and utilisation of productivity-enhancing technologies such as improved seed and agro-inputs.

2.7 Strengthening extension

ASARECA should:

- Commission studies to understand the underlying bottlenecks to technology adoption.
- Review and critique the extension approaches and their relevance in different contexts.
- Widen its scope of capacity building to include extension and contribute to building the capacity of pluralistic extension services delivery system encompassing public, private and farmer-based extension.
- Support initiatives that foster partnerships and closer collaboration between research/training and extension service providers, including farmer organisations, NGOs, private sector organisations and civil society.

2.8 Supporting NGOs

ASARECA should:

- Encourage and support genuine NGOs that play a supportive role to functions of ASARECA and create platforms for their networking and partnerships with research/training institutes.
- Broaden its "concept of NGOs" to embrace civil society organisations to tap into the contribution of professional associations in agriculture-related disciplines.
- Enhance the participation of NGOs in programme priority setting.
- Nurture and enhance the capacity of NGOs to mobilise resources, including competing for agricultural research and development (ARD) funds, and create a window through which they can favourably compete for resources from ASARECA.

2.9 Supporting the private sector and their strategic partners

ASARECA should empower the private sector by:

- Building its capacity to lobby and advocate for favourable policies, for example tax exemptions on agricultural goods and products, and increased access to finance for agriculture.
- Commissioning research into strategic entry points for greater interaction between the private sector and farmers that could trigger economic transformation within the agricultural subsector.
- Providing access to an inventory of available technologies and their suitability in the different areas within the region, production levels, potential markets, value addition, and so forth.
- Facilitating an innovation systems approach to make value chains and agribusiness in the region work, and support dialogue among the different actors.
- Supporting agribusiness incubation centres in research institutions so that the private sector and the farmers can learn about how the business works.

- Providing evidence-based recommendations that inform the policy formulation processes, with an emphasis on activities, processes and procedures that support commercialisation of agriculture, including financial services and risk aversion.

2.10 Dealing with emerging issues underlying food insecurity

To coordinate agricultural R&D efforts to deal with emerging issues underlying food insecurity, ASARECA should:

- Strengthen its efforts in engendering agricultural research and enhance equity to boost food production.
- Strengthen centres of excellence and build their capacity by recruiting outstanding scientists and developing infrastructure to produce and/or exploit appropriate technologies for diverse cultures.
- Support member countries to invest in rainwater harvesting, water harnessing and irrigation to boost agricultural productivity and enhance food security.
- Strengthen quality assurance in the entire agricultural research and production system.
- Zone the ECA region and implement mega projects in suitable agro-ecological zones for greater impact.

2.11 Mainstreaming universities in the R&D system

ASARECA should:

- Support a mapping exercise as a step towards building a database of experts within the ECA region and initiate ways of sharing that capacity within the individual countries and across the region.
- Establish and co-ordinate national platforms which bring together various FAS in the ECA regions to foster and develop regional programmes on capacity building as well as R&D.
- Explore the possibility of using the institutional infrastructure which has been established in the ECA region to develop regional programmes on HR capacity building and R & D efforts in agricultural sciences in the region.
- Tap into the existing regional and global networks that strengthen collaboration between universities and national research institutions, to strengthen human resource capacity development, institutional knowledge management and learning.
- Support universities to undertake reforms that make them more relevant to the current and future needs.
- Increase representation of universities on the ASARECA Board based on the number agricultural-oriented universities and the number of scientists and the diversity of disciplines.

"The people and Government of Uganda have made exceptional contribution to the success of ASARECA. ASARECA was established in 1994, and Uganda offered to host ASARECA in the offices of NARO. At that time, ASARECA did not have enough funds to start a new office. In addition to this generous effort, Uganda also provided the first Headquarters agreement for ASARECA, allowing it to be legally established in Uganda for the benefit and service to all the member countries."

Remarks by ASARECA Board Chairman, Dr. Lala Razafinjara

3 SPEECHES AT THE OPENING CEREMONY

ASARECA Board Chairman, Dr. Lala Razafinjara

3.1 Welcome address and briefing on ASARECA by Prof. Dr. Lala Razafinjara, Chairman, ASARECA Board of Directors

Honourable Mr. Tress Bucyanayandi, Minister of Agriculture, Animal Industry and Fisheries of Uganda, Honourable Ministers from the 10 Member States, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

First of all, on behalf of ASARECA, I'd like to welcome you all to the first ASARECA general assembly being held here in Entebbe from 14 to 16 December 2011.

The people and Government of Uganda have made an exceptional contribution to the establishment and success of ASARECA. ASARECA was established in 1994, and Uganda offered to host ASARECA in the offices of National Agricultural Research Organisation (NARO) since ASARECA did not have enough funds then to start a new office. In addition to this generous effort, Uganda also provided the first Headquarters Agreement for ASARECA, allowing it to be legally established in Uganda for the benefit and service to all the member countries. ASARECA would also like to note with great appreciation the fact that the first ASARECA general assembly, which is attended by ministers from the 10 member countries, is also hosted in Uganda.

The Board of Directors of ASARECA, on behalf of the member countries, wanted to acknowledge this special contribution from the people and government of Uganda and therefore decided that the first president for the ASARECA general assembly should be a Ugandan. The Board of Directors of ASARECA kindly requested Hon. Tress Bucyanayandi, the Minister of Agriculture, Animal Industry and Fisheries, to nominate the first president from among the members of the Business Committee representing Uganda. Hon. Tress Bucyanayandi nominated Prof. Elly Sabiiti to be the first President for the first ASARECA general assembly. ASARECA would like to acknowledge and express its great appreciation for the special contribution that the people and Government of Uganda (have) made to the establishment and success of ASARECA.

Introducing the first President of the first ASARECA general assembly, Professor Elly Sabiiti

Your Honour, Honourable Ministers, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

It is, therefore, my great pleasure, on behalf of the Board of Directors of ASARECA, to introduce to you our first President for the first ASARECA general assembly.

Professor Elly Sabiiti is a BSc (Agric,) MSc Agric and a PhD. He has over 34 years' working experience in agricultural research, university teaching, supervision, outreach and administration at national, regional and international levels. He has mentored 26 graduate students at the Masters and PhD levels and has over 100 valuable scientific publications for public and private communities.

He has provided the nation leadership as the Head of the Crop Science Department and as the Dean, Faculty of Agriculture. He chaired Faculty Boards and the Senate Science Committee, and has been a member of the Makerere University Senate since 1988.

General Assembly President , Prof. Elly Sabiiti

Outside the university, he has contributed to the formulation of policies on various boards/committees for agricultural development.

He belongs to over 22 professional bodies and has served as an international expert on agricultural sciences of an International Think Tank forum on agenda for new the millennium.

He is a Fellow of the Academy of Sciences for the developing World, the African Academy of Sciences, and Vice President of the Uganda National Academy of Sciences.

He has played a key role in the Ministry of Agriculture, Animal Industry and Fisheries for over 20 years, where he has served on several committees/boards such as NARO. He was a pioneer steering committee member for the formulation of the Plan for Modernising Agriculture and a pioneer Director on the National Agricultural Advisory Services Board. He won the Presidential Excellence award for Science, Technology Education, and the Makerere University Vice Chancellor's Innovations and Academic Excellence Award for transforming the living conditions of pastoral communities in Kazo rangelands. He practises professional farming using agricultural waste as bio-fertilisers. He was a pioneer member representing FAS on ASARECA Board.

Your Honour, Honourable Ministers, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

Please allow me to present to you now Prof. Elly Sabiiti, and please welcome him by showing your appreciation through your applause.

Prof. Elly Sabiiti, please come to the podium.

Your Honour, Honourable Ministers, Mr. President, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

Please give me the opportunity to introduce to you the members of the Board of Directors of ASARECA.

The Board of Directors, the highest governing body of ASARECA, consists of the NARI directors in the ten member countries together with representatives from FAS, extension, CGIAR and the private sector in the region.

The Board is responsible for providing the policy oversight for the organisation and includes the following members:

1. **Dr. Aime Lala Razafinjara**
   Director General, FOFIFA, Centre National de Recherche Applique au Developpement Rural
   Chairman, ASARECA BoD
   Madagascar

2. **Dr. Solomon Assefa Gizaw**
Director General, Ethiopian Institute of Agricultural Research (EIAR)
Vice-Chairman, ASARECA BoD
Ethiopia

3. **Dr. Fidelis Angelo Myaka**
Director of Research and Development
Ministry of Agriculture, Food Security and Cooperatives
Second Vice-Chairman, ASARECA BoD

4. **Dr. Nahimana Dieudonne**
Director General, Institut des Sciences Agronomiques du Burundi (ISABU)

5. **Dr. Paul Mafuka**
Director General, Institut National pour l' Etude et la Recherche Agronomiques (INERA)
D.R. Congo

6. **Dr. Iyassu Ghebretatios Fesha**
Director General, National Agricultural Research Institute (NARI)
Eritrea

7. **Dr. Ephraim Amiani Mukisira**
Director, Kenya Agricultural Research Institute (KARI)

8. **Prof. Martin Shem Ndabikunze**
Director General, Rwanda Agricultural Board (RAB)

9. **Dr. Eltahir Siddig Ali**
Director General, Agricultural Research Corporation (ARC),
Sudan

10. **Dr. Emily Kabushenga Twinamasiko**
Director General, National Agricultural Research Organisation (NARO), Uganda

11. **Mr. Philip Macharia Kiriro**
(Farmers' Representative)
President, Eastern Africa Farmers Federation (EAFF), Kenya

12. **Dr. Kallunde Pilly Sibuga**
(University Representative)
Department of Crop Science and Production,
Sokoine University of Agriculture, Tanzania

13. **Mrs. Lucy Muchoki**
(Private Sector Representative)
Executive Director, Pan African Agribusiness and Agro-Industry Consortium (PANAAC)

14. **Prof. Nafisa Elmahi Ahmed**
(Extension Representative)
Agricultural Research Corporation,
Plant Pathology Section, Sudan

15. **Dr. Chungu Mwila (Common Market for Eastern and Southern Africa, COMESA Representative)**
Chief Executive Officer, The Alliance for Commodity Trade for Eastern and Southern Africa, Zambia

16. **Prof Nafisa Elmahi Ahmed**
(Extension Representative)
Agricultural Research Corporation,
Plant Pathology Section, Sudan

17. **Mr. Richard Sahinguvu**
Representative of Non-Government Organisations (NGOs);
Director, INADES Formation,
Burundi

18. **Dr. Jimmy Smith**
Representative of Consultative Group on International Agricultural Research (CGIAR),
Director General
International Livestock Research Institute (ILRI)

19. **Dr. Seyfu Ketema**
Ex-officio member and secretary to the BOD,
Executive Director, ASARECA

Your Honour, Honourable Ministers, Mr. President, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

Finally, please allow me to introduce briefly to you ASARECA.

ASARECA is a sub-regional, non-political and not-for-profit association established in 1994 by 10 member countries: Burundi, the Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda.

The 10 ASARECA member countries cover an area of 8.5 million km^2, with a total population of more than 280 million people, most of whom are rural dwellers pursuing agricultural livelihoods. About 300 million hectares of ECA region are devoted to agriculture. Agriculture, therefore, plays an important role in the national economies throughout the region. Overall, it accounts for 43% of the regional GDP.

The goal of ASARECA is enhanced sustainable productivity, value added and competitiveness of the regional agricultural system.

Its mission is to enhance regional collective action in agricultural research for development, extension and agricultural training and education to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in ECA.

Finally, the main objective of ASARECA is to develop policies and programmes aimed at widening and deepening co-operation among the member states in agricultural research and policy for the mutual benefit of all the stakeholders in the agricultural sector.

Your Honour, Honourable Ministers, Mr. President, High Official Representatives of Governments, Distinguished Delegates, Ladies and Gentlemen,

This is a brief presentation about ASARECA. We hope that in the next three days you will get to know more about ASARECA, exchange with us novel and innovative ideas, share our vision and collaborate with us to help us achieve our ambitious challenge of feeding the ECA region in the 21st century.

We wish you a nice stay in Entebbe!

Thank you for your attention.

"Our governments and people expect much from our professionals working in the field of agricultural research. We expect that our scientists, in partnership with regional and international scientists, farmers, the private sector and development partners, will come up with new innovations to help us eradicate poverty, bring about economic growth and improve our livelihoods….. We expect them to improve the nutritional quality of food; improve the drought tolerance of crops; combat emerging diseases; and mitigate the impact of climate change."

Tress Buchanayandi, Uganda's Agriculture Minister addressing the Assembly

3.2 Official opening speech by the Chief Guest, Uganda's Minister of Agriculture, Animal Industry and Fisheries, Hon. Tress Buchanayandi

Photo: Uganda's Agriculture Minister, Dr. Tress Bucyanayandi, was the Guest of Honour

Honourable Ministers, High Officials and Delegates, The President of the general assembly, ASARECA Board Members, The Executive Director of ASARECA, High Officials and Representatives of Development Partners, Distinguished Delegates, Invited Guests, Ladies and Gentlemen,

It is my great pleasure to be here with you at the first ASARECA general assembly. Especially at this particular meeting when ASARECA is presenting its new constitution to the 10 member countries for ratification and signing.

On behalf of the government and people of Uganda, and on my behalf, I welcome you to our beautiful country, Uganda. You are all most welcome and we wish you to have a pleasant stay and enjoy the beauty of our country and the hospitality of our generous people. I take note and I am proud of the fact that our country, Uganda, was one of the 10 founding members of ASARECA when it was established in 1994. It gives me great pride and we are all delighted that our country, Uganda, is not only hosting the first ASARECA general assembly, but also that our country, Uganda, has been the host country for ASARECA since its establishment in 1994.

Uganda is hosting this especial first ASARECA general assembly, which focuses on the theme: "Feeding our region in the 21ST century". No doubt that this is a very important and timely

theme and our country, Uganda, assures you of our commitment to make this general assembly successful so that the people in our region benefit from its outputs.

We are happy to note that ASARECA is working towards achieving the Millennium Development Goals (MDGs) and the NEPAD Agricultural Agenda of CAADP. We appreciate the effort of ASARECA towards contributing to economic growth, poverty reduction and sustainable agricultural development of our region in Africa. At the continental level, at the sub-regional level and at the national level, we are facing social and economic development challenges. At such a moment, more than any other, countries need to come together, join hands and have a clear strategy with a clear vision on how to tackle common regional challenges and explore the potential for exploiting regional opportunities to bring about economic growth, fight poverty and improve the livelihoods of our people.

We are happy to note that ASARECA has taken the initiative to create this forum through its first general assembly, where the leaders and scientists of our national agricultural R&D organisations, international R&D institutions, the private sector, farmers, and development partners are able to come together, to address the important and timely subject of "*Feeding our region in the 21st century*".

God has blessed our continent with vast natural resources, and our sub-region has one of the best soil, water, and biodiversity resources, giving it vast agricultural potential.

But it still remains a major challenge for our continent, our sub-region and our specific countries to tap this vast agricultural potential for the benefit of our people. It is important that the people and governments of different nations join hands and work together to solve common problems and exploit potential common development opportunities for the benefit and common good of all the ASARECA member countries.

Our governments and our people expect much from our scientists and professionals working in the field of agricultural research for development. We expect our national scientists, working in partnership with the various stakeholders, to come up with new innovations that would help us to eradicate poverty, bring about economic growth and improve the livelihoods of our people. We expect t our scientists to:

- Improve the nutritional quality of food
- Improve the drought tolerance of crops
- Combat new or emerging agricultural diseases, weeds and insect pests
- Mitigate the impact of climate change, and
- Enhance the competitiveness of the agricultural system by improving quality, quantity, sustainable supply and adding value to our agricultural products

In conclusion, it is my great pleasure to note that, over the past decade, ASARECA, with its international and national partners, has accomplished a lot in the field of agricultural research for development in its effort to bring about economic growth and eradicate hunger through sustainable agricultural development in our region. I would like to assure you that the people and government of Uganda will continue to support ASARECA in its effort to accomplish its mission as a sub-regional agricultural research association.

In addition to investing your time in serious deliberations, please make sure that you take some time to see our beautiful country and enjoy the hospitality of our generous people. I wish you a pleasant stay in our country and I wish you success in your deliberations.

Thank you.

3.3 Discours de Son Excellence Monsieur Roland Ravatomanga, Ministre de l'agriculture de Madagascar

La perception actuelle du monde rural à Madagascar met en premier plan l'énorme potentiel dont dispose le pays, non seulement en matière d'agriculture, élevage et pêche, mais également dans les secteurs mines et bois.

L'île de Madagascar s'étend sur une superficie d'environ 585.000 km^2 avec une population de 20 millions d'habitants dont 80% vivent en milieu rural et 73,2% dépendent de l'activité agricole. Cependant, la contribution de l'agriculture n'est que de 27% du PIB national.

L'aliment de base des Malgaches est le riz avec une production annuelle de 3.400.000 t sur une superficie de 1.200.000 ha. Une grande diversité des conditions agroécologiques permet cependant une grande diversité dans les activités agricoles. C'est ainsi que le manioc et le maïs jouent un grand rôle dans la complémentation du régime alimentaire des Malgaches avec des productions de 2.900.000 t et 390.000 t respectivement sur 390.000 ha et 250.000 ha.

L'élevage constitue avec l'agriculture l'élément de base de l'économie malgache et la principale source de revenu de 25% de la population rurale. Quatre sortes d'élevage sont essentiellement pratiquées à Madagascar: l'élevage bovin qui est le plus important (9.500.000 têtes), l'élevage porcin, ovin, caprin et l'aviculture. Mais le miel des Hauts Plateaux malgaches a été cité comme référence mondiale de « miel d'eucalyptus » récolté en zone tropicale à cause de sa grande qualité avec une pureté pollinique exceptionnelle de 97%.

La pêche et l'aquaculture constituent également un secteur porteur sur lequel Madagascar peut asseoir son développement économique. Son potentiel est constitué de 5 600 km de côtes, 50 000 ha de tannes propices à l'aquaculture de crevette, 155 000 ha de lacs et de lagunes présentant des intérêts halieutiques, et 150 000 ha de rizières propices à la rizipisciculture. Les produits annuels de la pêche maritime sont estimés à 100.000 t et ceux de l'aquaculture à 30.000 t.

Cependant, la majorité de la population rurale vit au dessous du seuil de pauvreté avec un revenu journalier inférieur à 1 dollar US et une consommation moyenne de moins de 2133 calories par jour. A cause du niveau de revenu très bas, l'insécurité alimentaire et nutritionnelle est prédominante en milieu rural. 45% des enfants de moins de trois ans souffrent de malnutrition chronique et 22% de malnutrition sévère.

Face aux exigences des marchés extérieurs qui constituent de solides barrières non tarifaires pour les produits malagasy, l'économie rurale, encore très faible, trouve beaucoup de difficultés pour s'intégrer dans l'économie mondiale ou régionale. Les pratiques de production (agriculture, élevage, pêche) restent très archaïques, résultant en une productivité très faible, et l'esprit de spéculation est encore omniprésent chez les opérateurs commerciaux. La transformation des produits agricoles et miniers reste embryonnaire sauf pour quelques filières. Bref, les produits sont peu compétitifs.

Deux types d'économies restent prédominantes à Madagascar : d'une part, l'agriculture de subsistance traditionnelle dans la campagne éloignée des grandes villes, et d'autre part, l'économie vivrière marchande émergente liée à l'agriculture périurbaine qui commence à prospérer aux alentours des grandes agglomérations et des sites touristiques. La première reste difficilement ouverte aux innovations et intègre peu l'économie de marché ; elle est à l'origine de l'importation des produits alimentaires de base comme le riz. Le second alimente les besoins du marché notamment les grandes surfaces et supermarchés, ainsi que les grands restaurants, et est potentiellement capable de générer des revenus pour améliorer les conditions de vie.

Par ailleurs, la filière vivrière marchande commence à être sollicitée par les opérateurs économiques pour l'exportation : cas de la pomme de terre, du haricot vert, du cornichon et des épices (piments, oignons, gingembre). En expansion, cette économie marchande peut être à l'origine de la diversification de la production et du développement des initiatives ; elle peut également répondre à une utilisation intensive de l'espace rural pourvu que l'investissement foncier soit protégé. Elle préfigure les transformations à venir dans l'ensemble des campagnes.

Pour les cultures d'exportation, le vieillissement des plants et le mauvais entretien des plantations sont à l'origine de la baisse de la production et de la mauvaise qualité des produits. Seuls, la vanille et le litchi, qui bénéficient d'appuis

de projets bilatéraux ou multilatéraux, connaissent un regain d'essor avec l'apparition de nouvelles plantations. Par contre, le café souffre de la concurrence internationale et de la détérioration des termes de l'échange.

Les feux de brousse successifs sont à l'origine de dégâts successifs sur le système de production ; en effet, ils causent l'érosion des pentes et provoquent des inondations, l'envasement des infrastructures d'irrigation, la détérioration des réseaux hydro agricoles, la rupture des digues et de l'ensablement des rizières ; de plus, ils entraînent la régression des pâturages naturels. Certaines pratiques culturales traditionnelles comme le brûlis-abattis, ne respectent pas non plus les mesures de conservation des sols et des eaux et entraînent la baisse de la fertilité des sols. Ces facteurs sont à l'origine de la dégradation de l'environnement, exacerbée par le changement climatique et résultent dans la stagnation sinon la diminution de la production et de la productivité.

Le monde rural reste soumis aux catastrophes et fléaux naturels : cyclones, inondations, sécheresse, et aux attaques des organismes nuisibles (criquets, rats, insectes) ainsi qu'aux maladies et autres pestes.

Pour faire face à ces défis, le Gouvernement Malgache considère le développement rural comme une de ses priorités. Ainsi, les efforts de l'Etat pour le développement de l'Agriculture, conformément aux engagements de Maputo, en 2003, sont matérialisés par la mise en œuvre de programmes/projets concernant les domaines du développement rural, la recherche agricole, le renforcement des pôles de production, la foresterie et la préservation de l'environnement, et dont les réalisations peuvent être confiées à d'autres départements ministériels que celui chargé de l'agriculture.

Depuis ces 7 dernières années, l'Etat a accordé une importance croissante pour le secteur agricole. En effet, si en 2004 la part du budget alloué au financement du développement agricole et rural ne représentait que 7,28% du budget de l'Etat, elle est passée progressivement à 13,85% en 2008, mais accusait par la suite un certain déclin à cause de la crise politique dans le pays.

Les investissements progressent, mais dépendent beaucoup des financements extérieurs. Les investissements directs étrangers dans l'agriculture, l'élevage et la pêche demeurent limités malgré un taux de valeur ajoutée important surtout pour la pêche. Le domaine de la recherche appliquée au développement rural se retrouve affaibli dans ses moyens mais arrive à assurer sa visibilité par le biais des coopérations scientifiques avec les différentes institutions de recherche internationales et régionales, ainsi qu'à travers les partenariats.

Le défi qui attend le pays pour nourrir sa population et pour contribuer à l'alimentation de la population de notre région est immense, mais c'est un défi à relever. Dans sa vision, le Ministère de l'Agriculture envisage une Agriculture (au sens large du terme) coordonnée dans toute la chaîne de valeur, qui profite à toutes les parties prenantes ; une agriculture qui n'est plus de subsistance mais de plus en plus orientée vers le marché.

Et c'est dans ce sens que Madagascar vient de lancer officiellement il y a quelques semaines, le processus « Programme Sectoriel Agricole» aligné au processus CAADP du NEPAD et qui implique toutes les parties prenantes des sous-secteurs agriculture, élevage et pêche. Des efforts dans la professionnalisation du secteur Agricole sont actuellement entrepris, surtout dans le lancement d'un projet de soutien aux jeunes entrepreneurs agricoles, qui initie et forme les jeunes entrepreneurs agricoles à être des professionnels en leur dotant d'un terrain avec titre pour les motiver. D'un autre côté, un certain nombre de technologies innovantes ont été développées par notre système national de recherche et sont prêtes à être disséminées ou transférées. C'est une valeur ajoutée que nous pourrions apporter au sein de l'ASARECA pour être partagée avec les autres pays membres.

Le développement de technologies innovantes est vital. Leur dissémination rapide au niveau des producteurs renforcés dans leur capacité et rendus professionnels dans l'entreprise de leurs activités est également cruciale. Et c'est dans ce sens également que nous voudrions saluer ici les actions de l'ASARECA dont le mandat est de renforcer l'utilisation des innovations de recherche et de développement agricole en Afrique de l'Est et du Centre.

Ce but répond d'ailleurs, à la conviction générale selon laquelle très peu de pays, surtout dans notre région, sont capables de maintenir un système national de recherche agricole répondant à leurs besoins de développement rapide mais durable ; mais cet objectif peut être atteint par une action collective des différents systèmes nationaux de recherche. Notre attente est de profiter au plus vite des technologies développés dans les autres pays membres et d'avoir un système national de recherche agricole renforcé et efficient, qui permettra à notre pays de nous lancer dans cette grande aventure humanitaire collective qui est de « **Nourrir notre région pour le 21è siècle** ».

Je vous remercie de votre attention.

3.4 Statement by H.E. Mr. Arefaine Berhe, Minister of Agriculture, the State of Eritrea

Honourable Minister H.E. Mr. Tress Bucyanayandi, Minister of Agriculture, Animal Industry and Fisheries of the Republic of Uganda, Honourable Ministers of the 10 ASARECA member countries, Executive Director of ASARECA, Representatives of Development Partners, Distinguished Delegates, Ladies and Gentlemen,

Allow me again to express my utmost gratitude to the Government and people of Uganda for the warm hospitality that they have accorded to my delegation and me and for hosting the first ASARECA general assembly. Let me also applaud Honourable Mr. Tress Bucyanayandi for the initiative that he has taken to convene this important and timely conference on "Feeding our region in the 21st century".

Your Honour,

The theme and timing of this conference could not be more appropriate. Needless to emphasise, the communality of interests that exist between all the member countries of ASARECA on a wide range of economic and cultural issues in the context of agriculture research is too evident to merit elaborate exposition. This is particularly true in the field of agricultural development and food and nutrition security. The scope and synergy in promoting our shared objectives and interests through agricultural research is substantially high.

Our region has a huge arable landmass with tropical weather and diversely rich soil for agricultural activities, but it is unfortunately under-utilised. In addition, climate change and global economic turmoil have intensified the food crisis in the region. More collaboration is needed to utilise our member countries potential to redress the food crisis and more so in agricultural research.

For a broad spectrum of synergy and cooperation, allow me to highlight the state of agriculture in Eritrea.

Situated at the eastern end of the Sahelian Zone of Africa, the topography of Eritrea is characterised by the central highlands flanked by the lowland plains to the east and west. The country has three main climatic zones: the central highland with cool sub-humid to semi-arid climate; the western lowlands with a hot semi-arid climate; and the eastern lowlands with an arid climate. About 80% of Eritrea is characterised by hot arid and semi-arid land (ASAL) that receives a mean annual rainfall below 500 mm. Only 1.5% of the country receives more than 700 mm annually. The ecological diversities inherent in the topography of the country offer several opportunities for agriculture and livestock development.

Eritrea has long coastal areas (1200 km), endowing it with ample marine resources that are yet to be fully exploited.

Agriculture is a major sector of the economy of Eritrea. It is the main source of livelihood for over 70% of the population, but contributes only 19% of the Gross National Product (GNP).

One of the development challenges that the government and people of Eritrea seek to address is food and nutrition security and sustainable agricultural development. Hence, the government has rightfully asserted food security as "a priority of priorities" on its development policy agenda. Its approach to food security is based on self-reliance from a comprehensive and integrated perspective, and it is exerting its efforts to achieve this national objective within the foreseeable future.

Your Honour,

About 2.1 million ha are estimated to be arable, of which 71% is suitable for rain-fed and 29% for irrigation. However, currently, only 0.6 million ha is under cultivation, of which 10% is irrigated agriculture. Hence, there is a lot of room in the arid and semi-arid parts of the country for improvement and expansion of agricultural activities to increase food production; conserve the environment; and accelerate poverty alleviation as well as to increase rural incomes, which could help to mitigate rural-urban migration.

The majority of smallholders produce primarily for subsistence. Farmers located in ASALs of Eritrea face a number of sustainable land management challenges, including vulnerability to land degradation exacerbated by climate

change and drought challenges, low soil fertility, and erratic rainfall. Application of low-input low-output traditional technologies, use of low-productive genotypes, use of traditional hand tools and animal-drawn implements, and poor storage and processing facilities have resulted in low agricultural productivity.

Eritrea's current polices and laws provide an enabling framework for good environmental management. Its rural development policy explicitly aims at improving land productivity through natural resource conservation and rehabilitation, with special emphasis on water resources. It encourages participation and mobilisation of local communities in the rehabilitation of degraded lands and management of local resources.

A sustainable development that would in the long run meet the country's national and household food security is Eritrea's long-term objective. Whereas, its specific objective is to increase production, employment opportunities and incomes of the rural communities.

To this end, the Government is supporting agriculture with the provision of modern crop and livestock production technologies and improved NRM methods. It is also providing improved access to basic infrastructure, mainly rural roads, irrigation systems, water supply, electricity, farm mechanisation and inputs with the aim of enhancing the sustainability of the livelihoods of the rural community.

Eritrea owns a significant population of livestock that are unevenly distributed in poor range lands. The livestock owners are also more interested in quantity rather than the quality of their livestock. The situation is exacerbated by the fact that there are very few water points across the grazing areas, resulting in continuous land degradation and decline of livestock and livestock products.

To remedy this situation, establishment of semi-intensive rangeland networks is needed in potential ranging areas to improve the agro-pastoral livelihoods. A semi-intensive range land package includes area demarcation and enclosure; construction of water points and check-dams; planting and sowing nutritionally superior forage plants; keeping genetically improved livestock breeds; provision of veterinary services; introduction of forage banks in respect to livestock carrying capacity; and transportation and marketing of livestock and livestock products.

Your Honour,

Although irrigation development in Eritrea has a long history, most of its infrastructure was destroyed during the successive colonial periods.

Nowadays, a number of smallholder and commercial farmers are engaged in vegetable, fruit and forage production that supply the local market. Commercial farming in Eritrea is at its infancy. A few farmers have undertaken modernisation of their agriculture using tractor services, improved seeds, inorganic fertilisers, efficient irrigation technologies and improved livestock breeds. Some smallholder and commercial farmers are now in transition to change to modern farming systems, but they need considerable technical support.

In the light of the above-mentioned points and to address Eritrea's agricultural development and food security challenges, the Ministry of Agriculture has started paying attention to the relatively vast arid and semi-arid parts of the country, which could substantially contribute to increased production of crops and livestock provided the right approach is adopted.

Comprehensive programmes of soil and water conservation, including watershed treatment, establishment of closures, tree planting, and construction of various soil and water retaining structures are more becoming regular features of the country's agricultural and environmental programmes. Communities at various levels are involved in these undertakings on a regular basis. Conservation agriculture is being piloted in the different agro-ecological zones. Eritrea would benefit from the experiences of many ASARECA member countries with regards to soil fertility, moisture retention and tillage as components of conservation agriculture to enhance food production.

As a result, Eritrea's arid and semi-arid areas are already showing some positive changes in productivity. But considering that experiences and technical capacity in this young country is very modest, collaboration with African countries in a similar situation is absolutely essential.

The vast areas of grasslands in the western and eastern escarpments have significant economic potential for those households that practice pastoralism and agro-pastoralist livelihoods. The quality and quantity of natural pastures and water management can be improved for their livestock with better interventions.

Recently, the coordinated efforts of agricultural research, regulatory and extension services within the Ministry of Agriculture have resulted in innovation and transfer of knowledge, which enabled farmers to increase their productivity. Small farmers who follow ecological approaches, maintain productivity and contribute to production, especially in dry lands, have been rewarded.

However, the diversity of crop and livestock production systems, dominated by small family farming units, each tailored to local ecological conditions as well as a changing market context, makes the search for a simple technical fix very difficult.

Food security, as rightly spelt out by the Government of Eritrea, is directly and indirectly fundamental to the sustainable realisation of most of the MDGs. Eritrea has already complied with MDG 1, set to be achieved by 2015, which envisaged reduction of poverty and hunger levels by half.

Your Honour,

NARI is being strengthened to develop new crop varieties suited for diverse soils, climatic regions and better breeds of livestock. It also has local research stations corresponding to agro-ecological zones. However, it needs more collaboration and synergy to upgrade the services it offers to match the demand of the farmers for higher production and productivity. Experience-sharing among the different research institutes in our region to raise crop and livestock productivity and to promote the use of sound soil and water management techniques is absolutely critical.

In conclusion, we look forward to robust and sustained cooperation in agricultural research among the ASARECA member countries. It is a call for action and Eritrea fully endorses the initiative taken.

Thank you for your attention.

3.5 Statement by Hon. Tefera Derbew, the Ethiopian Minister of Agriculture

Dear Mr. President, Honourable Ministers of the member countries, Distinguished Board of Directors, Distinguished Invited Guests, Ladies and Gentlemen,

Ethiopia is a country with a total surface area of 1.13 million km, with an estimated population of about 80 million. Agriculture continues to be the driving engine of the country's economy, accounting for 42% of the GDP, employing nearly 85% of the population, contributing about 90% of the exports and supplying over 70% of the raw materials for the agro-industries. Ethiopian agriculture is generally characterised by small-scale agriculture that contributes to more than 95% of the overall agricultural production.

Annually, agricultural crops are cultivated on more than 12 million hectares and the major crops grown include cereals (such as tef, wheat barley, maize sorghum millet, rice), pulses (such as faba bean and field pea, haricot bean, chickpea and lentil, soybean), oil seeds (sesame, ground nut, and niger seeds) roots and tubers (enset, irish potato, sweet potato, cassava), various vegetables, fruits, and spice crops. The country's major export and industrial cash crops include coffee, cotton, tea and sugarcane.

The country has a huge potential resources base, which can be used to improve agricultural productivity . The resources include diverse and conducive agro-ecological zones and climatic resources; a total surface area of 113 million ha, of which more than 56% is potential arable land (currently only 15% is utilised); more than 125 billion m^3 of surface and ground water resources, with nearly 3.5 million ha of potentially irrigable land (currently only about 0.8 m ha is under irrigation); rich biodiversity; and 134 million heads of livestock resources (cattle, sheep, goats, equines, camels and poultry)–all of which needs to be harnessed and utilised to bring about sustainable food security and agricultural transformation in the country.

Despite this potential resources base, agricultural production and productivity is still among the lowest, leading to poor economic growth, recurrent drought and problems of food security in the country. The major underlying factors responsible for low production and productivity of tinclude degradation of natural resources, diseases and pests infestation, the use of traditional production system, the devastating effect of climate change, poor adoption of improved technologies, access to credit, and poor infrastructure and marketing systems.

In recognition of these facts, Ethiopia began transforming its agriculture in the mid-1990s after the government formulated and pursued a pro-poor development strategy, which is known as Agricultural Development Led Industrialisation (ADLI). Since the start of implementing ADLI, with its focus on the development of smallholder agriculture as critical to transforming Ethiopia's agrarian economy, it has achieved a pattern of rapid and sustainable growth in agricultural production and productivity of peasant farmers through increased intensification and wider adoption of agricultural technologies. Moreover, the Ethiopian government, adhering to the Maputu Declaration, has continued to allocate well above the 10% limit of its annual budget to invest and transform the agricultural sector. As a result, the last decade has been different, as Ethiopia has revived its economy and registered a phenomenal double-digit economic growth in the past eight consecutive years.

In the current Growth and Transformation Plan of the country, the government has put great emphasis on modernising and transforming the agricultural sector by adopting three overarching key priority interventions. These include: improving the production and productivity of small-scale agriculture through a nation-wide scaling up of best and proven agricultural technologies; enhancing the management and restoration of natural resources and small-scale irrigation; and expanding all rounded support for the private sector to invest in large-scale agriculture. Accordingly, the government has set targets to double agricultural production from the present 18 million mt to 39.6 million mt, raise the average productivity of crop from the present 1.7t/ha to 3.7t/ha, and ensure food and nutritional security both at the household and the national level at the end of the plan period in 2015.

The Ethiopian government clearly understand that the implementation of such an ambitious plan to achieve rapid and sustainable agricultural development can hardly be possible without an aggressive and nationwide intensification of agriculture using demand-driven and high-yielding agricultural technologies. In this regard, the Ethiopian government and my ministry fully recognise the leading role being played by ASARECA in bringing together the ten countries to jointly tackle the common challenges hindering agricultural production as well as maximise our huge potential to ensure sustainable food and nutritional security in the region through the application of science-based agricultural technologies. To this end, Ethiopia has high expectations from ASARECA to further emphasise and reorient its research agenda to generate and avail more responsive, problem-solving and demand-driven agricultural technologies of regional importance, build the capacity of NARS of member countries, and enhance technology spillover among member countries for a wider impact and agricultural transformation in the region.

Finally, I would like to assure you that the Ethiopian government is extremely committed to provide all the necessary support to ASARECA for the realisation of its vision and mission.

I thank you very much for your attention.

3.6 Discours de la Ministre Burundaise de l'agriculture et de l'élevage, Hon. Odette Kayitesi

Excellences Mesdames, Messieurs les Ministres de l'agriculture et de l'élevage des pays membres de l'ASARECA, Monsieur le Président de l'Assemblée Générale de l'ASARECA, Excellences Mesdames, Messieurs, les Représentants des Partenaires de Développement, Mesdames, Messieurs, les membres du Conseil d'Administration de l'ASARECA, Monsieur le Directeur exécutif de l'ASARECA, Mesdames, Messieurs, les Directeurs Généraux des Institutions de recherches membres de l'ASARECA, Mesdames, Messieurs, les Représentants des Universités des Pays membres de l'ASARECA, Mesdames, Messieurs, les Représentants des ONGs, Mesdames, Messieurs, les Représentants du Secteur Privé, Mesdames, Messieurs, les Représentants des producteurs, Mesdames, Messieurs les Représentants des services de Vulgarisation, Distingués Délégués, Mesdames, Messieurs :

A l'occasion de cette première Assemblée Générale de l'ASARECA, l'honneur m'échoit de prendre la Parole devant cette noble assemblée, au nom du Peuple, du Gouvernement burundais et en mon nom propre pour avant tout remercier l'ASARECA pour l'accueil combien chaleureux dont les participants et moi-même avons fait l'objet. Cela témoigne si besoin en était de l'hospitalité des membres de l'Association et de ses dirigeants.

Excellences, Mesdames, Messieurs,

Le Burundi que j'ai l'honneur de représenter ici est situé entre le Rwanda au Nord, la République Démocratique du Congo à l'Ouest, la République Unie de Tanzanie, à l'Est et au Sud. Avec une superficie de 27 834 Km², le Burundi compte environ neuf millions d'habitants et connaît une densité de plus de 300 habitants au km² faisant de lui un des Pays les plus densément peuplés d'Afrique. Plus de 90% de la population est rurale et vit de l'agriculture qui est la source de ses moyens d'existence. Depuis 1993, le Burundi a été plongé dans une guerre fratricide qui l'a frappé tant au niveau politique, économique que social. Aujourd'hui, le pays sort petit à petit du marasme dans lequel il était plongé. Toutefois, il vit encore une situation de pauvreté très alarmante où la sécurité alimentaire est un défi et malgré nos efforts, 67% de la population rurale vit encore en dessous du seuil de pauvreté.

Dès la mise en place du Gouvernement issu des élections d'Août 2005, le Gouvernement du Burundi a entrepris, en 2006, une vaste campagne de consultation nationale qui a aboutie à l'élaboration d'un Cadre Stratégique de Lutte contre la Pauvreté (CSLP). Le document de CSLP complet a été adopté en juillet 2008. Il est doté d'un programme d'actions prioritaires et de sa mise en œuvre.

Excellences, Mesdames, Messieurs,

L'objectif du Gouvernement du Burundi est de mettre en place un plan de relance économique qui vise une croissance moyenne annuelle de 6 % à 7 % et le doublement du Produit Intérieur Brut (PIB) par habitant sur une période de 15 ans. Les secteurs porteurs de cette croissance forte et durable sont l'agriculture, l'industrie et l'artisanat. Cette forte croissance sera soutenue progressivement par le secteur privé, la Coopération régionale et internationale.Le Burundi s'est également doté d'une stratégie agricole nationale (SAN) qui s'inscrit dans la mise en œuvre du CSLP dont elle reprend pratiquement le contenu en matière d'agriculture: la sécurité alimentaire, la gestion durable des espaces et des ressources naturelles, la promotion d'une agriculture de marché et l'appui à la planification, à la vulgarisation et à la recherche.

La Stratégie Agricole Nationale (SAN) a aussi été élaborée en tenant compte des engagements internationaux et régionaux du Burundi en matière de développement de l'Agriculture et de la coopération en générale, notamment la déclaration de Paris, la déclaration de Maputo et la stratégie de développement agricole de la Communauté d'Afrique de l'Est (East African Community -EAC). Cette dernière met en avant les filières à haute valeur ajoutée, la recherche, l'échange d'information sur la sécurité alimentaire, la maîtrise de l'eau, la gestion rationnelle des ressources naturelles et l'harmonie des politiques et des normes de qualité. L'union douanière et la création du marché commun impliquent des ajustements nationaux conséquents dans la planification économique en général et dans la planification agricole en particulier. L'adhésion du Burundi au processus PDDAA/CAADP dans le cadre du NEPAD, témoigne aussi de la volonté du pays à éradiquer la faim en soutenant le secteur agricole par l'allocation d'au moins 10% des ressources nationales.

Excellences, Mesdames, Messieurs,

Si l'aurore de la reconstruction économique est en train de pointer à l'horizon, le ciel reste quelque peu assombri par les escarmouches des changements climatiques qui ne cessent de menacer notre Pays. Ces Catastrophes naturelles rendent notre population très vulnérable à telle enseigne que les objectifs du millénaire deviennent de plus en plus difficiles à atteindre. Ici, je salue encore une fois les efforts des pays, des Organisations Nationales, Régionales et Internationales, Gouvernementales et non Gouvernementales qui ne ménagent aucun effort pour appuyer notre pays afin qu'il puisse surmonter ces obstacles et atteindre progressivement la réduction de la pauvreté et le développement durable.

Avec l'appui de l'ASARECA que je remercie très sincèrement, le Burundi a pu bénéficier des projets de recherche qui concourent à la Réduction de la pauvreté et à la protection de l'environnement. Sans être exhaustif, je citerai le projet d'Amélioration de l'utilisation de la semence de bonne qualité chez le petit agriculteur, le projet d'amélioration de la productivité et de l'utilisation du manioc en Afrique Centrale et de l'Est, le projet de gestion intégrée de la striure brune et de la mosaïque du manioc en Afrique central et de l'Est, le projet d'intensification des agro systèmes intégrées sur le haricot volubile, le projet d'intégration de l'agriculture à l'élevage pour améliorer la productivité et la compétitivité des exploitations mixtes tout en renforçant la durabilité et la résilience de ces exploitations face aux effets de la variabilité et des changements climatiques; les projets d' amélioration de la santé et de l'alimentation des animaux afin d'augmenter la productivité de l'élevage chez nos petits exploitants, et j'en passe. Je salue également l'importante contribution de l'ASARECA à la formation de nos chercheurs à travers plusieurs formations à courte durée dans plusieurs domaines, ce qui a contribué à l'amélioration de leur savoir faire ; sans oublier les formations de troisième cycle au niveau Master. J'encourage vivement l'ASARECA à continuer sur cette lancée.

Excellences, Mesdames, Messieurs,

Les objectifs de réduction de la pauvreté sont à la fois nobles et difficiles à atteindre. Il faut mobiliser des moyens humains, matériels et financiers très importants. Cela est vrai dans tous nos pays de l'ASARECA en général, et plus particulièrement pour un pays comme le Burundi qui sort de longues années de Conflits. C'est pour cela que je demande à l'ASARECA de prêter une attention particulière au Burundi en travaillant encore plus avec notre Institut National de Recherche Agronomique, l'ISABU ; avec nos Universités et avec les divers partenaires travaillant pour le développement du secteur agricole dans le pays. Ces autres partenaires sont essentiellement les services de vulgarisation, les organisations non gouvernementales, les associations de producteurs, de commercialisation des produits agricoles et des intrants sans oublier le secteur privé et les producteurs eux- mêmes.

Excellences, Mesdames, Messieurs,

Cette Assemblée Générale de l'ASARECA vient donc à point nommé et sera l'occasion de discuter sur les défis majeurs à relever pour nourrir nos populations au cours de ce millénaire et atteindre parfaitement l'enjeu mondial de réduction de la pauvreté. Les résultats de ces discussions permettront sans doute de planifier d'autres activités à mener dans l'avenir pour arriver à une meilleure intégration de la recherche agronomique dans notre région d'Afrique de l'Est et du Centre afin de réaliser ensemble le but ultime de nourrir notre région au cours du 21ème siècle.

La nouvelle constitution que l'ASARECA vient de lancer vient à point nommé et permettra d'établir un cadre régional efficace dans lequel notre travail collectif va être encadré. Notre détermination à travailler avec les autres pays membres de l'ASARECA est sans faille et est proportionnelle à l'enjeu de la problématique de lutte contre la pauvreté et les défis du développement. Toutefois, il sied de noter que cette nouvelle constitution doit refléter un caractère inclusif surtout au point de vue linguistique.

En effet, alors que la langue demeure un outil de communication très important, mon pays tout comme la République Démocratique du Congo et le Madagascar sont des pays dont la langue officielle est le français. Certes, le Burundi est engagé en tant que membre fondateur de l'ASARECA, à contribuer pour la réussite des missions que l'association s'est assigné mais demande en contre partie que la Constitution de l'ASARECA consacre le Français comme la deuxième langue de travail de l'association.

Excellences, Mesdames, Messieurs,

Je ne doute pas qu'en travaillant ensemble, nous allons réussir le pari de bannir à jamais l'insécurité alimentaire et la malnutrition pour le bien être de nos populations.

Que vive la Coopération régionale ! Vive l'ASARECA

Je vous remercie.

3.7 Statement by Dr Theogene Rutagwenda on behalf of Rwanda's Minister of Agriculture, Hon. Dr Agnes Kalibata

Honourable Ministers of the ASARECA member countries, Delegates of the first ASARECA General Assembly, Ladies and Gentlemen,

I bring you greetings from Rwanda's Minister of Agriculture and Animal Resources, Dr. Agnes Matilda Kalibata, who has not been able to join us because of urgent national engagements at home. She has, however, wished you good deliberations during the assembly.

I now wish to take this opportunity to address you on the theme of the assembly: "Feeding our region in the 21st century", drawing on our experience in Rwanda. I also wish to answer the question, "Where is the food basket?" The food basket is with us, around us and we only need to tap it, orient it and make it work.

Agriculture in Rwanda

Rwanda's economy depends mainly on the primary sector, in which production of food crops is very essential. Traditionally, coffee, tea, hides and skins, and pyrethrum have been Rwanda's leading agricultural exports. These sectors have recently experienced rapid growth due to favourable prices as well as investment. There has also been an increase in high value commodities like fruits and vegetables. For food crops, there has been emphasis on rice, maize, beans, soya beans and cassava.

Rwanda's agriculture is carried out on the 1000 hills that are sometimes prone to erosion due to high population density and the farms are small, yet right now it is food secure.

How has this been achieved?

In 2007, the Government of Rwanda made an important decision to tap its agricultural potential by starting a crop intensification programme. At that time, only one-third of the country was food insecure. Today the entire country is food secure. The crop intensification programme is a package offered to farmers of inputs, including quality seeds and fertilisers delivered in time; land use consolidation; livestock ownership; and markets and extension. This has led to high crop yields, leading to food security and livestock ownership.

The government of Rwanda started a "one cow per family programme" in 2006. A poor family is given a pregnant heifer, and passes on the calf to the next poor family. The cow gives milk to fight malnutrition and also generates a cash income; additionally also producing manure for increased food production. To date, more than 117,000 families have benefited under this programme and since then milk production and manure availability have more than doubled.

There are indications that we can have food buckets in Rwanda and if we focus on developing them based on the regions where different crops do well and on the different geographical attributes, we can be food secure in the region.

Mr. President, Ladies and gentlemen,

Rwanda signed the CAADP compact in 2007 and has since been moving in the right direction of investment in agriculture. We have involved various stakeholders in the agricultural sector, including the private sector, NGOs and development partners. We have sector working groups and annual sector reviews that take stock of where we are and plan together, which has contributed to the development and implementation of policies and strategies that have led to the promotion of the agricultural sector.

Rwanda developed a programme to transform the agriculture sector in 2004; it was revised in 2009 (2nd phase) and we are now going into the 3rd phase. This programme has four pillars that are linked to the 4 Comprehensive Africa Agriculture Development Programme (CAADAP) pillars:

- Intensification and development of sustainable production systems (Pillars 1 & 3);
- Support to professionalisation of producers (Pillar 4);

- Promotion of commodity chain (Pillar 2);
- Institutional development of agribusiness (Pillar 4).

We believe that following these very important guidelines has led to the improvement of the agricultural sector.

I wish to thank ASARECA for organising the first general assembly, and Uganda for providing a home for ASARECA; and wish everybody fruitful deliberations. As for the theme of "feeding our region in the 21st century", it is possible; and yes we can!

I thank you.

> We are enjoying the fruits of agricultural research, including improved varieties for maize, rice, sorghum, millets, wheat, barley, coffee, cotton, tea, cashew, grapes, and agro-forestry. These varieties are grown using recommended agronomic and plant protection packages. I may confidently say that without these technologies, agriculture in Tanzania would not have been where it is now…
>
> I should, therefore, acknowledge the contribution of our regional partnership through ASARECA in attaining our research achievements. The partnership has been a source of support to various research projects that have complemented our government funding.
>
> *Statement by the Minister of Agriculture, Food Security and Cooperatives, Tanzania Prof. Jumanne Maghembe to the Assembly*

3.8 Statement by the Hon. Professor Jumanne Maghembe, Minister of Agriculture, Food Security and Cooperatives, Tanzania

The President of the general assembly, Distinguished Ministers, Distinguished Leaders of NARS, Distinguished ASARECA Representatives, Dear Participants, Organisers of this Assembly, Ladies and Gentlemen,

First and foremost, I would like to take this opportunity to thank the people and the government of Uganda for the hospitality they have accorded to our delegation since our arrival. Let me also thank the organisers and everyone who is here. I would like to acknowledge that I am happy to be associated with you and be a part of the concerted efforts to transform agriculture in order to feed our region in the 21st century. I also know that you have been facing various challenges while at the same time utilising the available opportunities as much as you can.

Your Honour,

While there are many developmental benefits that agricultural research has yielded in our region, I recognise that there is still work to be done, and this forum provides an extra platform to do just that. Let me say at the outset that I firmly believe that results and impact are what count. So I very much hope that everyone gathered here will be able to share what they have experienced in terms of the impact and benefits of agricultural research in our development agenda.

Let me underline the importance of agricultural sector in our region by taking the example of Tanzania. In Tanzania, agriculture is the leading sector in the economy. It accounts for 25.5% of the GDP, absorbs 74% of the labour force, meets 95% of the food requirement and comprises 34% of the foreign export earnings. In addition, the sector provides raw materials to industries and a market for industrial products. However, the sector's growth over the years has been low, averaging to about 4%, while the overall growth of the Tanzanian economy has been between 6% and 7% per annum for the past 10 years. This asymmetry is a problem in that 74% of the labour force represents only 25.5%, which explains the low productivity in the sector. Therefore, for any growth to be inclusive and pro-poor it must involve substantial growth of agricultural productivity and production and allow most of the rural population to benefit from such growth through selling to both domestic and export markets.

Your Honour,

The agricultural sector in Tanzania faces major challenges, including lack of access by majority of the farmers to support services such as improved agricultural technologies and extension services; continued dependence on rain-fed agriculture; poor rural infrastructure, limited capital and access to financial services; lack of investment incentives in agriculture; weak producer organisations; institutional constraints and gender-related problems. Furthermore, volatile food prices, population growth, low agricultural productivity and the potentially devastating effects of climate change make it a particularly daunting challenge. So how do we boost agricultural productivity and achieve regional food security while at the same time managing climate change? Part of the answer lies in partnership-based agricultural research for development. I know that this is exactly what ASARECA is doing.

Your Honour,

Let me reiterate that agricultural research plays an important role in our endeavour to boost agricultural productivity through our partnership-based agricultural research for development. Agricultural research is fundamental to meeting our regional, and Tanzania's in particular, agricultural challenges. Agricultural research drove the first Green Revolution in Asia. I also believe that agricultural research is contributing to our efforts to achieve development objectives and MDGs.

Agricultural research can ensure that smallholder farmers are provided with the means to adapt to climate change. It can ensure that poor rural people, whose lives and livelihoods depend on the earth's productive capacity, have the means to produce more and to produce it better.

Therefore, it is essential for us to harness the best of pro-poor agricultural research agenda and push back the frontiers of innovation to ensure improved agricultural productivity. It is also essential that we develop and diffuse innovative and climate-change-mitigating solutions, such as seeds that are more tolerant to drought or to floods, so as to assist resource-poor farmers.

We have a lot of examples of the benefits that can accrue from agricultural research, including improved varieties for maize, rice, sorghum, millets, wheat, barley, coffee, cotton, tea, cashew, grapes, agro-forestry, just to mention a few. These improved varieties are grown using research-recommended, improved agronomic and plant protection packages. I may confidently say that, without these technologies, agriculture in Tanzania would have not been where it is now.

Currently, we are more food secure than we were a few years ago. At this juncture, I should acknowledge the contribution of our regional partnership through ASARECA in attaining our current research achievements. This partnership has been a source of support to various research projects that have complemented our government funding. Examples of ASARECA-supported projects that have greatly aided our national objectives for attaining food security and improving agricultural productivity include:

- Transfer and dissemination of proven and emerging technologies in QPM (quality protein maize)
- Transfer and dissemination of proven and emerging agricultural technologies in orange fleshed sweet potato
- Introduction of *Dolichos lablab* in the rice-based based system

Your Honour,

Talking about the relationship between our research agenda, agribusiness and smallholders, agricultural research should provide the means for households to improve their livelihoods and get out of poverty. Our aim should be to transform smallholder agriculture into successful rural agribusinesses that are profitable and in which agricultural surpluses can be marketed. We should empower farmers to engage in agribusinesses. Farming has to be a business.

Your Honour,

There is also a need for greater investment in agricultural research to increase productivity. Currently, average global expenditure on agricultural research as a percentage of GDP is only1%. There are ongoing national and regional initiatives to improve the situation such as CAADP and the East African Food Security Programme. These should ensure a genuine two-way flow of knowledge and information between the scientists and the rural communities, to ensure that our response to the needs and conditions in rural areas is truly comprehensive.

Your Honour,

In recent years we have witnessed numerous emerging technologies and their applications for rapid agricultural growth. As we consider the capacity of agricultural research to support rural development, we have to use all of the available tools, technologies, and science at our disposal, including biotechnology. As everyone knows, agricultural biotechnologies encompass a wide-range of tools and methodologies that can be applied to crops, livestock, forestry, fisheries and aquaculture, as well as to agro-industries. Biotechnology can help in shortening our delivery and end-result time and in fine-tuning the products of research more efficiently in support of smallholder farming. We appreciate the regional partnership and support that we getting through ASARECA to use biotechnology applications in combating cassava diseases in our region and particularly in my country, Tanzania.

Your Honour,

Let me mention briefly the importance of agro-biodiversity. Indeed, biodiversity is a vital tool for rural development, climate change adaptation and poverty reduction. However, this is an area where we have been relatively weak. We have to help protect, preserve and enhance biodiversity as it draws on the knowledge accumulated by farming communities and our indigenous peoples over generations. This is because these people are best suited to recognise and understand their local needs under their local conditions.

Your Honour,

Finally, I would like to acknowledge the importance of public-private and other partnerships in agricultural R&D.

The private sector can help drive the skills and technologies needed for post-production activities, such as processing, value-addition, storage and marketing. These partnerships can also provide funding modalities. We have examples of this kind with cashew, cotton and coffee in Tanzania and other countries in the region. I believe these will continue to grow if our output improves their industries.

Local government authorities and national governments can create the right policy environment to allow agribusinesses and agro-industries to develop and flourish. Conducting research on the current policies will provide means for improved policies in all areas of agricultural development.

Your Honour,

Let me conclude by reiterating that agricultural research within ASARECA has contributed significantly to agricultural development. Agriculture and rural development hold the key to GDP growth. Agriculture research is fundamental to meeting many agricultural challenges. Agricultural research can ensure that the smallholder farmers are provided with the means to adapt to climate change. It can ensure that poor rural people, whose lives and livelihoods depend on the earth's productive capacity, have the means to produce more and to produce it better.

Our aim should be to transform smallholder agriculture into successful rural agribusinesses that are profitable and in which agricultural surpluses can be marketed. There is a need for greater investment in agricultural research to increase productivity. As we consider the capacity of agricultural research to support rural development, we have to use all of the available tools, technologies and science at our disposal, including biotechnology to harness our rich biodiversity.

Mr. President, Distinguished Guests, Colleagues, all participants in this historical assembly, let me now finish by thanking you for listening to me and wishing you fruitful discussions.

3.9 Statement by Hon. Kareke Mbiuki, Assistant Minister for Agriculture, Kenya

Distinguished Guests, Ladies and Gentlemen,

It gives me pleasure to grace this occasion, which is the first general assembly of ASARECA. May I take this opportunity, on behalf of the Government of Kenya, to express my gratitude to the organisers of the event for inviting me and granting me an opportunity to address the assembly.

First, I would like to inform participants at this assembly that Kenya's economy is largely agro-based, with the agricultural sector accounting for about 24% of the GDP and 70% of the employment. The sector also indirectly contributes a further 26% through linkages with agro-based and associated industries. As is the case in many countries in sub-Saharan Africa, growth in the national economy is closely linked to growth in agriculture. Estimates have consistently shown that an increase in the growth rate of the agricultural sector results in a corresponding increase in the overall economic growth.

The agricultural sector in Kenya is dominated by smallholders, who contribute approximately 75% of the total output. In line with MDG 1, smallholder agriculture must be transformed from subsistence to a vibrant profit-oriented sector; this would, in turn, significantly contribute to the overall goal of economic growth, wealth creation, food security and poverty alleviation.

Ladies and Gentlemen,

I am happy to note that this forum will discuss activities that are consistent with Kenya's "Vision 2030", which is a blueprint for the long-term development of the country. The vision is motivated by a collective aspiration for a much better society than the one we have today by the year 2030. In this regard, the agricultural sector will be expected to continue playing a key role in achieving the aspirations of Kenya's Vision 2030, since a high proportion of the population, especially in the rural areas, is engaged in agriculture-related livelihood activities. The sector will broadly cover six areas:

- Transforming key institutions in agriculture and livestock to promote agricultural growth
- Increasing productivity of crops and livestock
- Introducing land-use policies for better utilisation of high and medium potential lands
- Developing more irrigable areas in ASALs for both crops and livestock
- Improving market access for smallholders through better supply chain management, and
- Adding value to farm and livestock products before they reach local and international markets

Ladies and Gentlemen,

It is noteworthy that in Vision 2030, four key challenges have been identified as continuing to limit growth of the agricultural sector. These include:

- Productivity of most crop enterprises is below potential and, for some, yield and value have fluctuated over the last five years, depending on the prevailing weather conditions and prices on farm inputs. Similarly, production of livestock and livestock products has equally been affected by the same factors. Additionally, forestry cover and tree productivity have been on the decline, and population increase has resulted in persistent human–wildlife conflict, especially during droughts, which are becoming increasingly frequent.
- Much of the available cropland remains under-utilised, with smallholders using only 60% of their land. Dependency on rain-fed agriculture, and less competitive farming exhibited by the application of ineffective traditional tools contribute to under-exploitation of available land.
- Poor markets leading to inefficiencies in the supply chain resulting from limited storage capacity, inadequate post-harvest technologies and services and poor access to inputs; in most cases, it acts as a disincentive to invest in agriculture. This trend calls for improvement in the existing markets and creating new ones to increase Kenya's competitiveness in global agricultural markets.

- In order to become competitive regionally and internationally, it is imperative that value-added products are produced. At the moment, the agricultural sector is dominated by raw, semi-processed and low-value produce. These also populate the export market, and together with high cost of inputs make such products less competitive. The challenge therefore is how to increase value addition to all products to make them more competitive.

Other challenges include: low adoption of modern technology; livestock losses due to diseases and pests; low and declining soil fertility as a result of continuous cultivation, leading to rapid depletion of nutrients. Additionally, inadequate disaster preparedness and response; and inappropriate legal and regulatory framework pose further challenges to agricultural development. It is needless to over emphasise the fact that inadequate infrastructure, and insufficient water storage capacity, among others, further inhibit improved agricultural productivity.

Ladies and Gentlemen,

The opportunities for attaining food and nutritional security and agricultural development through national and regional effort include:

- Human resources: It is estimated that the country has a population of 38.6 million people, with about 20.3 million in the age bracket of 15–64 years. A majority of the population is thus active and can actively engage in agricultural activities, contributing greatly to economic development.
- Diverse ecologies: Kenya's diverse ecologies enable it to produce a wide range of agricultural products (temperate sub-tropical and tropical) for new and expanding markets. This opportunity positions the country to take advantage of expanding regional and international markets. Cereals, beef, diary, tea, coffee, horticultural products, ostrich, guinea fowl and crocodiles are examples of products that can be supplied to the expanding markets. Vast irrigation potential: Only 105,000 ha is under irrigation out of the potential 540,000 ha. This area could be expanded to 1 million ha through additional developments along the major rivers in the eastern parts of the country.
- Value addition: It is estimated that 91% of the agricultural exports is in raw or semi-processed form, making the country lose billions of earnings by not adding value to its products. It is noteworthy that the potential for adding value exists and is largely untapped.
- Improving productivity: The yield gap between potential and actual is huge. For example, maize production averages 1.5 t/ha against a potential of more than 5 t/ha. Additionally, the national dairy herd average milk production is about 2000 kg, while the potential is above 5000 kg. Vast areas in ASALS with high livestock potential are virtually untapped. To this end, the increased adoption of modern technologies, farming practices, use of irrigation, and improved policies and market access can greatly increase agricultural productivity.

Ladies and Gentlemen,

Kenya's development blueprint – Vision 2030 – has three pillars: Economic, Social and Political, all with a firm foundation in STI. This underscores the importance attached to the country's development. Given the challenges in the agricultural sector outlined above, which incidentally are not unique to Kenya but common in the ECA region, and the need for collective action, I see a very pertinent role that ASARECA can play to complement the regional governments' efforts in resolving them. When I read ASARECA's mission statement: "Enhance regional collective action in agricultural research for development, extension and agricultural training and education to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in East and Central Africa", I noted that it resonates well with Kenya's focus and approach to agricultural development. The notable challenges to improved agricultural productivity in the ECA region include:

- Diseases and pests
- Poor market infrastructure
- Poor utilisation of available resources (human capital, infrastructure)
- Inappropriate policies, regulations and standards within the region, to enable sharing of technologies and information that is for regional and public good
- Non-existence of appropriate frameworks/platforms for creating and sharing knowledge, innovations and technologies

Most of these challenges require collective action to resolve them. This would be realised if we can create platforms to coordinate resource mobilisation for agricultural R&D. It is recognised that over the years, ASARECA has initiated several regional activities, initially through the 17 networks, and now under seven programmes. These programmes cover broader areas in agriculture, including germplasm conservation, crop and livestock and fisheries production, NRM, policy analysis and advocacy, and knowledge management and up-scaling. I am informed that a number of projects are being implemented by regional teams coordinated by ASARECA under these programmes and I am pleased that Kenya is a participant in most of the projects. I have perused the book on the success stories and I am encouraged that these efforts are beginning to bear fruit for the region. Let me assure the secretariat of my country's support and my own commitment to supporting these efforts, and therefore encourage ASARECA secretariat and Board to continue with the excellent work of bringing us together for the good of the region.

This general assembly indeed offers an excellent opportunity for participants to interact and share ideas that should help transform the agricultural sector for increased agricultural productivity. It is a forum that will further promote the sharing of information regarding new developments in the agricultural sector and showcase the services and products available to the industry. It is needless to over emphasise that this would further enhance agricultural research for development, extension, and agricultural education. The ultimate goal, as it is anticipated, is to increase economic growth and improve livelihoods in ECA while enhancing the quality of the environment.

Ladies and Gentlemen,

Let me take this opportunity to once again thank the organisers for hosting this event, and wish the participants fruitful deliberations.

Thank you.

3.10 Allocution de Son Excellence Monsieur le Ministre de la recherche scientifique à la première Assemblée generale d'ASARECA

Excellences Messieurs les Ministres et chers Collègues, Mesdames et Messieurs les participants, Distingués Invités,

C'est pour moi un grand honneur et un réel plaisir de m'adresser à vous du haut de cette tribune de la première Assemblée Générale d'ASARECA qui se tient à Entebbe, en cette terre hospitalière de la République Ougandaise.

Apres les premières années d'activités sur le terrain, ces assises permettent justement de faire le point des acquis et surtout si besoin en est, la réorientation des activités futures de cette Institution internationale.

Durant cette période, c'est en fait certain que beaucoup de travaux ont été finances par l'ASARECA et les résultats obtenus ont permis l'amélioration de la production agricole sur l'ensemble de notre continent.

Certes, le domaine de la recherche agricole est vaste, mais la question que nous sommes en droit de nous poser est certainement celle de savoir si tous les aspects de gestion et production agricoles ont été abordés et résolus, compte tenu de l'immensité de la zone d'intervention de l'organisation, de la diversité des climats, des conditions topographiques et socioéconomiques.

Excellences, Distingues Invites, Mesdames et Messieurs,

Pendant ces années de turbulence politique, la République Démocratique du Congo, mon pays, a bénéficié des appuis financiers d'ASARECA et les plus éloquents obtenus sont les suivants :

L'intégration des légumineuses à graine dans la gestion des cultures céréalières

La culture des variétés d'haricot volubile ayant comme tuteurs, les troncs de bananiers renforces par des fils en nylon ou tout simplement par des cordes tissées avec les nervures des feuilles de bananier a suscité l'engouement de la population rurale de l'est de la R.D. Congo.

Cette technologie est restée bien adoptée également au Rwanda. La ruée vers cette technique a eu comme conséquence, l'augmentation palpable de la production des haricots et du panier ménager.

Il va sans dire que la masse foliaire ainsi produite sert également comme engrais organique ; ce qui est intéressant pour la restauration de la fertilité intrinsèque du substrat.

En outre, il s'avère indispensable, à mon avis, que des études similaires soient réalisées dans des zones agricoles de basse altitude.

L'évaluation de la transmission à l'espèce humaine de la cysticercose

Les résultats des travaux menés sous cet angle de vue par le laboratoire vétérinaire de Kinshasa, méritent d'être mentionnes. Les recommandations émanant de ce travail permettent de réduire considérablement la prolifération de cette pathologie.

Ces travaux devraient être également pour suivis dans les zones d'altitude caractérisées par une trop forte densité agraire et par la promiscuité entre l'espèce humaine et animale.

Mise au point des variétés performantes de la culture de riz et du maïs

Les travaux de sélection menés au Centre de recherche de Yangambi ont abouti à la sélection de la variété de riz dite « **lienge** », qui s'avère très productive et bien adaptée dans les sols acides. Ce riz est du reste bien apprécie tant par les riziculteurs que les consommateurs.Cependant, nous souhaitons vivement que les travaux de recherche sur le riz soient transfères dans le Pool Malebo à Kinshasa qui dispose d'un périmètre irrigué de plus de 1000ha, et ce, y compris son hinterland.

Signalons enfin la mise au point de la variété de maïs « **QPM** », au Centre de Recherche de Gandajika. Celle-ci est très riche en protéines et est largement utilisée actuellement dans la Province du Kasaï en RDC, pour l'éradication de la malnutrition infantile.

Après cette présentation des résultats, je pense qu'il faut donc qu'ASARECA obtienne les résultats similaires sur l'ensemble de son territoire, tout en travaillant sur les aspects régionaux, qu'il accorde des subventions adéquates pour les problèmes de gestion agricole au niveau sous régional voir même sectoriel et avoir une vision globale ascendante a savoir, progresser de la manière suivante :

Milieu rural Chercheur Producteurs Partenaires intermédiaires Consommateurs

Nous sommes aujourd'hui heureux de constater que cette nouvelle structure qu'est le CAADP a pu être mise au point grâce à l'implication des Présidents des pays membres, pour résoudre les problèmes que seul l'ASARECA ne pouvait le faire. Faut-il encore que nous puissions définir le rayon d'action de chaque structure et les points de convergence !

Excellences, Distingues Invites, Mesdames et Messieurs,

Permettez-moi de vous entretenir brièvement de quelques contraintes observées dans notre organisation.En effet, les pays membres d'ASARECA appartiennent à deux courants linguistiques : le français et l'anglais. Si cette dernière demeure l'unique langue de l'institution, cela freine énormément les compétences scientifiques et professionnelles des trois pays sont le Burundi, le Madagascar ainsi que la République Démocratique du Congo, notre pays.Nous partons de ces deux principes ci-dessous épinglés.

Un chercheur ne s'exprime mieux que dans la langue qu'il maitrise le mieux ;Dans d'autres réunions et institutions internationales, le français est utilisé comme. Deuxième langue officielle de travail. L'ASARECA aux moyens pour s'offrir le service des. Traducteurs si besoin est.Partant de là, la RDC que j'ai l'honneur de représenter dans ces assises, ne pourra signer cette constitution que moyennant cet amendement au niveau linguistique.

Distingués Invités, Mesdames et Messieurs,

Point n'est besoin de vous rappeler que la RDC a traversé une période d'insécurité pendant ces dix dernières années et tous les efforts du gouvernement ont été orientes vers la sécurité des personnes et des biens.C'est la raison pour laquelle certains secteurs vitaux de la vie d'une nation telle que la Recherche Scientifique ont vu leurs budgets réduits.

Maintenant que la stabilité est pratiquement atteinte sur toute l'étendue du territoire national, je ne manquerai pas d'intervenir auprès de mes collègues ayant les finances et budget dans leurs attributions d'honorer l versement des litiges de cotisation annuelle en souffrance.En guise de réponse est aux préoccupations de l'heure d'ASARECA d'agir positivement pour atteindre la sécurité alimentaire dans tous les pays membres, je peux, sans grandement me tromper, vous assurer que la RDC peut atteindre cet objectif rien qu'en se basant sur le réseau de recherche applique en matière agricole de l'institut National pour l'étude et la Recherche Agronomiques, INERA en sigle.

Cet Institut de recherche possède, en effet, un réseau de Centres et stations de recherche couvrant toutes les zones agro-écologiques dont certains correspondent à celles qui prévalent dans d'autres pays membres.Certains résultats des recherches des années précédentes sont disponibles et ne demandent qu'à être diffuses dans le cadre des échanges de nouvelles technologies.

D'autres travaux de recherches sont en réalisation; ils sont menés ensemble avec des Organismes internationaux, de recherches telles que le Centre International pour Entomologie et l'Institut International d'Agriculture Tropicale. Pour atteindre la masse critique de chercheurs, j'ai autorisé l'engagement de nouveaux chercheurs et beaucoup d'entre eux sont présentement occupés à faire des études diplomates du niveau MSc et PhD.En guise d'illustration des possibilités qu'offrent l'INERA, je vous convie de voir les posters récemment présentes à la Foire Internationale de Kinshasa en 2011.Mesdames et Messieurs, je vous remercie pour votre attention durant cet exposé.

Le Ministre de la Recherche Scientifique
de la République Démocratique du Congo

4 KEYNOTE PRESENTATIONS AT THE OPENING CEREMONY

ASARECA Executive Director, Dr. Seyfu Ketema

4.1 ASARECA strategy regional challenges and opportunities in the context of the theme "Feeding our region in the 21st century", by Dr Seyfu Ketema, Executive Director, ASARECA

ASARECA has 10 member countries, namely: Burundi, the Democratic Republic of Congo, Ethiopia, Eritrea, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda.

The theme for the First ASARECA general assembly is "Feeding our Region in the 21st century".

- ASARECA announces its first general assembly.
- The assembly follows the approval of the new constitution in 2010, providing for the establishment of patron ministers and a general assembly. These were established to offer strategic guidance to ASARECA in order to promote economic growth, fight poverty, eradicate hunger and enhance sustainable use of resources in ECA.

Objectives of the first ASARECA general assembly

- To create a forum for developing a shared vision and shared goals to enhance sustainable agriculture to bring about economic growth and improved livelihoods in our region.
- Introduce ASARECA, its strategic regional objectives, challenges, opportunities and successes to the patron ministers and members of the general assembly.
- Provide an enabling environment for the general assembly to play its oversight role in accordance to the provisions of the Constitution and Governance Manual.
- Receive from the patron ministers and the general assembly, in line with the mission of ASARECA, recommendations and strategic guidelines in agricultural research for development, extension and agricultural training and education, which will contribute to feeding our region in the 21st century.

Topical issues to be tackled

- The role of STI and their contribution to feeding our region in the 21st century

- Adapting agriculture to variable and changing climatic conditions in ECA: Lessons learnt and options for the future
- Volatile food prices: drivers and impacts on food security in ECA
- Progress towards implementation of CAADP
- Harnessing livestock resources for food security in pastoral areas of ECA
- Proven technologies for feeding the ECA region
- Governance and policy imperatives for transformation of agriculture in ECA

ASARECA Mission

ASARECA mission is to enhance regional collective action in agricultural research for development, extension and agricultural training and education; to promote economic growth; fight poverty; eradicate hunger; and enhance sustainable use of resources in ECA.

Mission is aligned to MDG and CAADP goals

This mission highlights the commitment of ASARECA to:

- MDGs to reduce poverty and hunger by half by 2015 and
- CAADP target of regional agricultural production growth rate at an annual rate of 6% by 2015

AU/NEPAD THREE GOALS

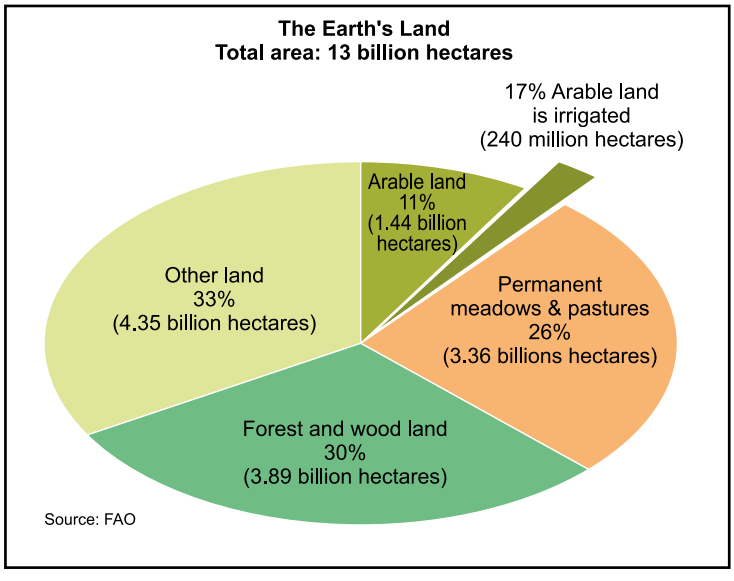
- Establish conditions for sustainable development (peace and security, democracy and good political, economic and cooperate governance, regional cooperation and integration, capacity building)
- Encourage policy reforms and increased investments in priority sectors (agriculture, human development, infrastructure, and environment)
- Mobilise resources (increasing domestic savings and investments, management of public revenue and expenditure, and enhancing Africa's share of global trade)

AU/NEPAD vision

The vision for agriculture is that the African continent should by 2015:

- Attain food security (in terms of availability and affordability) and ensure access of the poor to adequate food and nutrition
- Improve agricultural productivity to attain an average annual growth rate of 6%
- Create dynamic agricultural markets between nations and regions
- Integrate farmers into the market economy, and make Africa a net exporter of agricultural products
- Achieve a more equitable distribution of wealth
- Be a strategic player in agricultural science and technology development, and
- Practice environmentally sound production methods and establish a culture of sustainable management of the natural resource base

Challenges



Rationale for investing at ASARECA level

- There is evidence that investments at the regional level yield better dividends than when investments are undertaken by individual nations in countries facing similar challenges to improve agricultural performance.
- Some problems are regionally important and extend beyond national boundaries, thus calling for regional collective action and investment at the regional level.

Future trends in agricultural production

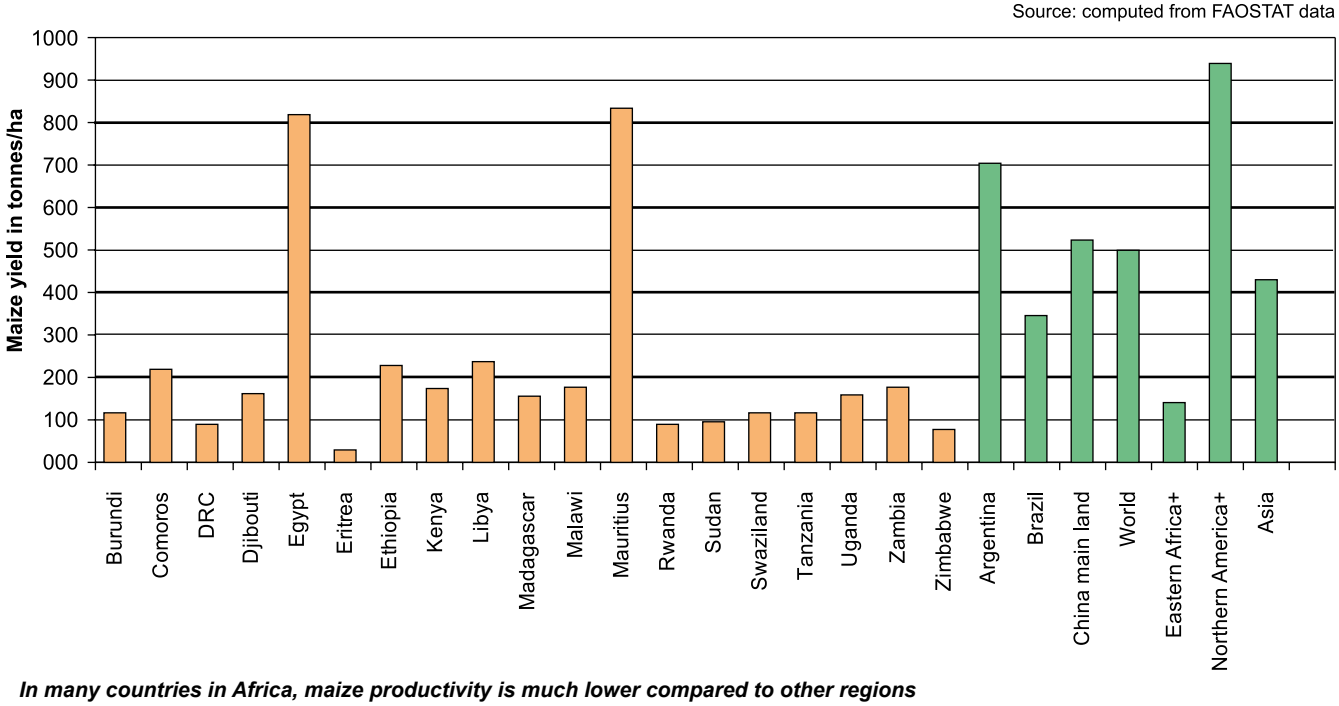
- According to FAO *Study on Prospects for food and Agriculture: Towards 2015 & 2030*, 80% of the future increase in food production will come from agricultural intensification to meet the goals of the Millennium Declaration and the World Food Summit.
- But agricultural intensification (per unit area), which is projected to increase in the coming two decades, can be the most serious threat to the environment and to sustainability of the natural resource base.

Challenges to African agriculture and food security

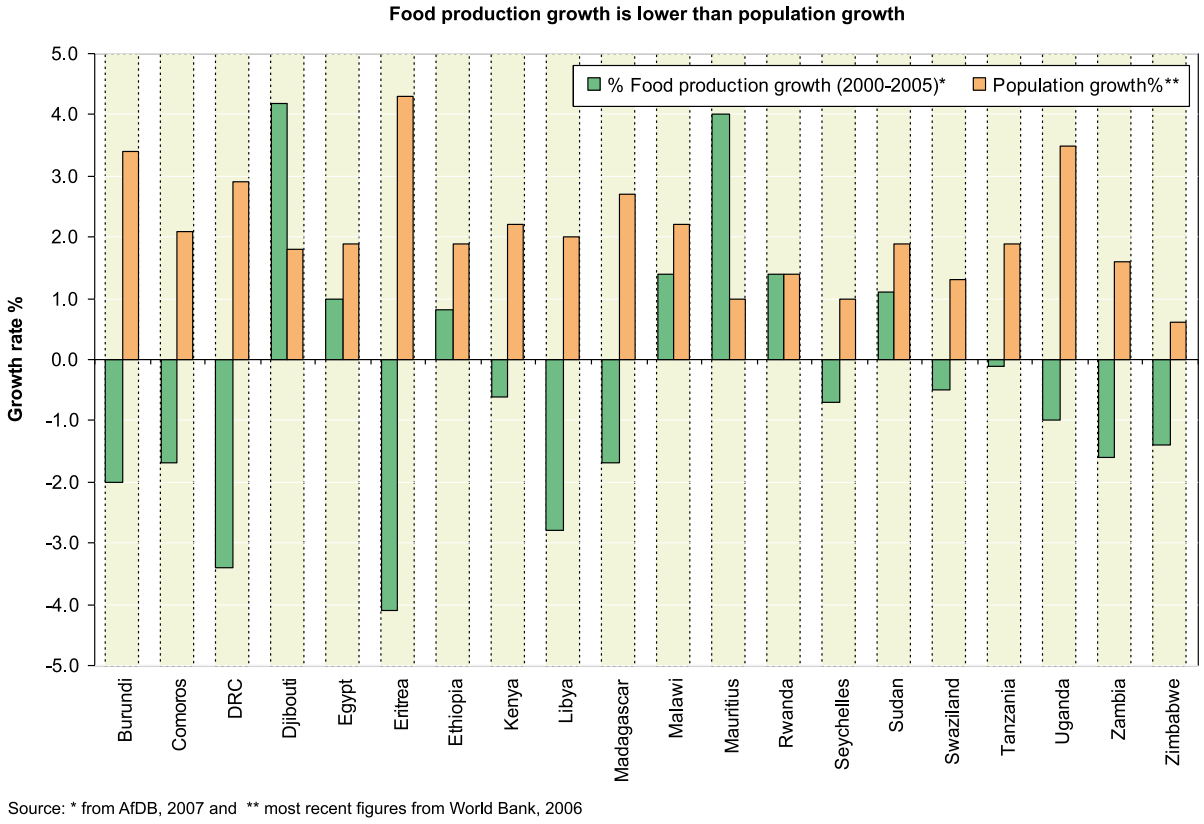
- Less water: increased demand from other sectors
- Less arable land: land degradation and urbanisation
- Less labour: HIV/AIDS and endemic diseases
- A changing climate: increasing variability and more extreme events is projected to:
  - reduce productivity
  - affect ecological systems
  - adversely affect human and animal health and
  - decrease biodiversity
- Environmental and social implications: Increasing concerns over the environmental and social implications of various agricultural policies and technologies

Science and technology challenges to African agricultural research

- Address water deficit problems, for example, through improved drought-tolerant crops, irrigation technologies, and so forth.



In many countries in Africa, maize productivity is much lower compared to other regions



Source: * from AfDB, 2007 and ** most recent figures from World Bank, 2006

Food production growth is lower than population growth. Source:* from AfDB, 2007 and figures from World Bank, 2006

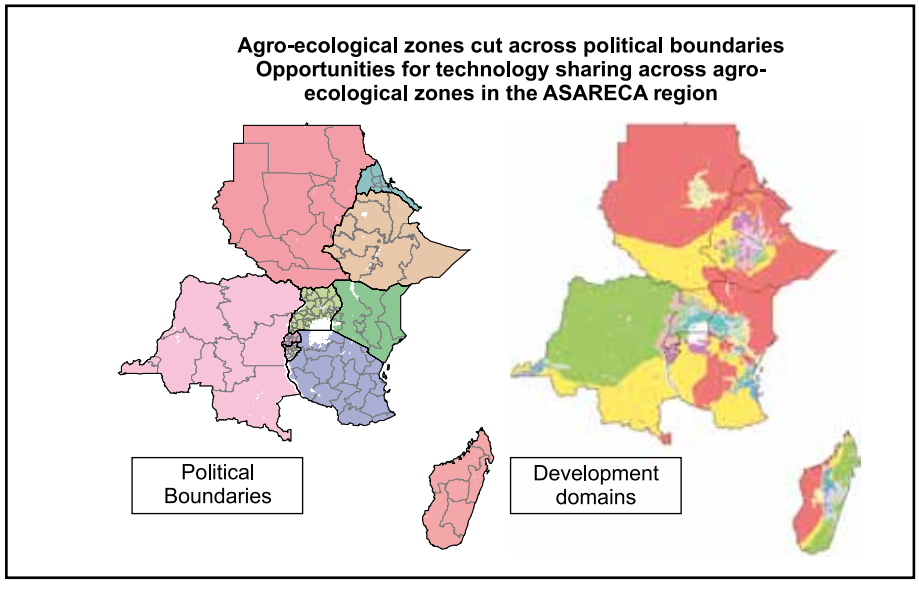
- Produce a diversified array of crops, livestock, fish, forests, biomass (for energy) in an environmentally and socially sustainable manner
- Address soil fertility and salinisation of soils

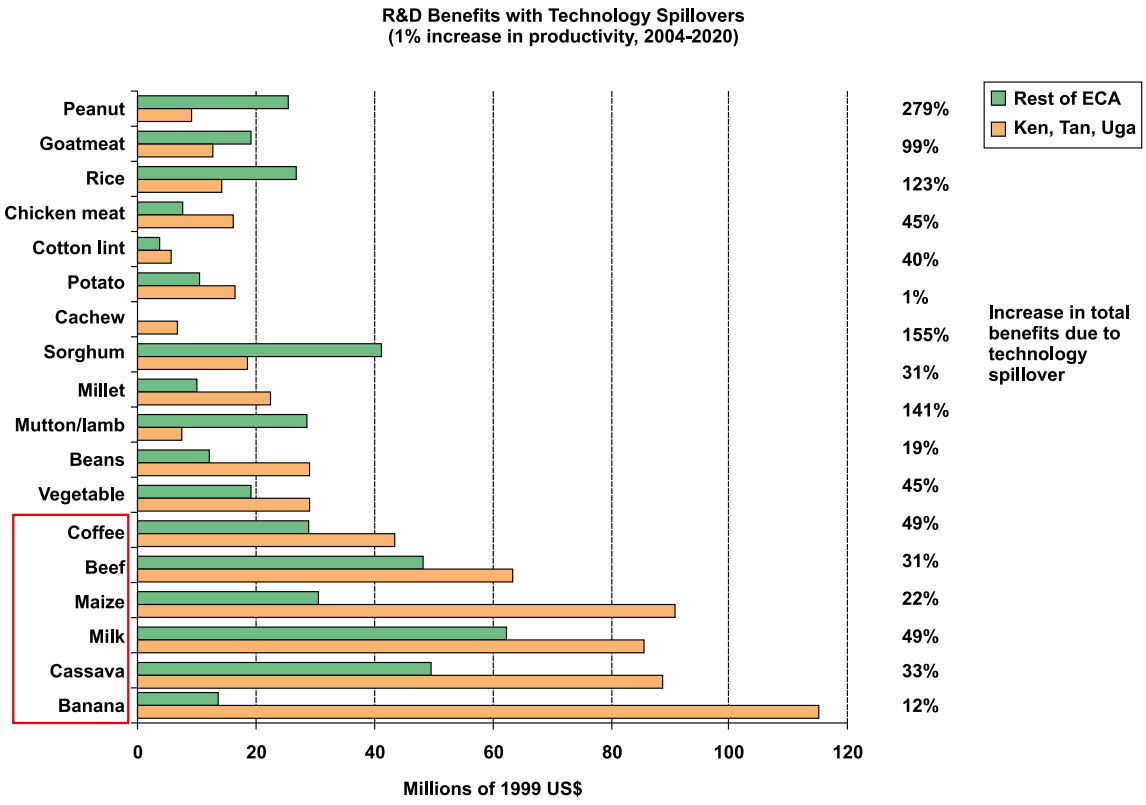
Opportunities exist to benefit from regionally coordinated action and investment through:

- The identification of shared goals
- The promotion of economies of scale and scope and
- Sharing of results and regional public goods that would come as a result of regional collective action, collaboration and specialisation

Agro-ecological zones cut across political boundaries, therefore:

- Technologies developed in one country frequently find fertile ground across the border in similar environments of neighbouring countries.





Estimated impact of collaborative research at regional and national levels

- Impact of collaborative research at the regional and national levels and benefits from regional spillovers.
  - Using DREAM model of IFPRI, the following slides present anticipated benefits from agricultural technology development in the sub-region, with and without regional spillovers.
- In the case of bananas, benefits with technology spillover for:
  - Kenya, Uganda and Tanzania anticipated to be over USD100 million.

Spillovers to other banana-growing and consuming countries in the region increase total benefits by an additional USD15 million over the 2004 to 2020 time period.

- In cassava, direct gains amount to about USD90 million, while spillovers add an additional USD50 million
- Clearly the regional spillovers can be substantial

Highlights of success stories

Quality Protein Maize

Quality Protein Maize Agro-Enterprises for Improved Household Income

Value chain analysis undertaken for QPM

Innovation Platforms for Technology Adoption (IPTAs) are formed

Breeder seed of QPM availed by seed companies

Recipes for QPM products developed

Examples of QPM-based food products

c) HEFO Engaging

Promoting utilisation of food products

Enhancing utilisation of quality seed potato by small-scale farmers

The positive selection and crop rotation technologies for management of bacterial wilt being tested

Information material developed on clean potato seed production and the management of bacterial wilt.

Integrated technologies for drought mitigation and increasing small holder sorghum productivity

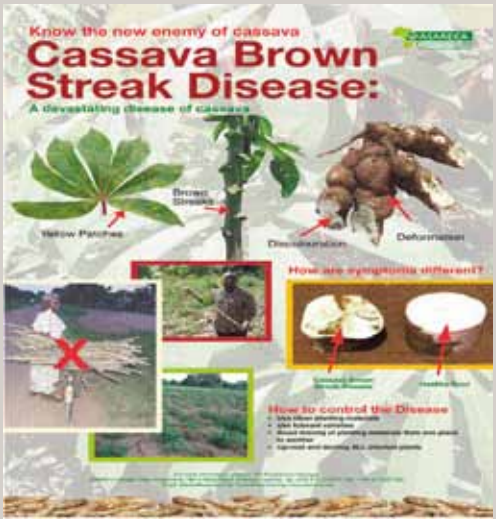
Sorghum variety **WAHI** received only one shower of rain but still managed to produce big heads at Mgori, Singida, Tanzania

Variety **Hakika** in Kamoda, Singida rural, Tanzania
The two varieties are some of the most drought and striga-resistant varieties available.

Increasing sorghum utilization and marketability through food diversification

- Recipes for using sorghum flour for confectionery have been developed. Bread, biscuits, cakes, pops from sorghum
- In Tanzania, these products are produced by small scale processors as cottage industries and marketed with premium prices in supermarkets
- In Uganda varieties are being evaluated for the brewing industry

Information on CBSD



Integrated management of CBSD and CMD diseases to enhance productivity and utilization of cassava in ECA

- Screening cassava clones for resistance to CBSD
- Epidemiology studies to determine the nature of spread of CBSD both in Uganda and in Tanzania
- Analysis of baseline survey data collected on CBSD and CMD
- Applying tissue culture to improve access to clean planting materials. - virus indexing tools are being developed

Sustainable management of Xanthomonas wilt in banana cropping systems in ECA

- Local and introduced varieties are being evaluated for their reaction to BXW
- Validating and use of management practices for the control of BXW
- Analysis of the bacterium for pathogenic variation using molecular markers

Fighting striga to boost sorghum productivity

Striga infestation threatens to bring 17 million hectares of farm land out of sorghum production

ASARECA and its partners, Eritrea, Sudan, Kenya and ICRISAT, have developed 50 striga-resistant sorghum lines capable of giving yield up to 3.6 t/ha

Success story of striga project

Donor Parent N13 for striga-resistant gene

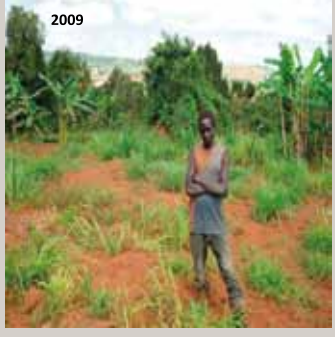
Background parent, Wad Ahmed

One of 50 lines developed with resistance to Striga

This breakthrough will enable 300 million people in Africa to get out of hunger, attain food security, walk out of the poverty bracket and lead better lives

Napier grass is grown extensively in Kenya and Uganda by smallholder farmers as feed for stall-fed dairy cows

Effect of Napier grass stunt on fodder yield in Uganda



Promising clones in Kenya and Tanzania

On farm establishment of small-scale irrigation kits and water-harvesting technologies to sustain year round vegetable and fodder production

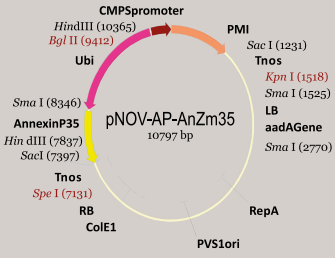
Responding to challenges of climate change through adaptation

Failure of maize adopting business as usual approaches, August 2010

Response farming saved maize, August 2010

Response farming demonstrated yield increase

Vector transformation map of the ASARECA Plant Transformation- Annexin *Zea mays 35 (*AP-AnZm35) gene construct in pNOV vector



Ms Rasha Adam discovered a drought-tolerant gene & named it ASARECA AnxZm35 gene

The sequence of this gene is
"ATGGCGACGCTCACCGTCCTTCCTCCGTCCCGGCCGTCGCCG-AGGACTGCGAGCAGCT-CCACAAGGCCTTCGAAGGCTGGGGCACCAACGAGAAACT"
This can now be used for fingerprinting. This is however confidential infor

Genetic engineering of maize for drought tolerance

Background

Maize is the most important staple food in Africa

Staple food for more than 300 million people in sub-Saharan Africa.

Drought is a single most important abiotic stress responsible for reduced maize productivity in arid and semi-arid areas, leading up to 70% crop loss.

rainfall is closely associated with the phenomenon of ENSO and sea surface temperatures, with a time scale of variability of 5 to 6 years (Nicholson, 1996, Schreck and Semazzi, 2004, Indeje et al. 2000). El Nino is associated with above-normal rainfall during the short rains throughout the entire region, except for Sudan. This relationship between rainfall and the phenomenon of ENSO makes the rainfall in the region more predictable. No discernable increasing or decreasing trend in either the annual or the seasonal rainfall is observable. The proportion of negative anomalies ranged between 49% and 59% for the stations we have data, indicating fairly equal distribution of positive and negative anomalies (Rao et al., 2011).

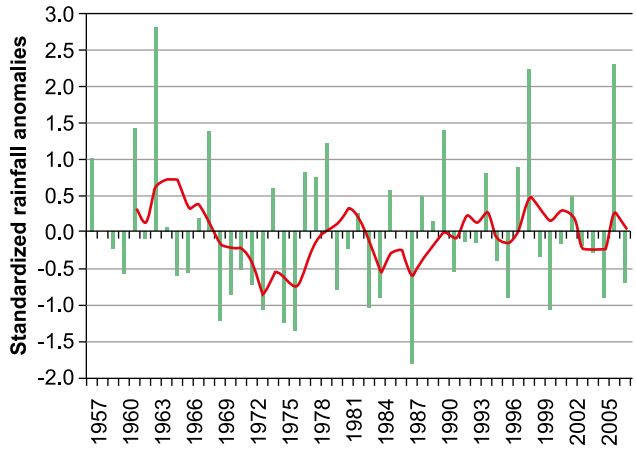


Figure 4: Standardised annual rainfall anomalies at Katumani.

However, a general increasing trend in both minimum and maximum temperatures, especially from about 1990 onwards, and in mean annual temperature is noticed in most months, (Figure 5) and the rate of increase is similar to the one reported by IPCC (IPCC, 2007). This supports (the hypothesis) that the region is warming along the lines predicted globally. Unfortunately, the analysis is limited by availability of good quality data. There are very few meteorological stations in the region with good records of long-term temperature data.

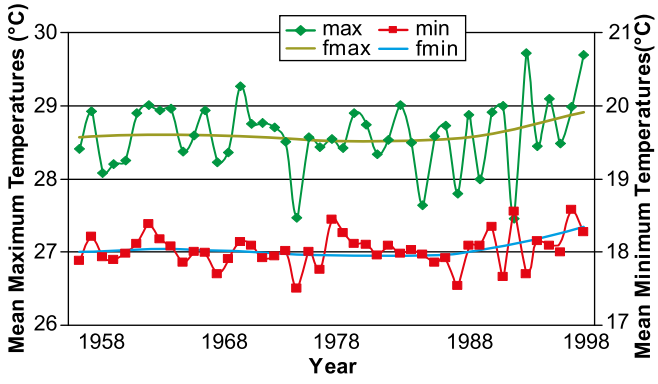


Figure 5. Mean maximum and minimum temperatures for the short rain season (Oct.-Dec.) at Makindu, Kenya (1959–2004).

4.3.3 Projected climate change scenarios

According to the most recent IPCC assessment report (AR4), the global average temperatures will increase by about 1.1^{0}C–2.9^{0}C under a low emission scenario and by 2.4^{0}C–6.4^{0}C under high emission scenario by the end of this century. For Eastern Africa, the predicted changes under a medium emission scenario (A1B) are summarised in table 1. The median predictions show an increase in both temperature and rainfall. Annual temperature of the region is projected to increase by about 3.2^{0}C and rainfall by about 11% towards the end of this century. For shorter time scales, IGAD Climate Prediction and Application Centre (ICPAC) predicts that the mean annual temperatures in the region will increase by about 0.8^{0}C–1.1^{0}C by 2030 and by 1.5^{0}C–2.1^{0}C by 2050 for the mid-range emission scenario, A1B (ICPAC, 2007). At the same time, the assessment predicts that the rainfall in the region will increase by 0.6%–9.7% and 1.1%–18.8% by 2030 and 2050 respectively, for the same emission scenario.

Table 1: Temperature and rainfall projections for Eastern Africa (12^{0}S and 22^{0}E to 18^{0}N and 52^{0}E) from a set of 21 global models in the CMIP3 for the A1B scenario by 2100 (IPCC, 2007)

	Temperature response (°C)					Precipitation response (%)					Extreme seasons (%)		
Season	Min	25	50	75	Max	Min	25	50	75	Max	Warm	Wet	Dry
Dec. Jan. & Feb.	2.0	2.6	3.1	3.4	4.2	-3	6	13	16	33	100	25	1
March April & May	1.7	2.7	3.3	3.7	4.5	-9	2	6	9	20	100	15	4
June, July & August	1.6	2.7	3.4	3.6	4.7	-18	-2	4	7	16	100		
Sept. Oct. & Nov.	1.9	2.6	3.1	3.6	4.3	-10	3	7	13	38	100	21	3
Annual	1.8	2.5	3.2	3.4	4.3	-3	2	7	11	25	100	30	1

Notes: Table 1 shows the minimum, maximum, median (50%), and 25 and 75 % quartile values among the 21 models for temperature (°C) and precipitation (%) change. Numbers in the Extreme Seasons columns indicate that when there is a change in frequency of extreme seasons, the increase is positive.

Table 2. Downscaled rainfall projections for some locations in Eastern Africa from a set of 11 global models in the CMIP3 for the A1B scenario

Location	2046–2065			2081–2100		
	Min	Med	Max	Min	Med	Max
Katumani (Kenya)	23.9	41	57.6	30.9	70.9	96.9
Melkassa (Ethiopia)	-27.6	1.9	39.6	-16.6	1.5	35.0
Same (Tanzania)	-1.1	8.6	29.2	-0.8	18.9	51.9
Gedarif (Sudan)	-74.9	-48.5	-42.2	-77.7	-49.6	-31.9

Despite the availability of overwhelming evidence in support of climate change at the global and regional levels, uncertainty prevails over the exact nature and consequences of climate change at the local level, making it difficult to plan and develop appropriate adaptation strategies, programmes, and technologies. Global-level simulations using climate models provide various scenarios with high levels of confidence, but these predictions become less clear when it comes to the magnitude and timing of the changes at sub-regional, national and local levels, and, according to IPCC, difficulties remain in reliably simulating and attributing observed temperature changes at smaller scales. For example, the downscaled median values for rainfall show a 71% increase for Katumani and 50% decrease for Gedarif (Table 2). These are highly significant changes, but with very high levels of uncertainty. These predictions are expected to improve in the coming years with better downscaling techniques.

Though there are problems in predicting accurately where, when, and by how much the climate changes, based on our current knowledge and understanding there seems to be a general agreement among the scientific community about the changes as listed below. Since these projections are based on several assumptions of greenhouse gas emissions and nature of future socio-economic development, the magnitude and direction of these changes can vary with changes in underlying assumptions.

1. The region will be warmer by about 1^0C by 2030 and by about 2^0C by 2050.
2. The region is expected to receive slightly higher rainfall, especially during the period from September to February.
3. The region will also experience an increase in the frequency of both extreme wet and dry seasons.
4. The region will experience an increase in the variability of rainfall both between and across the seasons.
5. The changes in temperature and rainfall will lead to significant changes in the extent and distribution of arid and semi-arid climates, especially in Tanzania, DR Congo and Madagascar.

1. Impact of climate change on agriculture

Rainfall and temperature regimes are perhaps the most important factors in determining the potential productivity of various agricultural enterprises either directly or indirectly. The direct effects of rainfall and temperature determine the suitability, rate of growth and potential yield of crops, while the indirect effects influence the supply of nutrients and water through changes in nutrient and hydrological cycles. Annual crops with short production cycles are considered to be much more sensitive to changes in seasonal climatic conditions compared to perennials with growth cycles covering several seasons or years. The extent to which climate change affects crop production at a given location, among others, depends on the current climatic conditions at that location, type of crops grown, level of management, and status of soil and other resources.

There are many pathways through which climate-related factors can affect crop yields (both positively and negatively) and crop suitability.

Firstly, changes in temperature and precipitation lead to changes in evaporation from the soil and transpiration from vegetation. Hence, higher temperatures will lead to increased demand for water by plants, which is difficult to meet, especially when rainfall is expected to decline and become more variable.

Secondly, different crops have different optimal growing conditions and high temperatures can make the crops unsuitable for growing in some areas where the current climatic conditions are already close to the maximum

tolerable limits. Major shifts in production zones are predicted for crops with a narrow optimal temperature range such as coffee and tea.

Thirdly, crops grow faster and mature earlier under warmer temperatures compared to cooler temperatures. The available data indicate that duration of several crops will be reduced by about one to two weeks with every degree increase in temperature, depending on current temperatures at that location and the type of crop grown. This reduction in the time that a crop takes to mature will also reduce the productive potential of these crops. Studies using crop simulation models broadly indicate that potential for biomass production will decline by about 500 kg/ha with every one week of reduction in the maturity duration of the crop.

Fourthly, some crops may benefit from increased concentration of CO_2 in the atmosphere. The response of crops to increased CO_2 concentration, often referred to as "CO_2 fertilisation effect", varies among plant species. Plants with "C-3" photosynthetic pathway, which include potato, beans, rice, wheat and many weed species, can benefit from this phenomenon, but no significant benefit is expected in case of crops like maize, sorghum and millet with "C-4" photosynthetic pathway.

Further, attaining these benefits requires high levels of management, including use of fertiliser, optimum conditions for root growth, and control of weeds, pests and diseases. Under the prevailing low-input management scenario, it is very unlikely that the region will be able to benefit from this phenomenon since other factors will continue to place overriding constraints to crop growth and yield. In addition to these direct effects, climate change will also affect crop production by reducing the capacity of natural resources to support productive agriculture. The effects include decline in soil fertility from increased mineralisation, reduction in plant available water due to increase in evaporative demand of the atmosphere, increase in erosion and soil degradation, and changes in the distribution and incidence of pests and diseases, including weeds. All these changes will have a significant impact on productivity, food security, and profitability, both at the household and the national levels.

Given the large number of factors and their many interactions, high spatial and temporal variability in the climate, soil and other resources supporting crop production, and high level of uncertainty associated with future climate projections, it is extremely difficult to estimate precisely how the productivity of crops is going to be affected by changes in climate. Recent studies have used a variety of approaches to assess the likely impacts of climate change on sub-Saharan Africa agriculture, ranging from quantitative crop simulation modelling (Jones and Thornton, 2003; Abraha and Savage, 2006; Walker and Schultze, 2008) to statistical time series analyses (Lobell et al., 2008). A more recent study, focusing on maize, sorghum, millet, groundnut and cassava, (Schlenker and Lobell 2010) combined historical crop production and weather data into a panel analyses and were able to produce a robust model of yield responses to climate changes. Their projections showed that the mean aggregate production changes for maize, sorghum, millet, groundnut and cassava were –22%, –17%, –17%, –18% and –8% respectively. A number of other studies that assessed impacts of climate change on agriculture in the region have, in general, concluded that the effects are largely negative and advocated serious efforts to adapt to the progressive climate change.

2. Adapting agriculture to climate variability and change

Adapting agriculture to climate change is an ambiguous task due to various reasons that include long-term nature of change, uncertainty in predicting the magnitude of change, likely impacts (both negative and positive), and unquantifiable inherent ability of natural systems and practitioners to adapt to the gradual changes in climate. Further, the impacts may not necessarily be linear; there may be thresholds beyond which impacts and resulting damages become catastrophic (Hansen, 2008). Although farmers continue to innovate and adapt, many studies indicate that they will be limited in their capacity to react and respond to the changes that are occurring much more rapidly than they have experienced before (Rao et al., 2011). More appropriate interventions that are based on deep understanding of historical and current trends in climate, sound science and meaningful analysis of costs and benefits are required to overcome adverse impacts of climate-induced uncertainties of today and the near future.

A number of different approaches have been suggested to adapt agriculture to climate variability and change. Among them are, integrated planning of land and water resources at plot and watershed scales to ensure that the synergies are properly captured; promoting activities that are geared towards improving soil fertility; diversifying agriculture with crops and varieties that can perform better under various climatic stresses; developing sound risk management strategies, including safety nets and risk insurance, and adaptive management that disseminates timely climate information to farmers and tailors techniques to shifting climatic conditions.

An integrated approach that combines all these elements is often referred to as "Climate Smart Agriculture", which addresses both adaptation and mitigation objectives. It is defined as agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals (FAO, 2010). The technological components that are suggested under these strategies are mainly aimed at sustainable intensification, which is the key to ensure food security, especially in countries where good scope for increasing current levels of productivity exists.

Most of these technologies are not new but have met with limited adoption by smallholder farmers (Table 3). The primary constraints that are affecting adoption of these practices include season specificity of these technologies, limiting economic benefits to certain type of seasons; high requirement of labour and capital investments per unit area; high input costs and uncertain returns; and lack of access to information and inputs. Fundamental to these practical constraints is the variability in inter- and intra-seasonal rainfall and the inevitable uncertainty that it imposes on farm production and returns on investments.

Table 3: Potential options for farmer adaptation to climate variability and change and benefits and constraints to adoption

Suggested adaptation practice	Potential benefit	Constraint to adoption
Change in crops/varieties	More suitable to new climates	Timing of shift and availability of appropriate crops. Market for some crops may not be attractive. Choices may be limited for very dry environments
Drought and heat-tolerant varieties	Covers risks from extremes	Low yield potential and may not be beneficial in normal and good seasons
Soil and water conservation	Increases soil water availability and moderates effects of droughts	Amount of water conserved is limited by profile water-holding capacity and benefits are associated with use of other productivity-enhancing technologies
Fertiliser use	Increases yield and arrests nutrient depletion	High cost and risk on investment. In some places access is a problem
Seasonal climate forecasts	Tactical decisions to match management to season's potential	Lack of reliability and availability in user-friendly formats
Conservation agriculture	Increases yield, conserves soil and water and improves soil quality	Lack of availability of residue and planting equipment
Diverse income sources	Non-farm income sources less climate sensitive	Limited opportunities in rural areas
Adjustable planting dates	Crop growth matches seasonal rainfall	Not appropriate to areas practicing dry planting, and limited opportunities due to short growing period
Farm expansion	Increases production	Availability of land and labour and potential impacts on environment
Improved markets	Increases income by realising better prices and reduces vulnerability to price fluctuations	Unsuited to areas with poor access to markets and possible conflicts with middlemen
Early warning systems	Avoids potential losses	Lacks reliability and institutional support
Safety networks and insurance	Covers risks and encourages investments in improved technologies	High premium and low interest of insurers in dry areas where risk is high
Agro-forestry	Increases over all productivity and makes better use of rainfall	Lack of availability of suitable trees and trade-offs

Development of interventions that reduce risk and enhance adoption of improved technologies is the subject of research under two projects supported by ASARECA-CGS: "Making the best of climate: Adapting agriculture to climate variability" and "Managing Uncertainty: Innovation Systems for Coping with Climate Variability and Change". Studies carried out under these projects have made significant contributions to improve the understanding

of uncertainty and risk associated with variable rainfall and in developing management options that not only minimise risks during below normal seasons, but also help farmers take advantage of opportunities created during normal and below normal seasons. Here we briefly summarise the findings from these studies and discuss their implications.

4.3.4 Understanding and evaluating climate risk

The process of risk management starts with an assessment of how the risk is perceived by farmers and how it is currently being managed. Over the years, farmers have developed and adapted successfully to the fluctuations in climate across and during the years through keen observation, experimentation and practice. The role and value of this local indigenous knowledge in designing appropriate research, development and extension strategies that are relevant to the local conditions has long been recognised and is well documented (Chambers 1983; Richards 1985; Agrawal 1995; Carswell and Jones 2004; Chambers et al. 1989; Pretty et al. 1999).

However, considering the complexity involved in understanding the trends in highly variable phenomena such as rainfall, doubts have been expressed on the ability of farmers to accurately discern climate trends from their casual observations (Kempton et al., 1997); the completeness of their assessment since they represent simplified versions of complex reality (Johnson-Laird, 1983); and the subjective nature of these perceptions (Beal, 1996; Marra et al., 2003; Pannell et al., 2006; Sattler and Nagel, 2010). Further, farmers' perceptions are also likely to be shaped by the agro-economic performance of crops and other farm enterprises that affect their livelihoods, where climate is only one of the many bio-physical and socio-economic factors that affect productivity. Farmers' perceptions are influenced by a range of other factors such as gender, level of education and farm size.

Table 4: Distribution of different season types (%) as perceived by farmers and from analysis of historical climate data

	Farmer perception			Climatology		
Location	Good	Average	Poor	Good	Average	Poor
Kitui	34	37	29	65	17	18
Mwingi	26	32	42	41	30	28
Mutomo	21	33	46	42	26	31
Katumani	23	34	43	28	36	35
Makindu	8	29	63	18	23	59

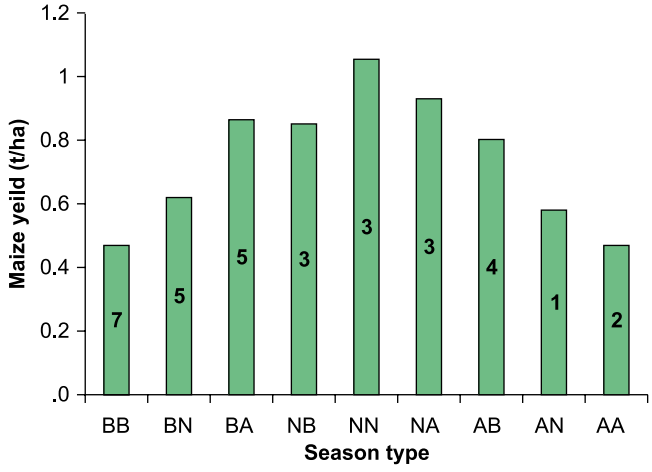


Figure 6: Maize yields of Machakos and Makueni districts during years with different types of seasons. (B = Below normal seasons with <250 mm rainfall, N = Normal seasons with 250– 350 mm rainfall and A = Above normal seasons with >350 mm rainfall. The two letters represent long and short rain seasons and numbers on the bar refer to the number of years)

Studies conducted in five districts of Eastern Kenya, viz., Machaos, Makueni, Kitui, Mwingi and Mutomo, to assess farmers' knowledge and understanding of both short-term and long-term variability in climate and associated risks revealed that farmers, in general, have a good understanding and knowledge of their location's general climate , its variability and the probabilistic nature of variability (Rao et al., 2011). However, their ability to estimate the frequency distribution of different events and discern long-term trends is more subjective. Farmers tend to attach higher significance to negative events or impacts, leading to a biased estimation in the frequency of occurrence of negative events (Table 4). This has important implications in the assessment of risk and in subsequent decision-making. Their perception of higher risk results in them preferring techniques requiring low levels of cash investment and acts as a major deterrent in optimising input use and taking advantage of improved technologies. This is one of the primary reasons for low levels of adoption of improved inputs such as use of fertilisers and improved seed.

The analysis of long-term maize yields of Machakos and Makueni districts highlights the effect of these conservative approaches adopted by farmers on productivity of agriculture (Figure 6). While the practices adopted by farmers are yielding fairly good results during below normal and to some extent during normal seasons, they are unable to capitalize on the opportunities available during the normal and above normal seasons. The current district average yields of about 0.5 t/ha is very

low when compared to the yields achieved in on-farm trials and on the farms of progressive farmers in the area.

Use of fertilisers is essential to improve productivity of inherently infertile soils. However, farmers, in general, do not use fertilisers even though the productivity gains from their use is well demonstrated and well known. One of the reasons for this is the risk and possible loss of investment made in this costly input. For example, results from simulation analysis conducted with long-term climate data from Katumani on maize yield with farmer practices of no fertiliser and improved practice with 40 kg N/ha indicate that, on an average, use of recommended dose of 40 kg N/ha gives much higher yield than that achieved by farmers under low input system (Figure 7). However, in below normal rainfall seasons, maize yields are higher under low input system than in the improved system. Further analysis on returns on investment revealed that, at Katumani, farmers will realize the investment made in fertilizers in 65% of the years and will earn a good profit in 56% of the years.

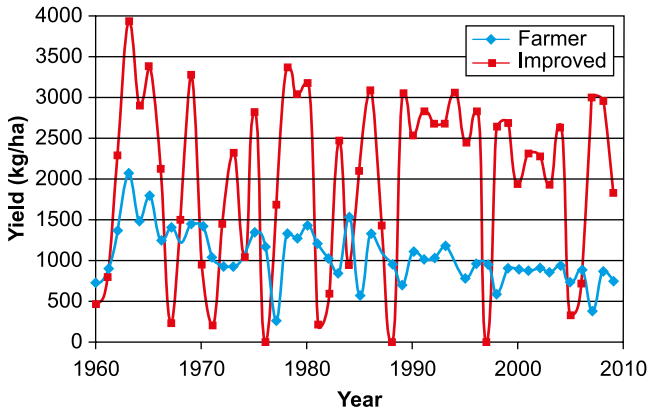


Figure 7. Simulated long-term maize yields at Katumani, Kenya, with farmer practice of no fertilizer and improved practice with recommended dose of 40 kg N/ha.

An important implication of this assessment is that recommendations based on performance under mean conditions may not be appropriate in environments where climate variability results in high season-to-season variability in production. The recommended solutions should include adequate information on the risk and return profile of the proposed technology so that the end users can make informed decisions depending on their ability to take risks.

4.3.5 Managing climate risk

The uncertainty associated with climate variability, combined with inaccurate perceptions about risks and risk aversion on the part of decision makers, causes substantial loss of opportunity in climatically favourable and even average years (Hansen et al., 2010). Farmers employ a range of strategies to protect against the possible losses, which include selection of less risky but less profitable crops (Dercon, 1996) or cultivars (Morduch, 1990); under-use of fertilisers (Bliss and Stern, 1982; Binswanger and Sillers, 1983); shifting household labour away from farming enterprises (Rose, 2001; Rosenzweig and Stark, 1989); and shifting from productive to non-productive but more liquid assets as precautionary savings (Paxon, 1992; Fafchamps, 2003; Zimmerman and Carter, 2003). Most of these practices are very effective in reducing the risk but at the cost of reduced productivity. The resulting opportunity cost is a serious impediment to agricultural development efforts and hence rural livelihoods and agrarian economies. Hence, there is a need for increased attention to risk management options in order to deal effectively with year-to-year fluctuations in seasonal rainfall.

Risk management is the process of choosing appropriate methods to avoid, reduce, mitigate and recover from risks that smallholder farmers face from events that have different probabilities of occurrence. Effective risk management strategies should cover adequately all of these aspects and should assist in better preparing, managing and recovering from impacts of different magnitude and frequency. Such strategies can be broadly grouped into three categories:

1. ***Ex-ante adaptation options for better preparedness***: Actions taken before the event is realised to prevent or minimise losses from identified risks.
2. ***In-season adaptation options for better management of emerging risks***: Actions taken in response to the nature of the rainfall season as it unfolds.
3. ***Ex-post adaptation options to facilitate better recovery from shocks:*** Actions taken after the risk is realised to minimise livelihood impacts of adverse climatic shocks. These are mainly associated with the relief and recovery programmes, and stress the need for a shift from ad-hoc relief measures to planned interventions that aim at creating longer-term livelihood options for better vulnerability reduction.

There are several opportunities that exist under each of the above three categories and a wealth of information has been generated in the past few years on the effectiveness of these options. These options open up new opportunities for smallholder farmers to increase productivity by making the best use of available resources. The discussion here is limited to ex-ante and in-season adaptation options.

4.3.6 Ex-ante adaptation options for better preparedness

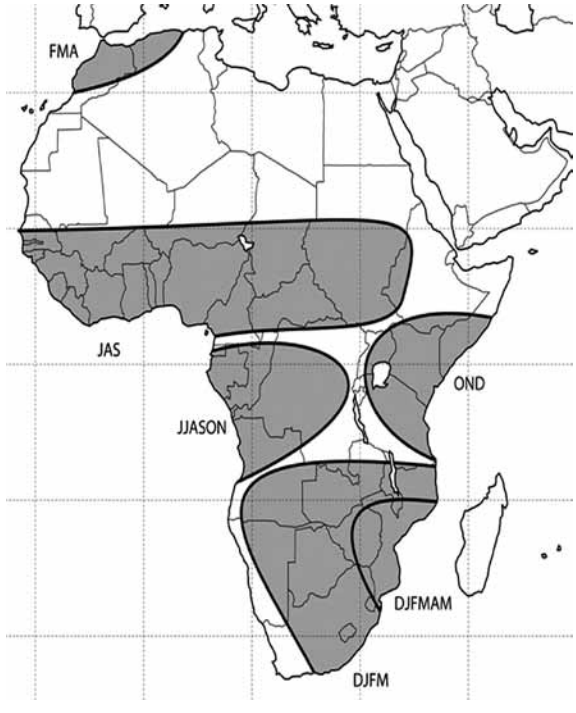
Ex-ante management options can reduce exposure to risk, and increase returns on assets, and, thereby, contribute to increased productivity and profitability of farm enterprises. Farmers normally use strategies such as diversification with crops and varieties with varying tolerance to water deficits; intercropping/mixed cropping; planting larger areas; using low plant population; and moisture conservation, including irrigation, to ensure at least some harvest every year. Here, we discuss two potential options that received less attention from researchers in the region – use of seasonal climate forecasts in farm-level decision-making and crop insurance schemes.

Seasonal climate forecasts

One important and promising way of preparing for the forthcoming season is through the use of seasonal climate forecasts. Seasonal climate forecasts though not perfect have sufficient skill to make more rational and informed decisions in preparing for the coming season. Globally, there is a growing interest in exploring the opportunities for forecast-based farming, more so after the accurate prediction of the 1997/1998 El Nino event. The reliability and accuracy of these forecasts is improving rapidly with the increased understanding of the global climate system and the factors influencing it.

In the case of Eastern Africa, good predictability was reported for October–December 'short rains' for the areas covering much of Kenya, eastern Uganda and northern Tanzania (Figure 8), while the skill of predicting 'long rains' was low (Mason, 2008). Hansen et al. (2011), after a thorough review of the available evidence from a combination of understanding of how climatic uncertainty impacts agriculture, model based ex-ante analyses, subjective expressions of demand or value, and the few well-documented evaluations of actual use and resulting benefit, concluded that seasonal forecasts may have considerable potential to improve agricultural management and rural livelihoods. They also identified constraints related to legitimacy, salience, access, understanding, capacity to respond and data scarcity as the main limitations for widespread use and benefit from seasonal prediction among smallholder farmers. Almost all the national meteorological services in the region issue forecasts on a regular basis though their use in agriculture remains under developed.

Figure 8: Predictability of rainfall across Africa. (Source: Mason, 2008)



Since important farm decisions, whose outcome is highly sensitive to the amount and distribution of rainfall during the season, are to be made well before knowing the seasonal conditions, advance information about the rainfall during the forthcoming season has the potential to help farmers make more tactical decisions in planning investments and in adopting management practices that make the best use of the season. The studies conducted in Kenya to evaluate the potential benefits from the use of seasonal climate forecast information in planning farm operations have provided valuable insights about the usefulness of this information. The studies focused on three key issues: (i) assessing the reliability of forecast information, (ii) the potential to change decisions, and (iii) access to information in a format that could easily be understood, which are critical for farmers to make decisions based on seasonal climate forecast information.

Reliability of forecasts

There is considerable variation in the skill with which climate can be predicted for different locations but the predictability over much of the ECA region is high, mainly due to the high influence of the El Nino and La Nina phenomena on the local climate (Figure 8). Analyses of 'hind casts' produced by International Research Institute for Climate and Society (IRI) for 43 seasons showed that the forecasts are generally reliable (Table 5). Out of the 19 and 24 seasons that were predicted to get below and above normal rainfall respectively, the prediction went wrong four times in each category. However, farmers considered that the failure of below normal season prediction is not a problem since it represents a lost opportunity and does not involve any losses on investment. But the wrong prediction of above normal season is a problem as it can lead to potential loss on investment. They have also indicated that for them to use forecast information in planning farm operations, it should be true in four out of five times, and considered that the current skill in the forecasting met their requirement.

Table 5: Reliability of seasonal climate forecasts at Katumani, Machakos district, Kenya

Rainfall class	Total predictions	Hits	Misses
Below normal (<250 mm)	19	15	4
Above normal (>250 mm)	24	20	4

(Studies by Stewart et al. 1983 and crop simulation analysis with long-term data indicated that a seasonal rainfall of about 250 mm is required to grow a good maize crop in this environment.)

Potential to change decisions

The forecast to be useful should lead to a change in management decision, and farmers in the pilot sites have identified a number of management decisions that can be based on forecast information. These include:

1. Selection of crops and varieties: Farmers prefer sorghum and other drought-tolerant crops and short duration varieties in the seasons predicted to be below normal.
2. Allocation of land to different enterprises: Allocation of land for different crops and varieties such as more land for maize in seasons predicted to be above normal.
3. Selection of management practices: Selection of a number of management practices such as use of soil and water conservation practices and use of fertiliser and other inputs can be made with forecast information.
4. Asset development: Farmers have indicated that it is possible to use the forecast information in deciding number and type of livestock, keeping food reserves, and so forth.
5. Labour allocation: In the seasons predicted to be below normal, they can look for more off-farm employment and, if necessary, consider temporary migration.
6. Marketing the produce: It is possible to strategise the amount of produce and the time of selling it and also buying inputs.

Access in a format that can be easily understood

A weather-based agro-advisory system was developed to communicate the timely forecast of information in a format that could be easily understood by farmers. The advisory is an interpretation of the seasonal climate forecast issued by the national meteorological department (KMD) in consultation with scientists from the national agricultural research institute (KARI) and the local extension officers from the Ministry of Agriculture in the target districts. The advisory provides a succinct summary of the agricultural implications of the forecast that the team, by consensus, has agreed as the most appropriate/feasible for the type of season predicted (Figure 9). The advisory is location-specific and is based on rainfall data from the closest meteorological station. The probabilities are converted into amounts of expected rainfall using the programme FACTFIT, developed by FEWSnet. The advisory was made available to the interested farmers through the office of the local agricultural extension officer.

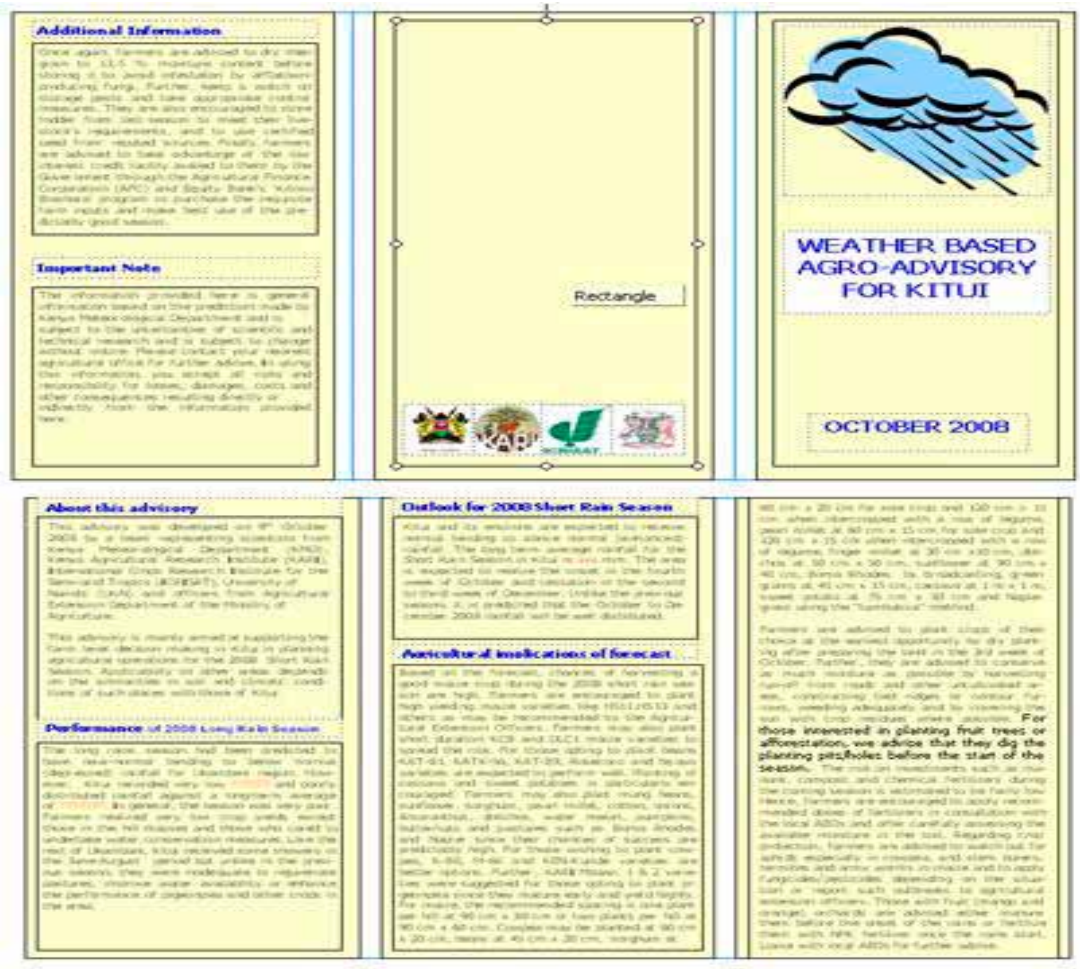


Figure 9. An example of location and season-specific advisory.

Farmer assessment of advisories

Though farmers preferred more specific information about the season, including distribution of rainfall during the season and length of dry spells, they felt advisories include relevant information that they can use to tailor crop management to expected conditions. In practice, a broad indication (season likely to be good, average, poor) was found to be sufficient for making informed decisions. A survey conducted to evaluate the usefulness of the advisories showed that most farmers considered the advisories as extremely useful in planning farm operations, an observation well supported by the willingness of 87% of the farmers interviewed to pay for the service if required (Table 6).

Crop insurance

Insurance against crop loss is receiving increased attention as a means to cover losses from extreme events such as flooding and droughts and enhance the resilience to shocks. Crop insurance schemes are well established in developed countries, where farming is practiced by large commercial farmers, but are new to developing countries, where farming is mainly limited to subsistence and generates very little marketable surplus. In addition, there are also problems associated with accurate assessment of risks in financial terms and high transaction costs due to involvement of a large number of farmers over small areas. Index insurance is one approach that appears to offer considerable promise in the countries where agriculture is predominantly smallholder in scale. Index insurance allows large number of smallholdings to be aggregated in a uniform area, and involves low transaction costs since no verification is required. Index insurance is based on an objectively measured index of how climate extremes affect crop production to determine certain climate triggers which when surpassed would support a compensation payment. The World Bank has supported the design and piloting of climate insurance schemes in India, Malawi,

Table 6: Farmer assessment of usefulness of advisories in planning farm operations and their willingness to pay for the service

Location	Total farmers (No)	Usefulness (%)			Willingness to pay
		Extremely useful	Somewhat useful	Not very useful	
Kitui	27	59%	33%	0%	81%
Mwingi	39	77%	29%	3%	85%
Mutomo	26	69%	22%	3%	96%

Mexico and many other countries across the world. In Malawi, the IRI designed an insurance system that allowed farmers to access loans, which, in turn, provided access to inputs and the cash necessary to pay for the insurance premium (Hansen et al., 2010).

Through this programme, farmers were able to purchase hybrid seed and quality fertilisers needed to be more productive. The number of farmers who purchased insurance increased from 892 in 2005 to several thousand in the 2006–2007 seasons.

ILRI in collaboration with UAP Insurance Ltd. and Equity Bank is piloting an index-based livestock insurance programme in the arid Marsabit district of Kenya. In this case, the indexes are based on the availability of forage estimated using satellite imagery. Payments are triggered when the satellite images show that forage is likely to become very scarce and animal mortality is expected to be in excess of 15% within the defined geographic area. In Ethiopia, a different type of insurance project was designed and tested to address national food security (Stayton and Hess, 2006). The insurance, developed in cooperation with the World Food Programme (WFP), is purchased by the Ethiopian government to provide funding for food aid in response to large droughts. When rainfall across several locations in Ethiopia is low and it is likely to lead to substantially lower maize yields, the WFP receives an insurance payout to supplement its relief budget for those years.

One of the limitations in developing and implementing such schemes in the region is related to the availability of climatic data. Good historical weather records to analyse and design the index and extensive and reliable network of weather stations for monitoring current climate are the two important prerequisites in designing index-based insurance schemes. Another problem with index-based schemes is that payments are connected to the climate surpassing a certain trigger, and losses, if any, before the reaching the threshold attract no payment. Such schemes generally involve collaboration between various organisations, including private and public sector institutions. Substantial investments are required to develop the product and explain it to the farmers, and it is unlikely that insurance companies develop these products unless facilitated by the national governments or organisations such as the World Bank or Africa Development Bank. The low capacity of farmers to pay the premium is another important hurdle in promoting these schemes. Some countries such as India, Brazil and Mexico are promoting these schemes by subsidising the insurance premium.

4.3.7 In-season adaptation options for better management of emerging risks

There are several well-researched options which, when adopted, have the potential to reduce risk and even take advantage of the conditions depending on how the season progresses. These are simple, inexpensive and efficient technologies requiring low levels of investment, but the potential benefits from these technologies are very high. Some of them are based on indigenous knowledge. A few examples of such interventions are presented here.

a. **Seed priming:** Seed priming is a simple strategy to make seeds germinate faster and achieve a good plant establishment. Seeds normally spend a great deal of time just absorbing water from the soil. Priming hastens germination and seedling emergence by reducing the time required for imbibing water from the soil. Farmers from Nepal and Botswana have used this technique for generations, especially when the onset of rainfall is delayed to catch up on time lost to drought. This simple technology has several advantages. Primed seed usually emerges from the soil faster, and more uniformly than non-primed seed of the same seed lot. This helps in establishing the plant quickly and in overcoming moisture stress from early period dry spells. Faster germination and emergence result in rapid development of seedling root system while conditions in the surface

layers are still favourable and hence the plant is able to survive better by making better use of moisture stored in the lower layers. It is also observed that in some instances primed crops compete vigorously with weeds and escape pest attacks.

The crops flower early, mature earlier and give higher yields. It also provides a means to supply some nutrients that are required by the crops in small quantities. For example, in acid soils of Eastern Africa, legumes do not grow well because they cannot take up enough molybdenum. In some soils phosphorus is a constraint. Substantial yield benefits can result from the addition of tiny amounts of molybdenum to the priming water or by treating the primed seed with small quantities of soluble phosphorus. Researchers from CAZS natural resources, University of Wales, Bangor have conducted extensive research in several countries to establish safe limits – the maximum length of time for which seeds can be soaked – and evaluated benefits (Table 7) for a wide range of tropical and sub-tropical crops (Harris, 2006).

b. **Transplanting:** Transplanting seedlings is another strategy to extend the crop-growing period in the areas where the length of the growing period is short or reduced by delayed on-set of rains. Transplanting is a technique more commonly practiced with rice and vegetable crops. In areas of Africa and Asia, transplanting of cereals such as sorghum and pearl millet is a traditional practice used to either fill gaps after crop emergence and thinning or to compensate for a growth period that is insufficient to complete crop cycle (Rehm, 1989; BOSTID, 1996). Transplanting maize is not common except in some countries under irrigated systems. It is usually done by raising nurseries about a month earlier to the onset of rains on small plots near the homes using small amounts of water. Transplanting, besides increasing yields, was found to contribute to stabilisation of yields and avoidance of loss of crop in some seasons. Studies conducted in the Tigray and Afar regions of Ethiopia revealed that transplanted sorghum flowered 10–25 days early and matured 50–65 days earlier than the sorghum directly sown at transplanting time (Assefa et al. 2007). Further, the transplanted sorghum recorded about 1.0–1.8 t/ha higher yield compared to normal sowing with the onset of rains. In the studies conducted by Oswald et al. (2001) in Western Kenya, yield losses from striga infestation was found to be significantly less than that in direct seeded crop. Striga densities were considerably low when maize seedlings of more than 17 days old were planted. The main constraint here is high labour requirement.

c. **Response farming:** Detailed studies were conducted in Kenya on response farming in a project aimed at designing sustainable and flexible cropping systems for low-resource farmers in marginal rainfall zones, characterised by great seasonal rainfall variability, uncertainty, and recurrent drought. The method uses date of onset of the rainy season as a predictor to assess the amount and distribution of rainfall during the cropping season. Stewart and Fraught (1984) found that seasons with early onset are superior to late onset seasons and last longer. The critical date separating early onset from late onset is selected from the graph of season rainfall duration versus date of onset, and was used as the first decision tool to select varieties of appropriate duration. The season is continuously monitored and the data related to the observed long-term trends studied to make necessary decisions on fertiliser application, plant population adjustments and other agronomic decisions. Though found to be very effective, there are constraints in terms of communicating the information regularly and in time to the farmers. While all components of response farming such as reducing the number of plants after a certain amount of moisture deficit may not be practical, some components of this system are extremely useful in planning farm operations under uncertainty.

Table 7. Summary of crops responding positively to on-farm seed priming

Crop	Soaking time (hrs)	Countries	Largest yield benefit observed (%)
Wheat	12	India, Nepal, Pakistan	37
Barley	12	Pakistan	40
Upland Rice	12-18	India, Nigeria, Sierra Leone, Gambia, Cameroon	70
Maize	12-18	India, Nepal, Pakistan, Zimbabwe	22
Sorghum	10	Pakistan, Zimbabwe	31
Pearl millet	10	Pakistan	56
Chickpea	8	Bangladesh, India, Nepal, Pakistan	50
Mungbean	8	Pakistan	206
Finger millet	8	India	15

d. **Microdosing of fertiliser:** Low use of fertilisers is one of the major factors contributing to the low levels of crop yields in the region. Given the risks involved with an unpredictable climate, farmers are unwilling to invest in fertilisers to replenish the soil, and consequently soils are depleted, yields and crop quality decline, and hunger and under-nutrition are exacerbated. Use of small doses of expensive fertiliser is a precision-farming technique that helps farmers overcome this problem. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has carried out research on effectiveness of micro dosing at several locations in many African countries. The technique involves application of small, affordable quantities of fertiliser onto the seed at planting time, or a few weeks after emergence. The technique was found to make optimum use of fertiliser with high levels of use efficiency, making it an economically viable option for the farmers. Considering the potential of this technique, private fertiliser companies in many countries are now making fertilisers available in small packets suited to the resource constraints of small-scale farmers.

e. **Contingency plans:** A contingency plan defines how a household will recover from a critical event to resume normal operations. Unfortunately, not much work has been carried out in the region in developing location-specific contingency plans that suggest effective management alternatives for situations like early, mid and late season dry spells of differing intensity and frequency.

4.3.8 Conclusions

Farming in dryland areas is a risky enterprise and the primary source of that risk is variability in climate. Projected changes in climate are expected to make the situation worse, with increased variability in rainfall and more frequent occurrence of extreme events. Managing risks associated with variable climatic conditions is a difficult task but opportunities exist. Research carried out in the region under projects supported by ASARECA-CGS and CCAA programme of International Development Research Centre (IDRC)/Department for International Development (DFID) has identified opportunities that can yield significant benefits. The key lessons from this research are as follows:

a. In general, inadequate attention was paid by researchers and development agencies in managing production risks associated with variability in climate. Recommendation and promotion of most technologies is based on the performance under average conditions, with little or no attention to possible risks and costs involved. As a result, adoption of these technologies by risk-averse smallholders remained low.

b. Farmers' perceptions of climate variation, risk and change are complex. The evidence suggests that they over-estimate risks of negative impacts and adopt conservative low-input agriculture that covers risks, but cannot make use of good conditions when they occur. The resulting opportunity cost is the profit foregone.

c. Climate change is real with the potential for significant negative consequences. For adaptation related work, more accurate projections about the potential changes at the local level are required. At this stage, there are still problems in downscaling and developing site-specific scenarios. Hence, adapting to risks associated with current climatic conditions is an essential first step towards adapting to future changes in climate.

d. Research and development organisations should consider developing and promoting risk management strategies that are based on systematic use of historical and current weather/climate information. Seasonal climate forecasts, especially for locations with high predictability, are extremely useful in making farmers take tactical decisions in planning and managing their resources, and thereby reducing risks and achieving higher levels of productivity.

e. Several low-cost low-risk technologies with a potential to improve productivity are available. These are mostly technologies developed from indigenous knowledge and are easy to adopt. Promotion of such technologies can lead to significant gains in both increasing productivity and adapting to current and future climate uncertainties.

f. Developing and implementing contingency plans defining effective actions to minimise unanticipated damage from climate events at the farm and local levels is an important strategy that is not very well developed in the region. There is a need for R&D organisations to put in place such measures to create awareness and provide timely advice in managing-climate related risks.

g. There is need to strengthen the capacity to make better assessment of impacts of climate variability and change. Understanding how systems perform under different climate scenarios and how the negative impacts can be

mitigated is an important prerequisite in formulating effective adaptation options. Crop simulation models and other tools are extremely useful in making such assessments and, currently, the region has very limited capacity in using such tools. There is an urgent need to strengthen the formal and informal education by including such curricula in the formal university education and by developing appropriate short-term training programmes.

h. Institutional arrangements that can better link relevant institutions to work together and complement each other's strengths are required both at the national and the regional levels. No good collaboration exists between the meteorological and the agricultural research institutions at the national level, and the links between research and extension are also weak.

4.3.9 Way forward

ASARECA as a regional organisation has done well to place adaptation to climate variability and change high on the research agenda by identifying it as one of the priority areas for research in its current and previous strategy documents and by initiating and supporting research through its CGS system. These initiatives have led to significant achievements in creating awareness about climate issues; establishing teams of researchers in the participating countries; improved understanding about the role of climate variability in smallholder agriculture; and in developing innovative approaches to reduce negative impacts of variable climate. However, not all countries have benefited from these initiatives and some of the products are yet to reach the scales where outcomes of these investments translate into on the ground actions and generate measurable impacts. ASARECA, with a network of national, regional and international organisations as well as donors, is well positioned to build on these initial successes. In looking to the future and suggesting possible ways in which ASARECA may continue to support climate risk management research, we suggest that ASARECA should work towards developing a more comprehensive well-targeted regional research agenda centred around key problems that the region is facing. Considering that the research on climate issues is fairly new in the region, efforts should be made to develop effective partnerships between local and advanced research institutions to strengthen the local capacity. Following are some of the key issues that ASARECA can consider while building such initiatives:

i. Increased focus on climate issues: Despite the key role that climate plays in defining agriculture, researchers and development agents have not given it the required attention. The current focus on climate issues, triggered by climate change and its potential impacts on smallholder agriculture, has opened up new opportunities to undertake a more detailed evaluation of climate impact on agriculture and develop and promote technologies that help smallholder farmers in effectively managing them. All ASARECA programmes should consider supporting studies that quantify economic impact of climate variability and change as well as the benefits, and develop management options aimed at minimising the negative impacts. This can be achieved through integration of climate issues into ongoing activities or through reanalysis of data from previous studies.

ii. Promote better understanding of climate issues: Previous work highlighted the need to improve the understanding of all stakeholders from farmers to policy makers about the impact of climate variability and change on agricultural systems. Agricultural systems are complex involving integration of many processes, and analysing them will be difficult. Problems with availability of good quality data and limited skills in analysing the available data inhibit the capacity of the organisations in the region to quantify and understand the effect of climate on productivity and performance of agricultural systems. There are also problems with separating the effects of climate variability and change from the effect of other factors such as changes in soil fertility. Also, impacts of climate change are not always negative and uniform across the region. There is a need to improve the understanding of all stakeholders, including planners, researchers, extension workers and farmers, on issues related to climate variability and change and on the possible location-specific impacts.

iii. Address the current challenges: Climate change brings new challenges but it also highlights the need to address more comprehensively the same old problems that agriculture in the region has been struggling to cope with. Since the projected impacts of climate change on agriculture tend to be extensions of the substantial challenges that climate variability already imposes, developing management options that could actually buffer against some of the more detrimental impacts associated with current variability in climate provides a good starting point to deal with future changes. Most practices aimed at strengthening and promoting sustainable agriculture can make significant contributions towards adapting agriculture to climate change and variability and in improving the resilience of small-scale agriculture. The need here is more on addressing the constraints limiting the adoption

of these practices by smallholders than doing more research to develop new technologies. Since climate-induced risk is one of the major constraints in the adoption of these technologies, adaptation research should focus on developing and promoting effective risk management strategies such as those identified in this paper.

iv. Enhance the capacity of researchers in the region: Understanding how systems perform under a changing climate and how the negative impacts can be mitigated is an important prerequisite to formulate effective adaptation options. There are a wide range of weather-driven climate risk assessment tools that provide valuable insights into climate-induced production risk as well as allowing the evaluation of the potential of a range of crop, pasture, soil and water management innovations to mitigate such risks. Such tools also have the ability to evaluate the implications of a range of climate change scenarios using varied scales ranging from the plot, farm, catchment scales to the national and regional scales. The region has very limited capacity to use such tools and there is an urgent need to strengthen the formal and informal education to include them in the curricula. ASARECA, in collaboration with partner institutions, should work towards establishing core teams of researchers with relevant skills to develop and disseminate climate information products.

v. Networking of partners: Of particular interest here is the partnership between meteorologists and agricultural researchers. Research on climate issues can be more effective when climate scientists work together with agricultural scientists. In almost all countries in the region, the collaboration between these institutions is very limited. The National Meteorological Services are the collectors and custodians of long-term climate data, and are increasingly gaining the skills to analyse and use such data to deliver climate risk related products. As such, it is imperative that they are key R&D partners in the consideration of agricultural adaptation to climate change. ASARECA and partner institutions should make deliberate efforts to involve them as partners in the projects and programmes involving climate studies.

vi. Promote sharing of knowledge and best-bet technologies: The region is a diverse mix of countries with varying capacities and strengths. Researchers and practitioners throughout Africa are conducting climate related research under a number of initiatives including those supported by ASARECA-CGA, but the available knowledge is not shared effectively for the benefit of all. Most research results end up in grey literature such as project reports with limited access. ASARECA can play an important role in developing a knowledge management system that allows efficient sharing of knowledge and experiences among institutions so as to promote rapid and effective uptake of innovative practices, technologies, and research results and to avoid duplication of research efforts.

"The broad adoption and implementation of the CAADP agenda at this particular time in the history of agricultural sector development in Africa is of great significance. It offers the opportunity to further sustain and deepen the unprecedented pace of growth recovery of the last 15 years. If, through CAADP, a large number of countries manage to maintain a 6% growth trajectory, living conditions in the continent would change dramatically within a generation. At the turn of the century, only five countries exceeded the CAADP target agricultural growth rate of 6%. By the middle of the decade, that number had grown to 9."

Dr Ousmane Badiane, Director for Africa, International Food Policy Research Institute, speaking at ASARECA General Assembly, December 2011

5 ABSTRACTS AND EXECUTIVE SUMMARIES

SUB-THEME 1: AGRICULTURAL DEVELOPMENT CHALLENGES AND OPPORTUNITIES

5.1 The emerging impact of CAADP as a planning and partnership platform to accelerate growth and poverty reduction in Africa

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This paper reviews the implementation progress of CAADP and evaluates its emerging impact on future growth and poverty-reduction outcomes. Analysis of long-term agricultural growth and poverty reduction options at the country level as part of the CAADP implementation agenda is supporting evidence and outcome-based agricultural policy planning and execution. Results of analysis from 7 east and southern Africa and 14 West Africa countries reveal that, at current trends, achieving the CAADP 6% growth target and MDG1 target of halving poverty by 2015 is out of reach for many countries. Meeting these targets will require countries to not only raise agricultural spending but also its efficiency. Nonetheless, emerging trends in agricultural growth and spending, development assistance, and improved partnerships, review and dialogue, and mutual learning mechanisms bode well for CAADP and Africa's success. The CAADP implementation process is taking place at a time when the continent has been undergoing an agricultural growth recovery, with many countries showing improved agricultural growth rates in recent years. The number or countries that have raised their funding levels in pursuit of the CAADP 10% agricultural budget share has increased steadily, while support from the international development community has been stepped up as evidenced by recent increases in overseas development assistance and various commitments and initiatives in support of Africa's agricultural and rural development.

"In Africa, many farmers are incapable of responding to the high commodity prices because they lack access to input markets. Increasing prices of key agricultural inputs such as fertiliser, fuel for transportation are constraining supply response, even as food prices increase in the Eastern and Central Africa. The high fertiliser prices are likely to reduce its use even further. This is further exacerbated by poor physical infrastructure, which constraints the distribution of agricultural inputs and outputs.

Joseph Karugia in a paper presentation at ASARECA General Assembly December 2011

5.2 High and volatile food prices: drivers and impacts on food security in ECA

Joseph Karugia, *ReSAKSS-ECA, ILRI*

Global food prices increased substantially between 2007 and 2008, but declined in the last half of 2008 and stabilised in 2009 only to begin surging again in 2010 to reach unprecedented peaks in February 2011. Indeed, the recent price levels are the highest since the inception of the United Nation's FAO food price index (FPI) in 1990, suggesting a renewed food price crisis. On the other hand, domestic food prices within the ECA region defied international trends to remain persistently high throughout the period under review. As global food prices rose sharply and peaked in the first half of 2008, food prices within the ECA region increased too, but at lower rates. Furthermore, even though global commodity prices slumped in the second half of 2008 and stabilised throughout 2009, food prices within the ECA region remained high.

In 2010 and 2011, food prices within the ECA region have continued to rise in tandem with world food price trends. This paper draws from several reports and briefs that have been prepared by the Regional Strategic Analysis and Knowledge Support System for Eastern and Central Africa (ReSAKSS-ECA) in collaboration with ASARECA in the last three years. It presents the results, major conclusions and recommendations from the analysis to provide information on the nature, content, causes, effects and implications of what has been called the global food price crisis in the context of the region of ECA. Such information is useful for governments, donor agencies and other stakeholders concerned with addressing the food price crises, both in the short and long term.

A key result is that while the price rise involved most of the staple commodities including maize, rice, wheat, and meat, different countries in the ECA region exhibited different patterns and were affected differently. Among the countries considered in the analysis, FPI rose fastest in Ethiopia and Kenya in that order. Uganda started experiencing a surge in FPI in early 2010. Results also show that domestic prices are more volatile than global prices. The differing pattern between global and domestic prices is largely explained by the low transmission of global price changes to domestic markets, an indication of poor integration of ECA markets to international markets.

The factors behind the dramatic surge in global prices are varied and to a large extent remain contested. Many authors have argued that the overarching cause for the spike in global food prices was that demand had outstripped supply. However, recent evidence on the causes of the global food price crisis points to a combination of economic factors both on the supply side and the demand side. On the demand side, the combination of rising incomes in developing countries, increasing world population, rapid urbanisation, changing diets and an ever increasing demand for biofuel products to cater for energy needs have been the driving forces behind the food price crisis. On the supply side, the combination of high agricultural input prices (especially fertilisers and fuel), climatic shocks, reduced world food stocks, reduced exports, underinvestment in agriculture and declining agricultural resources such as land and water have been associated with low supply of food commodities.

In the context of ECA , the food price crisis has been attributed to a combination of the global causes and other region specific factors. One of the dominant causes of the high food prices in this region is a rapidly expanding population that has created a huge demand for food. Unfortunately, the region is characterised by low agricultural productivity that is partly attributed to underinvestment in the sector, high input prices and recurrent droughts. As a result, food

supply has not expanded adequately to match the increases in demand, fuelling an increase in prices. The region-specific causes of the food price crisis include unstable macroeconomic conditions, inappropriate trade policies, poor transmission of international prices to domestic markets, recurrent droughts, natural disasters, and conflicts.

The high and volatile food prices have different effects on different countries and members of the community. It can deliver tremendous benefits to the farming communities and countries whose economies are dominated by agriculture. However, such benefits accrue mainly to net-producing households or net-exporting countries. Commercial farmers, who can respond to the increase in prices by increasing production, can potentially benefit from the price boom provided that changes in the prices are transmitted to them through the value chain. Net exporting countries benefit by experiencing increased revenues from sales, and hence improved terms of trade. Despite these potential benefits of the surge in commodity prices, the high food prices have impoverished many small farmers in ECA countries and led to household food insecurity as most farming households are net buyers of food. The surge in food prices has also adversely affected ECA economies, especially those of net food importing countries. Such countries face the threat of food price-induced inflation, large food import bills, and deteriorating terms of trade, which add to the problem of food insecurity at both the national and the household levels. The food price situation has posed significant challenges to the achievement of MDGs within ECA , and, in particular, to the reduction of poverty and hunger.

The responses to the food price crisis reflect a diversity of sorts across countries in ECA . Overall, two interrelated categories of responses have been noted. First, international actions and policies that were advocated for by donors, and, second, country-specific responses that were initiated by individual governments. Within this region, the policy responses adopted are greatly varied but can be broadly classified into demand-side and supply-side policies. The most common responses broadly aim to ensure that there is an adequate and affordable food supply for the majority of consumers and that safety nets are provided for the most food insecure and vulnerable. They also aim at fostering a positive agricultural supply response.

The conventional consumption policies adopted to cushion consumers against the adverse effects of rising food prices in the region included interventions such as food subsidies, food stamps, food for work projects, safety nets and tax reductions. The supply-side policies implemented to increase food production revolved around release of food reserves, input subsidies and producer price support measures. In addition to the demand and supply-side policies, several ECA countries adopted trade policies to cushion their producers and consumers. The most popular trade policy measures adopted to manage food price increases included import tariff reductions and the imposition of export taxes and export bans.

Given the many social problems that the food price crisis has created within ECA , this report recommends the adoption of both short-term and long-term policy measures. In the short-term, governments and donors within the ECA region can meet the food needs of the most vulnerable by the provision of emergency food aid, zero rating of duties on food imports, and abolishing of price controls and export restrictions coupled with the adoption of food safety nets. In the long term, investing in smallholder agriculture is undoubtedly the most sustainable safety net. The priority areas of agricultural investment should focus on increasing productivity and access to inputs and markets so that farmers are less vulnerable and more capable of responding to production incentives.

In the short-term, governments and donors within the ECA region can meet the food needs of the most vulnerable by pursuing the following demand and supply-side policy measures:

- Provision of emergency food assistance, which can be achieved through the distribution of relief food by both donors and governments and the release of public stocks of food staples by governments
- Adoption of food safety nets to cushion the vulnerable against the adverse effects of the food price crisis (for example, cash transfers, food stamps)
- The provision of agricultural inputs and services
- Abolishing price controls and export restrictions
- Adjustments in trade and tax policy measures
- Macro-economic policy management such as maintaining low inflation rates and reduction of domestic borrowing
- Investing in and strengthening the early warning and disaster management systems

In the long term, investing in smallholder agriculture is undoubtedly the most sustainable safety net for societies. The priority areas of investment that should be considered include:

- Investment in agricultural research to create a green revolution in Africa
- Investment in key agricultural services such as extension services, to ensure that the latest technologies are disseminated to farmers
- Investment in local infrastructure, including irrigation, communications, power and transport. In particular, there is a need to invest in the "last mile" rural roads – to ensure that what is produced by poor rural people can actually reach the markets and fetch a good price
- Investment in rural financial services, markets and linkages so that smallholder farmers can buy fertilisers and better seeds; gain more control over when and where to sell their produce; and insure themselves against risks such as drought
- Investment in agro-processing to add value to primary products and to reduce post-harvest losses and improve quality
- Enhance the ability of farmers to cope with effects of changing climate through research and supportive climate adaptation policies

> Response to agricultural policy failures has been uncoordinated, leading to knee- jerk policy actions. The failure of the agricultural extension system in many countries has enlisted uncoordinated responses that continue to undermine access to critical agricultural advice. Since the inception of the Structural Adjustment Programmes at the beginning of the 1980s, the approach of governments to agricultural extension has been less than satisfactory.
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> *Godber W. Tumushabe, Executive Director, Advocates Coalition for Development and Environment, at the Assembly*

5.3 Governance and policy imperatives for transformation of agriculture in Eastern Africa

Godber W., Tumushabe
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Three basic concepts: governance, policy and transformation provide the conceptual limits for this address. Governance is a more complex concept because different disciplines can define it and use it differently. In its simplest form, the concept of governance refers to "the process of decision making and the process by which decisions are implemented or not implemented." It is a concept that can be used across scale (international, national or local governance), across units (corporate governance, institutional governance) or applied generally to all situations where decisions have to be made and implemented by multiple actors – hence the concept of agriculture governance. According to Francis Fukuyama – one of the foremost leading scholars of our time – the concept of governance has four key elements:

- State capacity – related to state power and ability to enforce rules that are consistent and predictable.
- Rule of law – that establishes, among other things, property rights and limits the states' discretion in manipulating those rules.
- Democratic institutions – that further limit exercise of state discretion by holding governments accountable to their citizens.
- An active citizenry – devoid of fear and manipulation that acts as front-line defenders of democracy.

Our consideration of governance of transformation of agriculture must therefore consider how each of these elements relate to agriculture policy decision making and the implementation of these decisions among the countries of Eastern

Africa. While the concept of policy is amenable to many definitions, the now commonly used basic definition of policy is **"what governments decide to do or not to do."** We refer to governments because we are mainly concerned with public policy. This is because we know that individuals, households, corporations or business make policies as well. For students of policy analysis, the point of departure is how to differentiate between the policy rhetoric of governments from what the governments actually do. As I will elaborate later, I believe that part of the challenge of agricultural transformation is a policy challenge that manifests itself in several dimensions.

5.4 Harnessing livestock resources for food security in the pastoral areas of ECA

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Pastoral areas constitute the major land use in the drylands of ECA, and in countries such as Kenya and Ethiopia the drylands account for a considerable land area and are home to millions of people. Pastoral livestock productions systems represent the most suitable and adapted use of land in the ECA drylands, and currently the meat and milk produced by those systems contribute significantly to local, national and regional food security as well as GDP. However, this livestock production and productivity face a number of challenges. First, the drylands are characterised by very high precipitation variability and droughts occur regularly, of late every three to four years. Second, the mobility that pastoralists have traditionally relied upon to manage high climate variability is increasingly constrained by various forms of land expropriation and fragmentation, which exacerbates degradation in the accessible grazing areas. Third, many ECA pastoral communities face poverty and food insecurity and this is becoming a chronic situation for some groups, especially those who have very low herd sizes or have "dropped out" of livestock production all together Fourth, although pastoralists have always participated in markets, this participation could be higher, more equitable and contribute more income to pastoral producers. Additionally, milk markets, the domain of women, are not well supported. Fifth, little research has been done on improving pastoral livestock breeds or supporting species diversification. Sixth, rangeland management studies and interventions are also lagging and could contribute greatly to enhancing livestock productivity. This paper, therefore, outlines a strategy for "harnessing" the livestock resources of pastoral production systems as they have great potential to contribute to food security in ECA. This strategy relies on the combined efforts of R&D to ensure a long-term and sustainable future for pastoralism.

5.5 Proven technologies for feeding the ECA region

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This paper presents the basic realities that have shaped adoption of agricultural technologies and innovations, and discusses challenge of feeding our people in this century. This paper reviews and highlights available agricultural technologies and innovations that can be utilised to enhance agricultural productivity in ECA and ensure food security. The technologies are reviewed under four main categories: (i) mainstream food production systems; (ii) integrated systems; (iii) drought-prone fragile ecosystems production; and (iv) urban and peri-urban production technologies. The technologies reviewed cover the whole range of production decision – from systems choice to crop types – and follows activity sequences in food production from land preparation, planting, crop management (nutrients, water, weeds, pests and diseases), to harvest and post-harvest handling and processing. From the review, it is concluded that adequate agricultural technologies and innovations exist to enable the region transform its agriculture and ensure food security for the people. The paper also highlights existing opportunities that can be exploited to transform agriculture, in particular the untapped potential and the renewed foreign interest in African agriculture, and the need for our countries to invest in the transformation. In conclusion, the paper recommends that the region must renew its commitment to agriculture; focus on transformation of farmers, particularly smallholders, who are a key factor in agriculture; and encourage research and technology generation as the key to developing scientific, highly reliable and competitive farming systems.

5.6 The role of mainstreaming gender in agricultural R&D, and its contribution to feeding our region in the 21st century

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This paper seeks to highlight one of the major contradictions bedevilling the efforts to feed ECA in the present times; whereas the gendered management system of food production in particular and agricultural production in general has not changed much over the last century, the bio-physical production system has undergone tremendous change. As a result, there has been increasing demand for food without commensurate increases in food production. Unfortunately, while the deteriorating bio-physical production system that has depressed food production has evidently received research and policy attention, the static gendered management system has received scanty attention. This is because the gendered management system is part of the broader structure of gender relations that are so entrenched in the formal and informal institutions in society that they are treated as a given or "natural". Hence, agricultural and social scientists and policy makers rarely recognise the challenges posed by the gendered management system to food production.

Yet, evidence abounds that the gendered management system entitles males with ownership and control of resources and decision-making powers in the production, exchange and consumption of food more than it does the females. Paradoxically, the responsibility for food provisioning within smallholder farming systems in the region lies predominantly with females. From a gender perspective, herein lies the challenge for feeding the people. For those on whom custom bestows the responsibility for food production are less entitled by the same custom. Asymmetries in males' and females' entitlements are the foundations for gender inequalities not only in the agricultural sector, but also in the wider sectors of society.

Therefore, if the region has to be fed, we cannot continue with "business as usual" without addressing the constraints and challenges embedded within the static gendered management system of food production. These constraints and challenges can best be addressed through mainstreaming gender in agricultural R&D. Gender mainstreaming is a globally accepted strategy for promoting gender equality. Mainstreaming is not an end in itself but a strategy, an approach and a means to achieve the goal of gender equality. Mainstreaming involves ensuring that gender perspectives and attention to the goal of gender equality are central to all activities in policy development, research, advocacy/dialogue, legislation, resource allocation, and planning, implementation and monitoring of policies, programmes and projects. It is in this context that we examine the role of mainstreaming gender in agricultural R&D and its contribution to feeding our region in the 21st century.

SUB-THEME II: NATIONAL AND REGIONAL INSTITUTIONS' PERSPECTIVE

5.7 The role of farmers, regional farmer organisations and their strategic partners in feeding our region in the 21st century

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Small-scale agriculture contributes less than 80% of food in the urban centres. This contribution is however threatened by regular famine cycles, exacerbated by climate change (among others) and poor policy responses, thus rendering our countries as perpetual net food import countries. The result of this is food prices spiralling out of control, and this phenomenon has pushed over 70 million people into poverty and hunger. History suggests the necessity of productivity increases in smallholder agriculture. Except for a handful of city-states, there are virtually no examples of mass poverty reduction since 1700 that did not start with sharp rises in employment and self-employment income due to higher productivity in small family farms (Lipton 2005).

Making markets work for smallholder farmers will require actions from many different actors, both private and public, as well as from international financial and donor organisations. Our premise, however, is that the public sector's role is decisive. If the public sector policy choices do not reduce the currently high levels of risk and uncertainty in African agricultural markets, and if governments use their scarce resources in ways that do not provide greater investment

incentives for the private sector, then there will be limited scope for private investment to provide smallholder farmers with the access to markets that they need.

Financial markets will also stay away from African agriculture if the risks of investment remain very high relative to the returns. On the other hand, if African governments define their roles clearly, implement these roles transparently and consistently, and invest their scarce resources in ways that make the greatest contribution to agricultural growth and poverty reduction, then this approach is likely to leverage even greater private investment in support of smallholder agriculture. When the conditions are created for profitable and stable private investment, the private sector has, in other parts of the world, grown and responded as seen in much of Asia, and there is little reason to believe Africa is different.

Hence, private sector investment patterns and the supply of bank financing for private investment, are largely *outcomes* of public sector behaviour – its policy choices, integrity of its institutions, and the ways it spends its funds.. For these reasons, there is no single or deterministic "future" of the small farmer in Africa. The decisions made by governments (regionally and nationally) primarily, and international organisations (to provide support in research, advocacy, information, etc.) secondarily will largely determine the future of smallholder agriculture in the region. Without renewed attention to sustained agricultural productivity growth, most small farms in Africa will become increasingly unviable economic and social units. Sustained agricultural productivity growth and poverty reduction will require progress on a number of fronts: most importantly, increased public goods investments to agriculture; a policy environment that supports private investment in input, output and financial markets and provision of key support services; a more level global trade policy environment; supportive donor programmes; and improved governance. Subsidies, if they are focused, well conceived and implemented, and temporary, can play a complementary role but should not be seen as the primary engine. Most of these challenges can be met. Meaningful progress will start when the political will is mobilised to adopt the policies and public investments which substantial evidence shows have the greatest chances of driving sustainable pro-poor agricultural growth.

5.8 The role of universities and their strategic partners in attaining food security in the ECA region in the 21st century

Prof. Geoffrey C. Mrema, Consultant

The objective of this paper is to review the current status, key challenges and opportunities in the context of the role of universities in feeding ECA region in the 21st century. The review aims at initiating and inspiring discussions to facilitate a constructive debate on the subject during the meeting of the general assembly of ASARECA scheduled for December 2011. The paper focuses on the role of FAS, and includes agriculture, forestry, veterinary medicine and those segments of the faculties of science and social sciences that are active in agricultural R&D. The role of FAS is covered focusing on two aspects: (i) Higher education and training; and (ii) Research and development (R& D). The two sets of activities are estimated to take respectively, on an average, about 50% and 25% of the working time of the scientific human resources of FAS. Estimates are that, in 2008, about 4476 scientists were employed in teaching and R&D functions of the FAS in nine countries of the region (cf. 3748 employed by NAROs mostly for research) [ASTI(2011); Flaherty (2011)].

The milestones in the evolution of FAS in the region are presented – starting from the two pioneering FAS which were established in 1950s at Makerere and Gordon Colleges in Uganda and Sudan respectively to the over 100 FAS established during the period from 1960 to 2010. The foci of the FAS in the early years and up to almost the end of the 20th century was on producing human resources for the public sector – either working directly in government departments and agencies and/or in NGOs. However, during the 1980s and 1990s, all countries in the region implemented economic Structural Adjustment Programmes (SAPs) with the objective of reducing the role of the public sector and increasing the role of the private sector. This reduced employment opportunities for the graduates of the FAS and forced them to orient their programmes towards the needs of the private sector – a task which they are still doing but are not adequately prepared for.

The capacity of the FAS in R&D efforts of the region is quite significant. This is largely because of the higher qualifications of their staff (for example, 45% of FAS academic staff in nine ECA countries have PhD qualifications cf.

22% in the NARIs/NAROs) and the fact that, organisationally, staff of different disciplines are stationed in one station. In addition, because of their teaching functions, FAS normally have more specialised and sophisticated equipment. However, in most countries, the R&D effort of FAS is not that well coordinated both internally (within FAS itself) and externally (with the efforts of NARIs/NAROs). It is apparent that the effectiveness and efficiency of NARS could be greatly increased if there is better coordination and enhanced synergies in planning and implementation of the R&D thrusts of NAROs and FAS. This will require changes in the current institutional framework that coordinates and implements the national R&D work.

A brief overview of the institutional frameworks for managing the higher education and research thrusts of FAS as well as of NAROs established in other parts of the world, especially where they have had significant impact in the positive transformation of the agricultural sector, is presented. This includes, among others, the land-grant colleges in USA, where the teaching, research and extension functions at the state level administratively fall under one organisation – the College of Agriculture – a system which is quite effective and efficient. Also reviewed are the State Agricultural Universities of India, which were established in the 1950s and 1960s and modelled on the land-grant colleges and have been quite successful, in fact, they were instrumental for the success of the green revolution, which transformed agriculture in that part of the world.

An overview of the issues that need to be factored in when considering the development of the agricultural sector in the 21st century is presented. These include the need to look at the entire agri-food chain from on-farm production, to harvesting, processing, transportation and marketing given the demographic trends in the region against the projections that over 50% of the population of all countries will be living in urban areas by the mid-century. These demographic trends also may require a review of current sectoral policies from an almost entire focus on small-scale peasant farmers to the more commercial farmers, especially the small and medium-scale ones who are the ones who are likely to produce significant surpluses for the market. Other issues discussed include rural infrastructure and environmental issues.

Challenges and opportunities which FAS have to grapple with in relation to human resources development include: declining employment opportunities for their graduates in the public sector (hence a need to revise programmes to focus on the needs of the private sector); declining university budgets and government scholarships; inadequate practical and entrepreneurial skills in the training programmes; and the need to design programmes specifically geared towards training commercial farmers, including strengthening the capacity of teaching staff in this area. The R&D issues include the need to intensify efforts to establish true NARS to better coordinate and manage the planning and implementation of the national and regional research efforts. There is need to improve planning within the FAS and strengthen linkages with departments in the universities that are undertaking strategic policy research.

The institutional and organisational mechanisms necessary to enhance the role of FAS in the human resources development as well as in R&D efforts to feed the region in the 21st century are discussed. Two programmatic issues related to the involvement of ASARECA with FAS are presented:

i. Institutional framework for NARS

There is need to increase efforts towards the formation of a true NARS and it is recommended that ASARECA should, as a matter of priority, initiate a programme for designing and recommending to its members options of national institutional frameworks. This should lead to well-coordinated national systems, which plan and coordinate the consolidated national agricultural research programmes, starting with the work of NARIs and FAS. In this regard, ASARECA could partner with other institutions with experience in institutional building in developing the conceptual framework for such a programme as well as other details. This is one of the core functions of ASARECA as stated in its strategic plan from 2007 to 2016; however, none of its current programmes is dealing with this function.

ii. Involvement of ASARECA in education matters

While ASARECA mission statement includes agricultural education and training, it is not apparent from its strategic plan that it intends to get involved directly in what FAS are doing in this area. The broad area of development of human resources is critical to the whole agenda of feeding the region in the 21st century, and ASARECA has to decide on the level and extent of its involvement in this area first. This may require further

consultations and studies given the fact that FAS have not been that active in ASARECA matters, especially in the area of human resources development through formal undergraduate and post graduate programmes.

Three organisational options for enhanced linkages between ASARECA and the FAS are proposed:

- ASARECA could link up with already established regional organisations such as Regional Universities Forum (RUFORUM) and/or Inter-University Council for East Africa (IUCEA) and sign MoUs with them on working together to enhance the role of FAS in human resources development as well as in R&D efforts. This will however depend on being able to resolve the issues related to the congruency of mandates as well as geographical coverage.
- ASARECA could consider establishing a Committee of Deans as was done in southern Africa in the 1980s and 1990s to serve as a sub-committee of its Board for handling all matters related to HR development as well as collaboration and coordination of the R&D work undertaken by FAS. This is subject to the option being possible under current governance instruments.
- ASARECA could start a programme/project to coordinate all its work-plans and activities with FAS on the understanding that the latter will contribute to the programme/project and that the programme will evolve within a specified time frame into an Association of Faculties of Agriculture in Central and Eastern Africa (AFACEA). The Association would then take over the coordination of all the human resources development activities as well as those of R&D handled by FAS in the region. They may also be able to elicit the support of ministries of education in addition to that of agriculture, as well as from other agencies like FAO, UNESCO, UNIDO, and so forth.

5.9 What is the role of NGOs and the regional forum and their strategic partners in feeding ECA in the 21st century?

Pascal Baridomo

The development of an agricultural system capable of feeding the people of ECA is a major issue of concern for ASARECA and other stakeholders, NGOs in particular. The theme suggested by ASARECA for its general assembly aims to strengthen the role of NGOs in the sub-region in order to meet the following challenge: access to food for everyone in the 21st century, especially in the area covered by ASARECA.

When you consider the context of the intervention of NGOs and given their experience and their distribution in the field, NGOs are indispensable to achieve the goals set by ASARECA. NGOs and civil society, in general, are part of the three main groups of actors, namely, NGOs/CBOs, traders, and governments. No matter how divergent opinions may be, these actors must co-exist and complement each other. It is also essential to enhance the adaptive capacities of NGOs in relation to the existing socio-economic and political settings, so that they can offer humanitarian assistance where needed and support for development in other cases.

NGOs are active on issues of major concern for farmers, especially the concern regarding sustainable agricultural development policies, taking into account the trend of continuous increase in population and the pressure on agricultural land, and adaptation to climate change. NGOs are involved in advocacy for productive, modern and sustainable family farming. Their concerns focus on the type of agriculture to promote, highlighting the debate on: sovereignty over the seeds compared to Genetically Modified Organisms; the governance of agricultural land as related to the phenomenon of land grabbing; and policies favourable to agricultural development for the benefit of farmers as related to the problem of financing the sector. In short, their expertise can be summarised under three categories of activities, which include: the management of humanitarian activities, advocacy, and research and training activities with farmers.

On a technical level, NGOs work on alternatives to mitigate the effects of climate change; integrated techniques to improve agricultural production, forestry and animal husbandry; promotion of savings and credit systems among the farmer communities; distribution of documents for information and training and so on. NGOs are entitled to some facilities provided by the governments. They have opportunities to develop

technical and financial partnerships at different levels: services delivery, cooperation between NGOs in the north–south context, responses to call for tenders, and selling products such as booklets or other documents. The promotion and visibility of NGOs activities in the cooperative programme with ASARECA, would address the following challenges:

- Dialogue and common understanding of the stakeholders on the agriculture model to promote at the time when most NGOs and civil societies are struggling for agriculture and family-friendly policies;
- Developing a communication strategy, a strategy for exchange of experiences and sharing of knowledge on agricultural research in the sub-region, to avoid repetition of what others have done and contradictions in the field or errors related to lack of reliable information;
- Mobilising financial and human resources and material to meet the needs on the ground so that interventions match the needs of the people;
- Endogenous and external financing of small farmers activities to modernise these activities and make them profitable; and
- Concerted strategies to support increased productivity without destroying the environment from the risks of divergent views: exchange of techniques and approaches that have been successful.

In terms of opportunities available, we can mention the involvement of NGOs, and their forums can grow through:

- The possibility of capital appreciation of trust towards NGOs vis-à-vis peasant farmers and long experience in the field for the application of research skills.
- The representation of the various stakeholders in agricultural development in the ASARECA General Assembly, particularly the country's NGOs and the Board of Directors, for better contact with the grassroots.
- The possibility of capitalising the accumulated knowledge and expertise of farmers in sustainable agriculture so that the approaches reflect the achievements of different NGOs.
- The possibility of sharing experiences on approaches and tools for education and training, for rural adaptation of more effective and efficient methods.
- The ability to access information on the needs of field research and early warning in case of findings of particular problems related to crops or livestock, to allow timely discussions with ASARECA.
- The existence of networks of some NGOs and farmers' organisations at the national and sub-regional levels as a channel for innovation or information.
- The NGO forums can help diversify funding sources and ways to achieve the set target.

For a greater involvement of NGOs, we suggest that the following actions be undertaken:

1. Establish a strategy of interactive communication and sharing information on current research, the achievements in the field and the practices by stakeholders (through newsletters, radio programmes, technical meetings, emails) so that ASARECA communicates its innovations and also gets feedback from the grassroots.
2. Organise platforms on issues of research, early warning on problems in the field, and agricultural development strategies by countries.
3. Make NGO representatives on the Board of Directors of ASARECA accountable and define the terms of reference to facilitate the involvement of NGOs from different countries.
4. Instal and manage joint programmes on selected topics and the implementation of prior research (seed, production technology, conservation, processing and marketing of surplus, information through newsletters, fact sheets and books, radio programs, and the like). Each stakeholder involves himself in collecting funds and in the implementation of his own action plan.
5. Undertake the periodic training of stakeholders to introduce innovations and collective appropriation of the tools used to avoid contradictions in the field.
6. Strengthen the structure and the professionalism among the farmer organisations and hold them accountable for the monitoring of field experiments.
7. Implement an advocacy strategy so that a sustainable agriculture is included in the national budget and in international cooperation frameworks.

8. Develop a document or strategic direction for the medium and long term, specifying indicators of strategic and operational objectives, with the roles of different actors, especially NGOs.
9. Establish a strategy for M&E indicators related to the overall objective on feeding the sub-region in the 21st century.
10. Promote research on the realities of the sub-region, which will ensure food security, biodiversity and biosafety.
11. Include ASARECA programmes and projects in each NGO action plan as a result of a harmonised view of the model of agriculture to promote.

5.10 Role of extension, the Regional Extension Association, and their strategic partners in feeding the region in the 21st century

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Nearly one billion people globally suffer from chronic food insecurity. The growing world population and climate change have affected farming practices, and the global demand for food is expected to increase dramatically. Engaging the research, extension and advisory Services and the scientific community is critical to developing the new and innovative agricultural approaches required to meet this demand. Empowerment of famers and producer groups encompasses various key elements such as: access to productive assets; strengthening capacity in development; establishing effective and efficient institutional structures; genuine participation in development; and democratic decision-making process. Empowerment has different aspects, including political, economic and institutional dimensions, which are important in food security and poverty campaigns.

The biggest challenge is the transformation of our agricultural extension services from the old stereotype of connecting researchers and farmers to being innovative, discussing and working with farmers, researchers and the business community. As a policy maker, educating people and sensitising them to understand the farming sector is important to avoid inaccurate, inappropriate policies. The private sector is one of the key actors to the success in extension and advisory services delivery and achieving food security in ASARECA region. In many cases, this implies delivery of Agricultural Advisory Services (AAS) through social enterprises funded through public-private partnerships. Such partnerships would lead to sector-wide growth that has direct and indirect benefits for the poor. The service centred around pro-poor growth should therefore not exclude the commercial sector, which benefits African agriculture through increased investment, through gaining access to international and local markets, and through increased competitiveness and an improved policy environment. On the other hand, reduced poverty creates increased opportunities and markets for entrepreneurs, processors and producers.

The objective of the African Forum for Agricultural Advisory Services (AFAAS) is to create efficient, effective and synergistic linkages and partnerships between AAS of member countries to improve the delivery of these services to farmers. It operates within the framework of Pillar IV of CAADP, which has the objective of enhancing the livelihoods of African farmers and pastoralists and is spearheaded by the Forum for Agricultural Research in Africa (FARA). Within this framework, it is the role of AFAAS to ensure that, through effective AAS, CAADP Pillar IV directly addresses the needs of African farmers, contributing to sustained growth and transformation of African agriculture.

The key reforms to date include: decentralising administration of field extension services; improving linkages among farmers, educators, researchers, extension agents and other stakeholders; and increasing the independence and flexibility of extension services by creating small and semi-autonomous units within government ministries. Though each country has approached its reform in a unique manner relevant to its own concerns, all have a common need and obligation to improve accountability to clients; to put in place a demand- and market-driven service provision system; to ensure decentralisation of service delivery; and to promote increased participation of the private sector in

the provision of agricultural extension services. Thus, a wealth of knowledge and innovations has arisen in different countries.

Agricultural extension and services are a vital element of the array of market and non-market entities and agents that provide critical information that can improve farmers' and other rural peoples' livelihoods. Apart from their conventional function of providing knowledge for improved agricultural productivity, extension and advisory services are expected to fulfil a variety of new functions, such as linking smallholder farmers to high-value and export markets; promoting environmentally sustainable production techniques; and helping farmers cope with the effects of HIV/AIDS and other health challenges that affect agriculture.

5.11 Role of the private sector, the regional private sector association, and their strategic partners in feeding our region in the 21st century

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Agricultural production (crop, livestock, fisheries and forestry) accounts for an average of 34% of GDP across the countries of ECA. The sector provides the main source of livelihood for an estimated 80% of the region's population and is dominated by smallholder mixed farming systems, which include livestock rearing, food and cash crop production, and fishing and aquaculture.

While agricultural production has been improving in the region, time and again, the region has not been able to feed its population for a number of reasons, which include: natural calamities such as drought and floods, civil strife and conflict, as well as the inability to move food products from surplus to deficit areas due to logistical and other policy constraints.

Given this situation, there is significant scope for the private sector to play a major role in reducing the region's need for external support to feed its population. The constraints facing production include over reliance on weather patterns, low productivity, lack of access to finance and markets, and limited value addition among other things. Despite these constraints, the sector is growing and has the potential to grow even more if attention is paid to the key drivers: commercialising smallholder production and reducing reliance on weather patterns. Further, facilitating greater access to finance, investing more in water harnessing and supporting the development of value chain clusters can contribute greatly to these two drivers of change.

SUB-THEME III: PARTNER INSTITUTIONS' PERSPECTIVE

5.12 An integrated bio-economy system for food security and sustainable development in Africa

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High pressure on cultivable lands, water mismanagement, plus relatively low yields obtained from existing agricultural practices has resulted in a food crisis in Africa, and this has only been alleviated by external aid and debts. The frequency and extent of these interventions has increased over the last 40 years. Before any agriculture-led industrialisation has any hope of success in Africa, the nation must feed itself and become a green trading continent.

The Integrated Bioeconomy System (IBS) Consortium has, over the last twenty years, developed innovative Ecohydrology and Biointensive Resource Management practices that immediately increase yields and also lead to long-term improvement in soil fertility and waste management as well as to the introduction of carbon-neutral benefits such as bio-gas production (for cooking and lighting) at the individual household level. There are many spin-off benefits, such as cash income generation and improved mother and child health (through a reduction in smoke pollution, by replacing kitchen fires with biogas cookers). IBS are an important part of an integrated approach

to rural development. Members of the Consortium discuss with the local people their perceived problems that often hinge around human and animal health, and agricultural productivity. IBS is introduced through demonstration projects, now established in five different regions in Ethiopia, and offers different elements of improvement of existing practices that can be put together differently and according to local demand. Thus, for example, Biofarm in the humid South West will have different elements from a biofarm in the arid northern regions. IBS setup principles can be applied by the individual farmer, or by the community or the disadvantaged sections (such as single mothers). In the latter case, the benefits are generally shared as cash income derived from the sale of IBS products. Local generation of cash from the sale of surplus productivity is clearly a key to pump-priming regional development. IBS training also includes novel income-generating opportunities, for example activities like honey and silk production.

IBS and its partner institutes are also investigating all aspects of IBS development in Ethiopia, Cote d'Ivoire, DRC and Mozambique, including the application of integrated pest management techniques and the minimisation of post-harvest crop losses.

The minimum outputs are the IBS practices applied by well-informed individuals locally (private benefits). When applied at the community level, IBS is an engine of development in which cash flowing back into the community from the sale of agricultural products may be used to generate public goods, such as clinics, schools or access roads. IBS is a facilitator in this process. It addresses adaptive growth and building of social, economic and ecological capital.

By changing the behaviour both of individual farmers and of whole communities, this initiative can change a farmer's perception of the environment (as something sustaining and sustainable), which is more likely to lead to sensible rather than exploitative environmental practices. This was best encapsulated in one (ecohydrology and IBS trained) farmer's comment, "Now, for the first time, I can imagine leaving something for my son to inherit."

SUB-THEME IV: AGRICULTURAL DEVELOPMENT CHALLENGES AND OPPORTUNITIES

5.13 Overcoming seed potato quality constraints to tackle food insecurity and poverty in ECA in the 21st century

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In order to improve the availability of healthy seed potato in ECA countries, where more than 95% of mostly poor quality seed potatoes are sourced from farmers' own previous harvests or markets or neighbours, two technologies, namely seed-plot technique (SPT) and positive seed selection (PSS) were considered for validation and promotion through farmer-learning fora in Kenya, Uganda and Burundi. Noticeable improvements in the quality and availability of seed potato to small-scale farmers were made. The SPT achieved 2.5 to 3 times higher land productivity for bacterial wilt-free seed potato and about 50% less land requirement to meet on-farm seed tuber needs than was achievable under conventional production systems. In addition to meeting their own on-farm requirements, some farmers started producing high quality seed potato in larger seed-plots for sale to others in their neighbourhood. Additionally, farmers' enthusiasm to utilise the SPT spilled over to the setting up of seed-plots for the multiplication of planting materials of other vegetatively propagated crops such sweet potato and arrowroot as was the case in Kenya. On-farm ware potato yields under PSS were at least 30% higher than ware plantings with no regard to the health status of the mother plants. Farmers who embraced and applied this technology effectively benefited by making potato farming more commercial, and also became sources of high quality seed potato for other farmers. The role that the two technologies played in improving the availability of high quality seed potato was further strengthened by linking farmers to sources of starter seed potato. In particular, more farmers were familiarised with the processes of generating certified/clean seed potato in research institutions and some private establishments, including those producing mini-tubers through aeroponics technology. Through the trainings provided, farmers gained knowledge and skills that enabled them to safeguard seed potato quality by protecting against disease-causing agents such as *Ralstonia solanacearum* and viruses through intensive care of their potato plots that were meant to be the sources of their seed for subsequent planting.

5.14 Utilisation of common bean for improved heealth and nutrition in ECA

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Common beans have the potential to alleviate micronutrient malnutrition and hunger as they are rich in quality protein, fibre, and micronutrients such as iron, zinc and vitamin A. Although several interventions have been implemented to alleviate micronutrient malnutrition, including supplementation, fortification of foods and use of diverse micronutrient rich diets, micronutrient malnutrition has remained rampant in developing countries. This has been due to limited reach and unaffordability of the interventions by the rural and urban poor. Utilisation of biofortified nutrient dense beans, which is popular in the diets of many vulnerable groups, offers a potential and sustainable solution to malnutrition and hunger-related deficiencies. The national bean research programmes across ECA region have developed nutrient-dense bean varieties with iron and zinc contents above 70 ppm and 30 ppm, respectively for farmer use in the region. Twenty-one micronutrient dense bean varieties have been released across the region, while twenty varieties are at pre-release stage in eight countries. The national bean research programmes have also developed bean-based food baskets and recipes (twenty-six recipes) for utilisation of bean for improved health and nutrition in the region. The developed varieties and bean-based food baskets are being intensively promoted through awareness creations (demonstrations, publications, trainings) for use among the vulnerable groups in EAC region for improved health and nutrition. Preliminary results from Rwanda and Uganda showed improved health and nutritional status of HIV-affected communities through regular consumption of micronutrient-rich beans. Therefore, improved access to micronutrient-rich beans and bean-based products is likely to improve health and nutritional status of the vulnerable groups in the communities across EAC.

5.15 Crop-livestock integration for sustainable management of natural resources in ECA

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The sustainability of smallholder crop-livestock production in ECA region is threatened by adverse effects of climate change, leading to inadequate livestock feeds and water. Studies were conducted in Uganda, Kenya, Tanzania and Burundi from 2010 to 2011 to: (a) describe existing dairy farming in mixed crop-livestock systems and identify constraints to its productivity; (b) scale-up technologies and innovations for improved resilience and sustainable crop-livestock systems; (c) assess socio-economic benefits of improved technologies and innovations; (d) promote policies to transform smallholder crop-livestock system into sustainable and resilient profitable enterprises; (e) increase awareness and knowledge and information on crop-livestock value chain innovations; and (f) document lessons learned from introducing improved technologies and innovations.

Survey results to describe existing dairy farming practices revealed that households in semi-arid Kenya had a larger dairy herd size (1–10 animals) when compared to households in Uganda, Burundi and Tanzania (1–3 animals). The semi-intensive was the preferred production system in Kenya (55%, n=116) while, in other study areas, stall-feeding was the most preferred system (60%, n=344) due to land shortage. Low rainfall, feed shortage, high cost of forage seed, inadequate feed and poor soils were the major constraints affecting dairy production and was reported by over 70% (n=460) of the respondents. Feed availability and milk yield closely followed the rainy season, with scarce

feed and low milk yield (5 lt.–10 lt.) being reported during the dry seasons compared to the rainy seasons (8 lt.–25 lt./cow/day).

Results of on-farm trials showed that total fodder availability and number of feeding days increased by over 70% when 0.5 ha of a mixture of Brachiaria mulato and forage legume (14,119±195.8 DM/ha/year; 193.6±19.4 days) and 0.5 ha of Napier grass-forage legume mixture (17,790±331.2 kg DM/ha/year; 284.2±26.9 days) with manure application were both established on a farm. An on-station study to investigate the effect of manure type (goat, cattle and poultry) on cabbage production showed average yield (6,233.4 kg) of cabbages from manured plots was 157% higher than the yield (2,422.2 kg) obtained from plots with no manure. The cabbage heads obtained from plots with chicken manure were 9%, 49% and 95% heavier than the heads obtained from goat (416.7 gm), cattle (305.6 gm) and non-manured plots (233.3 gm). Water harvesting from roof catchment and surface run-off enabled farmers to store 30,000 litres of water sufficient to cater for 4 people keeping 2 dairy cows for a period of 3–4 months. Milk yield and household income increased by over 50%. Irrigation and manure application increased vegetable yields by up to 500% and ensured year-round vegetable supply.

Major constraints to implementation of policies were: poor quality feeds; limited veterinary services; poorly equipped and capitalised veterinary practitioners; high interest rates on loans; poor breeds; and limited facilitation to policy implementing institutions. Over 2,000 stakeholders were trained on aspects of crop and livestock production through workshops, field days, field visits and on-farm trials. Ten scientific papers were presented at scientific conferences and workshops.

The major lesson learnt was: dairy farming contributes to sustainable crop and livestock production in ECA region. It is therefore important to identify innovations and technologies that provide early benefits to stakeholders. The farmers will want to first test the technologies and innovations on a small scale as this minimises risk. In conclusion, integrated management of improved forages, soil fertility improvement, and water harvesting and irrigation technologies along with favourable policies provide for sustainable crop and livestock production and productivity.

5.16 Genetic engineering of maize for drought tolerance in ECA

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Charles Mugoya, *Agro-biodiversity & Biotechnology Programme, ASARECA*

Maize, the most important staple food crop in ECA, is affected by drought – the single most important abiotic factor responsible for up to 70% maize loss. In the year 2008, a project funded to a tune of USD350,000 by USAID through ASARECA was initiated. The objective of the project was to develop and avail drought-tolerant engineered maize genotypes adapted to ECA. This was done using genetic engineering approaches of gene up-regulation, under-regulation (silencing) and drought-inducible expression of candidate genes. To date, 15 tropical maize genotypes have successfully been transformed with drought-conferring genes: Annexinp35, Annat1, NHX1, XvPrx2, XvSAP1, IPT, CBF 1, amiRNA1 and amiRNA3. The maize genotypes developed using these genetic engineering technologies are being advanced and evaluated in the glass house at Kenyatta University in preparation for drought stress experiments and field trials. The genetically engineered maize lines are: one Ethiopian open pollinated variety (OPV), one temperate line, eight Sudanese genotypes, one Tanzanian OPV and five International Maize and Wheat Improvement Centre (CIMMYT) inbred lines. The research

products ready for uptake and utilisation are the base sequence of a drought-tolerance gene, whose protocols have been isolated and cloned and optimised for regeneration of maize germplasm adapted to ECA. Seventeen partners from around the globe have been identified and are playing different roles in the development of drought-tolerant transgenic maize. Scientists from ECA region are being trained on genetic engineering at MSc and PhD levels. For farmers to avail drought-tolerant engineered maize genotypes in ECA region, more studies involving the generated maize lines are critical. This will be done by building synergies for up-scaling the utilisation of findings of the research.

5.17 Market-focused approach to NRM: Potential for beekeeping in rehabilitation of degraded water sources and riverbanks, and biodiversity conservation: A case of Lushoto district, Tanzania

D.N. Kimaro *Sokoine,* *University of Agriculture, Tanzania*
G.E. Mbeyale, *Sokoine, University of Agriculture, Tanzania*
J.P. Hella, *Sokoine, University of Agriculture, Tanzania*
G.C. Kajembe, *Sokoine, University of Agriculture, Tanzania*
O. Semalulu, *National Agricultural Research Laboratories, Kampala, Uganda*

Beekeeping is a major activity for socio-economic and environmental conservation benefits, providing food (honey, pollen, brood), industrial raw material (beeswax candles, lubricants), medicine (honey, propolis, beeswax, bee venom) and income. Beekeeping in Tanzania is mostly carried out using traditional methods, which account for 99% of the total honey and bee wax production. About 95% of all hives are traditional, and on trees far away from the household, which makes it difficult for women. Although environmental legislations recommend a 60 to 200 m buffer strip around a water body (lake or river), land shortage makes enforcement difficult. Where buffers satisfy socio-economic and ecological demands, a win-win situation is attained. Modern beekeeping is a profitable enterprise for monetary and biodiversity conservation benefits.

The overall objective of the research was to promote adoption of sustainable NRM technologies through development of farmer-market value chain for honey as a stimulant to NRM investment. Specifically, the objectives were: (i) To evaluate the effect of introducing improved beehives on honey production; (ii) To assess the effect on vegetation cover and biodiversity. Studies were initiated in Mwangoi and Migambo villages, Lushoto district, Tanzania, using modern beehives (SUA-ITATOBE). Honey production, marketing, market linkages, vegetation regeneration and ground cover were monitored between 2008 and 2010, and used to calculate density, species abundance and dominance diversity indices, profit margin, and discounted benefit-cost analysis. Beekeeping has become a commercial activity, carried out by both men and women, unlike what it traditionally was. With bees serving as 'police' to the would-be land degraders, improved beekeeping has resulted in vegetation recovery and species diversity in the once degraded water sources and river banks. During 2008, 2009 and 2010, average honey production at the project sites increased from 69, 142.5 and 203 kg, and mean ground cover from 2.5%, 22.5 and 62.5%. Through improved honey harvesting, handling and packaging, farmers accessed honey buyers in Lushoto town and Dar es Salaam city for better market access. Profit margin (farm gate) ranged from Tz Sh. 834 to 1,111 per litre of honey.

5.18 Productivity and profitability of groundnuts grown using phosphorus fertiliser in Mbale district, Uganda

O. Semalulu, *National Agricultural Research Laboratories, Kawanda, Kampala, Uganda*
V. Kasenge, *Makerere University, College of Agricultural and Environmental Sciences, Kampala, Uganda*
P. Makhosi, *National Agricultural Research Laboratories, Kawanda, Kampala, Uganda*
R. Gita, *National Agricultural Research Laboratories, Kawanda, Kampala, Uganda*
C. Gumisiriza, *Uganda National Farmers Federation, Kampala, Uganda*

The productivity and profitability of groundnuts following phosphate use on four varieties (red beauty, serenut 2, serenut 3 and serenut 4) were assessed on farms in Bungokho sub county, Mbale district, Uganda between 2009 and

2010. Phosphorus was applied as single superphosphate at 0, 17.48, 34.96 and 52.44 kg Pha^{-1} in 2009 and at 0, 4.37, 8.73, 13.10 and 17.46 kg P ha^{-1} in 2010. During 2009, response was highest for red beauty followed by serenut 3 then serenut 4. Response was quadratic for serenut 3 and serenut 4, with a peak observed at 35 kg Pha^{-1}. For red beauty, the response was linear; no response was observed for serenut 2. Phosphorus application increased groundnut yield in 2010 with a quadratic and significant ($P<0.05$) response, but varieties did not differ in their response to P. Agronomic response was observed up to 8.73 kg Pha^{-1}, beyond which no significant increment in yield was observed. Highest gross margin (USD47 ha^{-1}) was observed at 4.37 kg Pha^{-1}. Considering that fertiliser costs contributed between 18% and 40% of the production costs, phosphate use at rates higher than 8.73 kg P ha^{-1} although agronomically beneficial, was not profitable under the prevailing groundnut marketprice conditions. Breakeven prices, however, indicated for the four varieties with various P rates, how high the groundnut price would have to be for additional output to become profitable. Profitability would be assured with red beauty and serenut 3 varieties if their prices rose by 10% for all rates of P. Profitability with serenut 2 and serenut 4 varieties could be assured if their prices rose by 20% for P rates between 4.37 and 13.1 P ha^{-1} only. The study recommends that governments and other value chain actors put in place mechanisms for smallholder farmers to access and use fertilisers for enhanced productivity and profitability.

5.19 Evaluating the potential of grain amaranth as a climate change adaptation strategy for rural communities in East Africa: A case study of the Western Highlands of Kenya

G. Ayaga, *Kenya Agricultural Research Institute- Kibos, Kisumu*
R. Orlale, C. Esendi, D. Mutsotso, O. Semalulu, *National Agricultural Research Laboratories, Kampala, Uganda*

The growing scientific evidence linking climate change to many socio-economic and biophysical challenges affecting the vast majority of communities, especially in the developing countries, calls for an urgent need to develop viable coping strategies. This study evaluated the potential for Grain Amaranth (GA) as a climate change adaptation strategy in Gem district, Western Kenya between 2009 and 2010. The objectives were: (i) To evaluate the potential of GA as an adaptation strategy to climate change for smallholder farmers; (ii) To develop soil fertility management guidelines for sustainable GA production; and (iii) To facilitate value chain development for GA. Farmyard Manure (FYM) at 0 t ha^{-1}, 2.5 t ha^{-1}, 5.0 t ha^{-1} and 7.5 t ha^{-1} and Diammonium phosphate (DAP) at 0 kg ha^{-1}, 25 kg ha^{-1}, 50 kg ha^{-1} and 75 kg ha^{-1} were applied as a factorial structure in a randomized complete block design (RCBD), replications three times. Maize hybrid 511 was planted in adjacent fields under the same fertiliser treatments. Financial analyses for both GA and maize were carried out using partial financial analysis. Highest average GA yield was obtained from a combination of 75 $kgha^{-1}$ DAP and 7.5 t $FYMha^{-1}$. However, the best marginal returns for GA was obtained at 75 kg $DAPha^{-1}$. Marginal returns for GA was about 5 times higher than that of maize receiving the same FYM and DAP treatments. Moreover, with a shorter growth period and less moisture requirement, GA presents a possible alternative for rural poor communities to adapt to the impacts of climate change. The project introduced and tested on-farm, prototypes of equipment for planting, harvesting and threshing GA to ease field operations and reduce post-harvest losses. Farmers were also trained in GA value addition, including milling, packaging and processing into different products, and linked to local and regional markets.

5.20 Evolution of seed sector policies in ECA

Evans Sikinyi, *Seed Traders Association of Kenya*
Michael Waithaka, *ASARECA*
Miriam Kyotalimye, *ASARECA*

For a long time, sub-Saharan Africa commanded less than one percent of the global trade in seed, with little if any intra regional trade between neighbours. Regulations and policies established when most plant breeding and formal seed production were dominated by the public sector constrained growth in the sector, as variety release procedures were designed to meet the needs of public research institutes and seed certification was focused on public or parastatal seed enterprises. Each country developed its own seed certification regime. The lack of harmonised procedures and standards for key processes along the seed value chain posed a significant barrier to seed trade and inhibited the spread of new varieties beyond national boundaries. This led to delays in release and often rejection

of useful varieties that did not meet the criteria and procedures. A public variety released in one country faced long battles to gain release in a second country. Phytosanitary regulations that were not based on scientific evidence further restricted possibilities for trade. Commercial seed trade was also hampered by the lack of intellectual property protection for plant varieties and by different procedures for import and export of seed.

Starting in the late 1990s, an ASARECA initiative brought together key stakeholders in the seed industry to analyse the policy landscape, review and spearhead efforts to adopt options for policy reform. Options were clustered around five key areas: variety evaluation and release, seed certification, plant variety protection, phytosanitary issues and export and import documentation. A harmonisation agreement around these key areas was adopted by delegates from Kenya, Tanzania and Uganda in 2002 and later rolled out to all ASARECA countries. The operationalisation of this agreement was vested in a public–private entity launched as the Eastern Africa Seed Committee (EASCOM) in Kigali, Rwanda in 2004.

Reforms included a review of national seed industry laws and regulations to align to the regional position on seed; providing more autonomy to national seed agencies; creating more space for participation of the private sector; recognising the role of plant variety protection and streamlining export and import documentation procedures. As a result, seed production and trade has more than tripled, while prices for the key tradable – seed maize – have also stabilised. The total welfare gain for enhanced intra-regional trade in seed maize alone arising from harmonised seed policies has been estimated at USD 727 million per year for ASARECA region.

The pace of harmonisation has been slow, with some countries adopting reforms faster than their counterparts. The agreed reforms must be communicated through a policy process that may not be sympathetic to the view that regulation's principal purpose is to encourage seed system development rather than to be a "police force". Amendments of laws and regulations takes time, but changes in attitude and interpretation are often as important and as difficult to achieve. In addition, many regulatory reforms imply changes in institutional responsibilities and the establishment of new protocols that require additional resources.

5.21 Promoting farmer-led seed enterprises of African indigenous vegetables to boost household incomes and nutrition in Kenya and Tanzania

Dr. Daniel Karanja, *CABI Africa, Nairobi*
Daniel Karanja, *CAB International (CABI), Nairobi, Kenya*
Richard Musebe, *CAB International (CABI), Nairobi, Kenya*
Martin Kimani, *CAB International (CABI), Nairobi, Kenya*
Nasambu Okoko, *Kenya Agricultural Research Institute, Kisii*
Edwin Kiptarus, *Kenya Seed Company, Kitale, Kenya*
Paul Okongo, *Technology Adoption Through Research Organisation (TATRO), Yala, Kenya*
Silivesta Samali, *Horticultural Research Institute Institute-Tengeru, Arusha, Tanzania*
Alphonce Katunzi, *INADES Formation Tanzania*
Dodoma, *Tanzania*
Hamis Mtwaenzi, *Tanzania Official Seed Certification Institute, Morogoro, Tanzania*
Firoz Mwakitwange, *Tanzania Official Seed Certification Institute, Morogoro, Tanzania*
Victor Afari-Sefa, *The World Vegetable Centre, Regional Centre for Africa (AVRDC-RCA), Arusha, Tanzania*
Lydia Kimenye, *ASARECA*

The problem of food security in sub-Saharan Africa is aggravated by micronutrient deficiencies, a major impediment to social and economic development. Malnutrition, including lack of essential micronutrients can impair growth and/or cause high mortality, especially among vulnerable populations of women and children. In Kenya and Tanzania, 40% to 45% of the pregnant and nursing women suffer from anaemia, while 25% to 30% of the children under five are stunted and highly susceptible to infectious diseases. African indigenous vegetables (AIVs), including *Africa nightshade*, *Amaranths*, *Crotalaria*, *Spiderplant*, *Jute mallow* and *African eggplant*, are rich in micronutrients such as iron, zinc, Vitamin A, and contain non-nutrient substances called phytochemicals, which help protect people against non-communicable diseases. Consumers in many parts of ECA, especially in the urban areas are becoming aware of the nutritive benefits

of these vegetables. A growing number of smallholders, in turn, are striving to take advantage of this renewed interest in the AIVs by growing and supplying them to markets in both the rural areas and in urban centres.

AIVs are becoming a common item in major supermarkets and green grocery stores in some countries, notably, Kenya, Tanzania, and Uganda, to name a few. However, the potential to meet the growing demand for these vegetables in the region is limited by the lack of good quality seeds. The majority of farmer use seeds obtained either saved from their own previous crop or from open-air markets, which have problems of purity, with mean germination rates rarely above 50%. Depending on the seeds from such sources also means that farmers have limited access to seeds of improved varieties that meet consumer-preferred attributes. An effective seed supply system and an assured market for seed is critical in unleashing the potential of AIVs to improve food security and livelihoods of target communities, and increase adaptation of vulnerable populations. This paper describes the process used and the success achieved in an ongoing pilot project aimed at validating and promoting farmer-led seed enterprise (FLSE) models for the sustainable supply of quality seeds of AIVs. This is being implemented in Kenya and Tanzania; however, the lessons learned on these models will be shared for scaling up in other countries. Three FLSE models are being evaluated: private sector seed company-mediated model, research-mediated model and informal grade model. The success of the models is based on development of technical capacities of seed producers as well as building strategic and functional linkages through public–private partnership with institutions/organisations in the value chain.

Success parameters, such as volumes of quality seed (certified or quality declared depending on country seed regulations) of different AIVs produced and sold, and number of smallholder seed growers trained and able to go through the quality assurance are among those used in the evaluation of enterprise models. More than 500 farmers (>40% women) have been trained in quality seed production and post-harvest handling. Through the private sector mediated farmer-led seed enterprises model in Kenya, farmers are earning on an average USD4,500 per annum from indigenous vegetables seed production. One exceptional farmer earned up to USD17,000 in 2010. Similarly, from the training and inspection by the government seed certification agency, farmers in Dodoma Tanzania are now producing and selling high quality declared seed of *African eggplant*, *amaranths* and *nightshade*. These quality seeds, which have been shown to have a mean germination and purity standard above 90%, are in high demand both locally and in Dar es Salaam and fetching good prices of approximately USD 3 per kilogram.

5.22 Improving capacity for agricultural research in ECA: The SCARDA approach at ARC, Sudan

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J. Methu, *ASARECA*
D. Akishule, *ASARECA*
W. Ekaya, *RUFORUM*
S. Chindime-Mkandawire, *RUFORUM*
I. Frempong, *FARA*
N. Ojijo, *FARA*
T. Chancellor, *NRI*

Strengthening Capacity for Agricultural Research and Development in Africa (SCARDA) was a continent-wide capacity strengthening initiative funded by DFID and coordinated by FARA. In ECA, SCARDA was managed by ASARECA, and targeted three NARS represented by Institut des Sciences Agronomiques du Burundi (ISABU), Institut des Sciences Agronomiques du Rwanda (ISAR) and the ARC in Sudan. The SCARDA programme goal was to strengthen the institutional and human capacity of African agricultural R&D systems to identify, generate and deliver research outputs that meet the needs of poor people. SCARDA had three components: (a) strengthening competencies and capacity in agricultural research management; (b) strengthening capacity for professional development in agricultural R&D; and (c) empowerment of tertiary agricultural educational institutions. Most of the focus at ARC-Sudan was on components (a) and (b).

Under component (a), a series of learning workshops to strengthen the competencies and capacities of agricultural research managers were delivered. The learning workshops, focused on five competence areas: (1) facilitation for change; (2) managing research for development and quality of science; (3) facilitating partnerships and innovation

platforms for impact; (4) managing self- development for leadership; and (5) managing organisations, units or teams. In each of these areas, participants gained a level of proficiency, which enabled them to professionalise their engagement in change at ARC and to improve their overall performance as leaders and managers. Furthermore, during the workshops, participants were able to identify key issues/challenges, which were then assigned to peer learning groups to address, using principles acquired during the group learning sessions.

Under component (b), activities undertaken were MSc training for young ARC scientists in disciplines that were found to be deficient. Short, targeted re-fresher courses in selected agricultural R&D areas were also delivered, and a mentoring programme for middle- level and early career development staff undertaken. In the MSc training, a total of 15 young and mid-level scientists from ARC and a few other satellite institutions in Sudan were supported for training in various disciplines, including Plant Breeding, Horticulture, NRM, Range Management, and Agricultural Information and Communication Management.

Short training courses were provided in two areas: Integrated Pest Management (IPM) and Laboratory Management for research technicians. The IPM course benefited 30 staff of ARC and its partner institutions and covered critical areas relating to the identification and management of insects, diseases and weeds. The Laboratory Management training benefited 16 technicians from ARC and covered topics such as best laboratory management practices, clean seed production, seed certification, seed legislation and marketing, principles of research ethics, plant disease diagnostics, and data management.

At the individual level, the ARC staff gained new knowledge and skills in agricultural research management. The learning workshops reflective sessions touched some deep issues in ARC and brought them to surface, for example, strategy development, regionalisation of research and institutionalisation of M&E systems. These issues are now on the ARC agenda and the trained managers are actively involved in the ongoing change process. A feedback culture is defusing gradually among ARC staff, and is expected to be anchored in the system. A mentoring and coaching culture has formally taken root at ARC and is expected to cover a wide range of areas, such as career guidance, technical and professional development, and leadership. ARC staff in some of the research stations have successfully applied knowledge and skills acquired during the training related to the facilitation of partnerships and innovation platforms for enhanced impact. The Master's training programme has enhanced professional skills of researchers in areas such plant breeding and biotechnology and Agricultural Information Communication and Management (AICM). The short-term training for technicians has upgraded their skills for laboratory analyses and crop protection techniques, and the trained staff have become part of a wider net work in the region.

5.23 Harnessing agro-biodiversity for food security and sustainable development: Conservation and sustainable utilisation of PGR in Sudan

El Tahir Ibrahim Mohammed, *ARC, Sudan*

Sudan, being an eastern African country, is one of the eight member countries of the Eastern Africa Plant Genetic Resources Network (EAPGREN/ASARECA), a project operating under the umbrella of the Agrobio Programme of ASARECA. Sudan has been part of EAPGREN since its conception in 1997. The Plant Genetic Resources Programme in Sudan is operating under ARC of Sudan. It is being run through a PGR Unit in the ARC, with the main objective of conserving and enhancing the use of plant agro-biodiversity and PGRs in the country. Sudan has benefited considerably from the implementation of activities related to EAPGREN since its operationalisation in 2004. The activities were conducted using funds that were made available through the project "Capacity Building and Networking for Conservation and Utilisation of Plant Genetic Resources in Eastern Africa", with funding from the Swedish International Development Cooperation Agency (Sida).

The capacities of the programme in Sudan to conserve and enhance the use of PGR have improved significantly as the result of the project support from EAPGREN. This is reflected in the improvement of germplasm storage capacity by 65% and increase in the total PGR holdings by 80%, as well as increase in the number of germplasm accessions that have been multiplied and characterised by more than 100%. Human capacity of the PGR programme in Sudan has also been upgraded through post-graduate training programmes, leading to Master's and PhD degrees, as well as through specialised and on-job short-term training. A PGR documentation system for facilitating data capturing,

storage, access and retrieval has been adopted as part of a regional arrangement for PGR information management. Passport data of PGR collections in Sudan are made accessible through the internet using the EAPGREN data portal.

Activities to raise awareness and solicit public participation have also been undertaken, resulting in a wider level of sensitisation and interaction in the PGR domain. Arrangements for back-up and safety duplication of PGR collections from Sudan have been undertaken in collaboration with sister institutions inside and outside the country. The PGR activities undertaken during the project life are useful in addressing basic PGR activities, challenges and backlogs in Sudan. Although further studies are required, the germplasm characterisation works have revealed useful agronomic traits that can be used in future crop improvement programmes. All project outputs constitute the basis for PGR conservation and sustainable utilisation in Sudan, with significant implications for food security and sustainable development in eastern Africa and beyond.

5.24 Up-scaling of soil water management technologies and drought-tolerant varieties for increased maize productivity in ECA countries

H.W. Mwangi, *Kenya Agricultural Research Institute, Nairobi*
F. Mgonja, *Selian Agricultural Institute, Tanzania*
H. Admassu, *Ethiopia Agricultural Organisation*
F. Opio, *ASARECA*
I. Rowmshana, *University of Nairobi, Faculty of African studies and anthropology, Kenya*
J. Karau, *Pesticide Agricultural Resource Centre*
V. Kimani

ECA region has an average production of 9 million tons of maize on 5 million ha of land and an average yield of 1.8 t/ha. These yields are relatively low compared to the potential yield of 4.5 t/ha –7.0. The major constraints facing maize productivity include drought and low soil fertility. The current changes in climate due to global warming will further exacerbate the problem of drought that already exists in the region. However, research has developed technologies and innovations that could alleviate the problems and boost maize productivity in the region. The challenge is that the technologies are not yet adequately used by the small-scale farmers in the target areas and hence there is no wide-scale impact. A review was conducted in Ethiopia, Tanzania and Kenya to document proven soil/water management technologies (SWM) and drought-tolerant varieties for improved maize productivity and to identify constraints to adoption. SWM technologies were documented using literature review, and participatory approach during workshops and focused group meetings with farmers and other stakeholders. Use of priority SWM practices with appropriate drought-tolerant varieties optimised productivity of maize; it more than doubled the yield, created demand for capacity building in the technologies and contributed to household food security. However, a majority of the smallholder farmers have limited access to technological knowledge; researchers lack adequate resources for adaptation trials to enhance technology dissemination; there are poor linkages and institutional frameworks. Increased stakeholder participation and empowerment at all levels, including the primary and the tertiary, is required to increase research building upon generated knowledge to meet the demand; hence there has to be a strong up-scaling initiative to achieve the wider impact needed to meet food security for the region in the 21st century.

Some moments at the ASARECA General Assembly, December 2011

The ASARECA Board with the chief guests

Delegates chat with the Dr Seyfu Ketema, Executive Director

Annexes

First ASARECA GENERAL ASSEMBLY

Programme

Theme:

"FEEDING OUR REGION IN THE 21ST CENTURY"

14–16 December 2011,

Entebbe, Uganda

Annex 1

First ASARECA General Assembly, 14–16 December 2011, Entebbe, Uganda

Programme

DAY 1: Wednesday 14 December 2011 (Morning)

Plenary

Venue: ZIBA
8.00–9.00: Registration
8.30–9.00: Ndere Troupe
Master of Ceremony: Dr Emily Twinamasiko, Director General, NARO

Opening Ceremony

Facilitators: *Dr Paul Kibwika and Dr Maria Nassuna Musoke*

Reporters: *Dr Florence Birungi Kyazze and Mr Ahmed Zziwa*

09.00–09.10	Introduction of the agenda by the Master of Ceremony
09.10–09.25	Welcome address and briefing on ASARECA by Prof Dr Lala Razafinjara, Chairman, ASARECA Board of Directors
09.25–09.45	Keynote address: Prof Calestous Juma, Harvard Kennedy School
	Agricultural science, technology, and innovation: Feeding ECA in the 21st century, Prof Calestous Juma, Harvard Kennedy School
09.45–10.05	*Managing current and future climate-induced risk in ECAagriculture*, Dr K P C Rao, Principal Scientist, ICRISAT/ICRAF
10.05–10.15	Master of Ceremony, Permanent Secretary MAAIF/Director General, NARO
10.15–10.30	*ASARECA strategy regional challenges and opportunities in the context of the theme feeding our region in the 21st century*, Dr Seyfu Ketema, Executive Director, ASARECA
10.30–10.45	Official welcome address, Hon. Tress N Bucyanayandi, Minister of Agriculture, Animal Industry and Fisheries (MAAIF)
10.45–11.05	Official Opening of the FirstASARECA General Assembly: Guest of Honour

11.05–11.35 **Group Photo/Visit to the exhibition and Tea/Coffee Break**

11.35–13.00	Minister's address to the FirstASARECA General Assembly from the ASARECA founding member countries on *Challenges, opportunities and the way forward in feeding our region in the 21st century: national efforts*	
	Hon. Jean-Pierre Bokole Ompoka,	Minister for Scientific Research, Democratic Republic of Congo
	Hon. Arefaine Berhe	Minister for Agriculture, Eritrea
	Hon. Tefera Derbew	Minister for Agriculture, Ethiopia
	Hon. Japheth K. Mbiuki	MP, Assistant Minister for Research & Extension Services, Ministry of Agriculture, Kenya
	Hon. Roland Ravatomanga	Minister for Agriculture, Madagascar, represented by Prof. Dr. Lala Razafinjara
	Hon. Agnes Kalibata	Minister for Agriculture, Rwanda
	Hon. Abdelhailm I Almutaafie	Minister for Agriculture, Sudan, represented by Dr. Mamoun Dawelbeit
	Hon. Jumanne A Maghembe	MP, Minister for Agriculture, Food Security and Cooperatives, Tanzania

DAY 1: Wednesday 14 December 2011 (Afternoon)

13.00–14.30 **Lunch break**

Sub-Theme I: Agricultural Development Challenges and Opportunities

Plenary

Venue: ZIBA
Chairperson: Prof Elly Sabiiti, President of the General Assembly
Master of Ceremony: Dr Eldad Tukahirwa, Deputy Executive Director, ASARECA
Facilitators: *Dr Paul Kibwika and Dr. Maria Nassuna Musoke*
Reporters: *Dr Florence Birungi Kyazze and Mr. Ahmed Zziwa*

14.30–15.15 **PRESENTATIONS**

14.30–14.45	*The emerging impact of CAADP as a planning and partnership platform to accelerate growth and poverty reduction*, Dr Ousmane Badiane Director for Africa, International Food Policy Research Institute (IFPRI)
14.45–15.00	*High and volatile food prices*: *drivers and impacts on food security in ECA*, Joseph Karugia, Coordinator, ReSAKSS-ECA
15.00–15.15	*Governance and policy imperatives for transformation of agriculture in Eastern Africa*, Godber W Tumushabe, Executive Director and Policy Analyst, Advocates Coalition for Development and Environment (ACODE)

15.15–16.00 **Panel Discussions on Sub-Theme 1**

	Agricultural science, technology, and innovation: feeding ECA in the 21st century Panellist: Prof Calestous Juma, Harvard Kennedy School
	The emerging impact of CAADP as a planning and partnership platform to accelerate growth and poverty reduction Panellists: Dr Ousmane Badiane, IFPRI; Dr Boaz Blackie Keizire, AU; Dr Sam Kanya-rukiga, COMESA; and Dr Fatumbi Oluwol, FARA
	High and volatile food prices: drivers and impacts on food security in ECA Panellists: Joseph Karugia, ReSAKSS-ECA; Prof. Wilfred Mwangi CIMMYT; Dr Michael Hailu, CTA
	Governance and policy imperatives for transformation of agriculture in Eastern Africa Panellist: Godber W Tumushabe, ACODE

16.00–16.20 **Coffee/Tea Break**

16.20–16.50 **PRESENTATIONS**

16.20–16.35	*Harnessing livestock resources for food security in pastoral areas of ECA*, Dr Polly Ericksen, ILRI
16.35–16.50	Proven technologies for feeding ECA region, Mr Morris W Ogenga-Latigo, Farmer

16.50–17.30 **Panel Discussions on Sub-Theme 1 continued**

	Managing current and future climate induced risk in ECA Agriculture Panellist: Dr K.P C Rao, Dr J B Okeyo Owuor, Prof Fisseha Itanna
	Harnessing livestock resources for food security in pastoral areas of ECA Panellists: Dr Polly Ericksen and Dr David M Mwangi
	Proven technologies for feeding the ECA region Panellists: Mr Morris W Ogenga-Latigo, Farmer and Dr Silim M Nahdy

18.30–22.00 **Cocktail**

DAY 2 : Thursday, 15 December 2011 (Morning)

Plenary

Venue:	ZIBA
Chairperson:	Prof Elly Sabiiti, President of the General Assembly
Master of Ceremony:	Dr Eldad Tukahirwa, Deputy Executive Director, ASARECA
Facilitators:	*Dr Paul Kibwika and Dr. Maria Nassuna Musoke*
Reporters:	*Dr Florence Birungi Kyazze and Mr. Ahmed Zziwa*

8.30–8.45	*The role of mainstreaming gender in agricultural research and development and its contribution to feeding our region in the 21st century*, Dr Henry Manyire, Makerere University
8.45–9.00	Discussion

Parallel Session I: Sub-Theme II: National and Regional Institutions Perspectives

Venue:	PRINCESS
Chairperson:	Mr Philip Kiriro, Farmers' Representative, ASARECA Board
Facilitators:	*Dr Maria Gorreti Nassuna*
Reporters:	*Mr Richard Batte*

09.15–09.30	*Role of farmers, the regional FO and their strategic partners in feeding our region in the 21st century*, Mr Steve Muchiri, Eastern African Farmers Federation (EAFF)
09.30–09.45	Participatory Radio Campaign Model, Mr Kevin Perkins, Farm Radio International
09.45–10.45	Discussion

Venue:	KAMA
Chairperson:	Prof Dr Lala Razafinjara, Chairman, ASARECA Board
Facilitators:	*Dr Prossy Isubikalu*
Reporters:	*Mr Ahmed Zziwa*

09.15–09.30	*Emerging issues underlying food insecurity in the ASARECA region* by Prof Joseph Mukiibi, Consultant
09.30–09.45	*Role of agriculture in overall regional economic transformation*, Prof Calestous Juma, Harvard Kennedy School
09.45–10.45	Discussion

Venue:	ZIBA
Chairperson:	Prof Kallunde P. Sibuga, University Representative, ASARECA Board
Facilitator:	*Dr Maria Gorreti Nassuna*
Reporter:	*Mr Richard Batte*
09.15–10.45	The role of universities and their strategic partners in attaining food security in ECA region in the 21st century by Geoffrey C Mrema, Consultant
10.45–11.15	**Coffee/Tea Break**

Parallel Session I: Sub-Theme II: National and Regional Institutions' Perspectives (continued)

Venue:	ZIBA
Chairperson:	Mr. Richard Sahinguvu, NGO Representative, ASARECA Board
Facilitator:	*Dr Maria Gorreti Nassuna*
Reporter:	*Mr Ahmed Zziwa*
11.15–12.45	*Quels Rôles des ONG's , du forum Regional des ONG's et de leurs partenaires stratégiques dans l'alimentation de la sous Region de l'Afrique du Centre et de l'Est au 21ème siècle,* Pascal Baridomo

Venue:	PRINCESS
Chairperson:	Prof. Nafisa E. Ahmed, Extension Representative, ASARECA Board
Facilitators:	*Dr Prossy Isubikalu*
Reporters:	*Mr Ahmed Zziwa*
11.15–12.45	*Role of extension, the Regional Extension Association, and their strategic partners in feeding the region in the 21st century*, Dr Silim M. Nahdy

Venue:	KAMA
Chairperson:	Mrs Lucy Muchoki, Private Sector Representative, ASARECA Board
Facilitator:	*Dr Maria Gorreti Nassuna*
Reporter:	*Mr Richard Batte*
11:15–12:45	*Role of the private sector, the Regional Private Sector Association, and their strategic partners in feeding our region in the 21st century*, John Kashangaki, Executive Director, Strategic Business Advisors (Africa) Ltd.
12:45–14:00:	**Lunch Break**

DAY 2: Thursday, 15 December 2011 (Afternoon)

Sub-Theme III: Partner Institutions' Perspective

Plenary

Venue: ZIBA
Chairman: Prof Elly Sabiiti, President of the General Assembly
Facilitator: *Dr Maria Gorreti Nassuna*
Reporter: *Mr Ahmed Zziwa*

14.00–14.10	Hon. Mrs Odette Kayitesi's statement on Burundi
14.10–14.25	*CGIAR perspective*, Dr Jimmy Smith, Director General, ILRI
14.25–14.40	*Integrated bio-economy system for food security and sustainable development in Africa*, Dr Getachew Tikubet, Director of Operations, Bio-economy Africa
14.40–14.55	*The East African Agricultural Productivity Programme perspective*, Mr Assaye Legesse, The World Bank
14.55–15.10	*ICIPE's perspective*, Prof Christian Borgemeister, Director General, ICIPE
15.10–15.30	Discussion

Parallel Session II: Sub-Theme IV: Advances in Research for Development: ASARECA Success Stories

Venue: ZIBA
Participants: Ministers and all invited guests to the general assembly except members of the business committee
Chairperson: Dr Solomon Assefa, Vice Chairperson ASARECA
Facilitator: *Dr Maria Gorreti Nassuna*
Reporter: *Mr Ahmed Zziwa*

15.30–15.40	*Overcoming seed potato quality constraints to tackle food security and poverty in ECA in the 21st century*,Dr Z M Kinyua (from KARI / NARL/Kenya)
15.45–16.00	Utilisation of beans for improved health and nutrition, Dr Michael Ugen
16.00–16.15	*Crop-livestock integration for sustainable management of natural resources in the ECA*, Dr Jolly M. L Kabirizi, NaLIRRI, NARO
16.15–16.30	*Genetic engineering of maize for drought tolerance in ECA*, Jesse Machuka
16.30–16.45	Discussions and recommendations
16.45–16.55	**Coffee/Tea Break**
16.55–17.10	*Promoting sustainable natural resource management through effective governance and farmer-market linkages: lessons and opportunities, Dr Onesmus Semalulu*
17.10–17.25	*Evolution of seed sector policies in ECA,* Dr Evans Sikinyi
17.25–17.40	*Promoting farmer-led seed enterprises of African indigenous vegetables to boost household incomes and nutrition in Kenya and Tanzania*, Dr Daniel Karanja (from CABI Africa, Nairobi)
17.40–17.55	*Improving capacity for Agricultural Research in ECA: The SCARDA approach at ARC Sudan,* K Elsiddig
17.55–18.10	*Harnessing agrobiodiversity for food security and sustainable development: conservation and sustainable utilisation of PGR in Sudan, Dr El Tahir Ibrahim Mohammed*
18.10–18.25	Discussions and recommendations

Parallel Session III: Business Committee Meeting

Venue: KAMA

Chairperson: Prof Elly Sabiiti, President of the General Assembly

Participants: Business Committee Members and ASARECA Board Members Only

Facilitator: *Dr Maria Gorreti Nassuna*

Reporter: *Mr Richard Batte*

15.15–15.30	*Progress in the implementation of the ASARECA operational plan*, Dr Seyfu Ketema, Executive Director, ASARECA
15.30–15.45	*ASARECA annual performance report*, Dr. Enock Warinda
15.45–16.00	*ASARECA annual work plan and budget for 2012*, Dr Eldad Tukahirwa
16.00–16.15	Presentation and discussion on recommendations from sub-theme I: agricultural development challenges and opportunities Speaker
16.15–16.30	Presentation and discussion on recommendations from sub-theme II: national and regional institutions perspectives
16.30–16.45	**COFFEE/TEA BREAK**
16.45–17.00	Discussion and approval of the general assembly rules of procedure
17.00–17.45	Decision on recommendations to be made to the General Assembly by the Business Committee

DAY 3: Friday, 16 December 2011 (Morning)

Open space for side meeting and networking

Venue: PRINCESS, KAMA, ZIBA

8.30–10.00	Open space for side meetings and networking
10.00–10.30	**Coffee/Tea Break**

Plenary Session

VENUE: ZIBA

Chairman: Prof Elly Sabiiti, President of the General Assembly

Facilitators: *Dr Paul Kibwika and Dr. Maria Nassuna Musoke*

Reporters: *Dr Florence Birungi Kyazze and Mr Ahmed Zziwa*

10.30–11.20	Recommendations from Business Committee to the general assembly
11.20–11.50	Discussion and adoption of the recommendations
11.50–12.10	Vote of thanks, Dr Emily Twinamasiko, Director General, NARO
12.10–12.30	Closing ceremony
12.30–14.30	**LUNCH BREAK**

***

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Acronyms and abbreviations

AAS	Agricultural Advisory Services
ADLI	Agricultural Development Led Industrialisation
AFAAS	African Forum for Agricultural Advisory Services
AFACEA	Association of Faculties of Agriculture in Central and Eastern Africa
AICM	Agricultural Information Communication and Management
AIV	African Indigenous Vegetables
ARC	Agricultural Research Corporation
ARD	Agricultural Research and Development
ASAL	Arid and Semi Arid Lands
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CAADP	Comprehensive African Agricultural Development Programme
CBSD	Cassava Brown Streak Disease
CGIAR	Consultative Groups on International Agricultural Research
COMESA	Common Market for Eastern and Southern Africa
DAP	Diammonium phosphate
DFID	Department for International Development
EAFF	Eastern Africa Farmers Federation
EAPGREN	Eastern Africa Plant Genetic Resources Network
EASCOM	Eastern Africa Seed Committee
ECA	Eastern and central Africa
ENSO	El Niño-Southern Oscillation
FARA	Forum for Agricultural Research in Africa
FAS	Faculties of Agricultural Sciences
FLSE	farmer-led seed enterprise
FOFIFA	National Center of Applied Research for Rural Development
FPI	Food Price Index
FYM	Farmyard Manure
GA	Grain Amaranth
GNP	Gross National Product
IBS	Integrated Bioeconomy System
ICIPE	International Centre of Insect Physiology and Ecology
ICPAC	IGAD Climate Prediction and Application Centre
ICRISAT	The International Crops Research Institute for the Semi-Arid Tropics
ICTs	Information and Communication Technologies
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
INERA	Institut National pour l' Etude et la Recherche Agronomiques

IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IPTA	Innovation Platforms for Technology Adoption
IRI	International Research Institute (check)
ISABU	Institut des Sciences Agronomiques du Burundi
ISAR	Institut des Sciences Agronomiques du Rwanda
IUCEA	Inter University Council of East Africa
KARI	Kenya Agricultural Research Institute
KMD	National Meteorological Department (check)
MAAIF	Minister of Agriculture, Animal Industry and Fisheries
MDG	Millennium Development Goals
NARI	National Agricultural Research Institutions
NARO	National Agricultural Research Organisation
NARS	National Agricultural Research Systems
NGO	Non-Governmental Organisations
NRM	National Research Management
OPV	Open Pollinated Variety
PANAAC	Pan African Agribusiness and Agro-Industry Consortium
PGR	Plant Genetic Resources
PLGS	Peer Learning Groups
PSS	Positive Seed Selection
QPM	Quality Protein Maize
RAB	Rwanda Agricultural Board
ReSAKSS	Regional Strategic Analysis and Knowledge Support System for Eastern and Central Africa (*ReSAKSS-ECA*)
RUFORUM	Regional Universities Forum
SAP	Structural Adjustment Programmes
SCARDA	Strengthening Capacity for Agricultural Research and Development in Africa
SIDA	Swedish International Development Cooperation Agency
SME	Small and Medium-Sized Enterprises
SPT	Seed-Plot Technique
STI	Science, Technology and Innovation
SWM	Soil/Water Management Technologies
WFP	World Food Programme

Glimpses of the first ASARECA General Assembly, December 2011

Full house

Attentive house

ASARECA Board Members participate

Attentive delegates...

...and delegates

Listening to success stories

Partners with keen interest

BOD members at the General Assembly

Addressing the press

South Sudan admitted as 11th member of ASARECA

Delegates listening to various perspectives

Dr.Jolly Kabirizi tells the crop and livestock success story

Rasha Adam who discovered the ASARECA gene for transgenic maize

Official media launch of the GA

Inspiring revelations

About ASARECA

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a non-political organisation of the National Agricultural Research Institutes (NARIs) of 11 countries: Burundi, D R Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan, Tanzania and Uganda.

The **mission** of ASARECA is to enhance regional collective action in agricultural research for development; extension, agricultural training and education to promote economic growth; fight poverty; eradicate hunger; and enhance sustainable use of resources in Eastern and Central Africa.

Partnerships: Through ASARECA, agricultural scientists in the 11 countries work together and in partnership with farmers, extension workers, the private sector, scientists of regional and international institutions and development partners, to come up with new innovations that could lead to agriculture-led economic growth, poverty eradication and improved livelihoods.

Development agencies that support ASARECA include African Development Bank (AfDB), Department for International Development (DFID), Canadian International Development Agency (CIDA Canada), European Union (EU), International Development Research Centre (IDRC), Swedish International Development Cooperation Agency (SIDA - Sweden), United States Agency for International Development (USAID) and the World Bank – Multi Donor Trust Fund (MDTF).

The views expressed in this publication are not necessarily those of the above-mentioned development agencies.

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