ASARECA
Transforming Agriculture for Improved Livelihoods

Strategy for the Agro-biodiversity and Biotechnology Programme

Towards increased economic growth and improved social welfare in the Eastern and Central African region while enhancing the quality of environment

2008 - 2016

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ASARECA

Transforming Agriculture
for Improved Livelihoods

The ASARECA Agro-biodiversity and Biotechnology Programme | **AGROBIO**

Strategic Plan 2008 - 2016

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Acronyms

AATF	African Agricultural Technology Foundation
ABSF	African Biotechnology Stakeholders Forum
AGRA	Alliance for Green Revolution in Africa
AGROBIO	Agrobiodiversity & Biotechnology Program
ASARECA	Association for strengthening Agricultural Research in East and Central Africa
AU	Africa Union
BECA	Biosciences East and Central Africa
BIO-EARN	East African Research Network for Biotechnology, Biosafety and Biopolicy Development
ABSPII	Agricultural Biotechnology Support Program
BTA	Biotechnology Trust Africa
CAADP	Comprehensive Africa Agricultural Development Programme
CBD	Convention for Biotechnology Diversity
C3P	Crop Crisis Control Programme
CGAIR	Consultative Group of International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
COMESA	Common Market for East and Central Africa
CPB	Cartgena Protocol on Biosafety
EAC	East and Central
EAPGREN	East and Central Plant Genetic Resources
EASCOM	Eastern Africa Seed Committee
ECA	East and Central Africa
ECABIO	East and Central African Biotechnology Program
EMF	Environmental Management Framework
GMO's	Genetically Modified Organisms
I.E.E	Initial Environmental Examination
IAR4D	Intergrated Agricultural Research for Development
ICRISAT	International Centre for Research in Arid and Semi Arid Tropics
IITA	International Institute of Tropical Agricultural
ILRA	International Livestock Research Institute
ISAAA	International Service for the Acquisition of Agricultural Applications
LMO's	Living Modified Organisms
MDGs	Millenium Development Goals
MDTF	Multi Donor Trust Fund
NARES	National Agricultural Research and Extension Systems
NARS	National Agricultural Research System
NEPAD	New Partnership for African Development
R4D	Research 4 Development
RABESA	Regional Biosafety Initiative in Eastern and Southern Africa
RUFORUM	Regional Universities Forum
WEMA	Water Efficient Maize

Preface

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) was established in September 1994 and comprises ten member countries: Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, 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"*.

This mission is a commitment to overcome poverty and hunger in the ECA 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).

The ten ASARECA countries have been and are currently investing in agricultural research, extension, education, and training. While ASARECA mobilises operational finances for sub-regionally planned agricultural innovation activities, the partner NARS contribute their infrastructure, personnel and some funding towards the sustainable implementation of the programmes. The Heads of State of the ten countries, along with all their counterparts in Africa, have committed themselves as a goal of CAADP to increase the share of their national budgets for agriculture to ten percent. The support provided to ASARECA by the development partners adds value to ongoing agricultural development efforts in the sub-region to achieve the goals of CAADP.

Over the past two years, ASARECA accomplished major works that reviewed the past performance, current status and future projections of agricultural performance in Eastern and Central Africa and laid out strategic directions and priorities for ASARECA (2007-2016). It also laid out the Strategic Directions and Priorities for Agricultural Development in the region in the context of the CAADP and the MDGs.

ASARECA serves as a forum for promoting regional agricultural research and strengthening relations between National Agricultural Research System (NARS), in Eastern and Central Africa including the Consultative Group for International Agricultural Research (CGIAR). Aiming to strengthen NARS and link them regionally, ASARECA has expanded its initiatives and leadership in linking agricultural research to the political dialogue possible in COMESA, FARA and AU/NEPAD. ASARECA monitors political and institutional change in the global research environment and provides to its member countries representation in such fora.

ASARECA adds value to the work of NARS in the sub-region through:

- The identification of shared goals and the promotion of economies of scale and scope through collaboration, specialization and sharing of results

- The identification of sub-regional public goods that would be under-produced in the absence of shared goals and a regional mechanism

- Sharing of knowledge and experiences with institutional innovation for more effective agricultural research for development (AR4D), extension and agricultural training and education.

Central to ASARECA's vision and mission is the recognition of the value of regional collaboration and the need for regional collective action among member countries and their partners. Also central to ASARECA's vision and mission is the notion that agricultural research, convened and facilitated by ASARECA, furthers development aims such as broad-based economic growth, poverty eradication and improved livelihood.

ASARECA has seven new programs. These are:

1. Staple Crops Programme,
2. High Value Non-Staple Crops Programme,
3. Livestock and Fisheries Programme,
4. Agro-Biodiversity and Biotechnology Programme,
5. Natural Resource Management and Biodiversity Programme,
6. Policy Analysis and Advocacy Programme, and
7. Knowledge Management and Up-scaling Programme.

What is presented in this document is the strategy and priorities developed for the ASARECA Agro-biodiversity and Biotechnology Programme through collective action of all the ASARECA member NARIS and all major ASARECA Stakeholders. I would like to thank Dr. Charles Mugoya - the Programme Manager, Agro-biodiversity and Biotechnology Programme and all our stake holders for having worked hard and enable ASARECA define its future direction and priorities in the context of the Sub-regional Agro-biodiversity and Biotechnology Programme. It is also my great pleasure to inform all our partners that this strategy document has been approved by the ASARECA Board of Directors.

Seyfu Ketema
Executive Director, ASARECA

Executive Summary

The Agro-biodiversity and Biotechnology Programme Strategic plan arose out of deliberations and consultations a regional workshop held at the Entebbe Resort Beach Hotel, Uganda from 8-10 October 2007. In that meeting, stakeholders took stock of issues affecting the Agro-biodiversity and Biotechnology research environment taking note of lessons learnt from the former ASARECA networks - ECABIO and EAPGREN. These lessons were applied to craft a strategic orientation for the new Programme nested under the overall ASARECA strategy framework.

The strategy makes an analysis of trends in the area of Agro-biodiversity and Biotechnology and their implications in addressing issues highlighted under the CAADP/FAAP processes. It lays down a conceptual integration of agricultural biotechnology and biotechnology. In that framework, Agro-biodiversity represents a resource base upon which agriculture is based as well as a platform to develop new knowledge. Biotechnology on the other hand is seen in the context of providing tools to enhance utilization of agro-biodiversity.

The strategy defines the scope of Agro-biotechnology to encompass a range of diverse technologies derived from molecular genetics, plant physiology (especially tissue culture related techniques), genetic engineering and the emergent sciences such as bioinformatics, genomics and proteomics as applied in crop improvement and management as well as applications of biotechnology in the livestock sub-sector. These technologies are clustered on the basis of themes, and prioritized. Identified thematic areas include: (1) Biotechnology development, transfer and commercialisation (2) Biotechnology infrastructure and human capacity mobilisation and development. (3) Agro-biodiversity conservation and utilisation. (4) Bio-policy development and harmonization and (5) Biotechnology communication and outreach.

The strategy also identifies key opportunities, challenges and constraints. The major constraints include low crop yields, crop and animal diseases, abiotic stresses especially drought, poor soil fertility etc. These constraints are associated with expansion and/or creation of new niches, value addition to traditional products and export competitiveness of the regional agricultural commodities. For each of the challenges and constraints, suggestions are made as to how to engage stakeholders in the national and regional innovations system to find durable solutions.

Finally, the strategy spells out modalities for the Programme implementation with respect to approaches governance and management modalities, communication, funding, monitoring and evaluation. This strategy therefore represents a road map for mobilizing biotechnology tools to enhance the performance of Agro-biodiversity. The expectation is that it will contribute directly to the achievement of the Millennium Development goals and the CAAD/FAAP processes of the African Union.

1 - Introduction

Agriculture supports livelihood strategies of about 280 million people on 300 million hectares in East and Southern Africa (ECA). The regions agriculture is based on exploitation of the natural resource base which is vulnerable to the biotic and abiotic constraints such as drought, pests and disease, declining soil fertility as well as policy constraints. Africa is cognizant of the pivotal role that science and technology can play is addressing these constraints as embodied in the Comprehensive Africa Agricultural Development Programme (CAADP) of the African Union. CAADP processes lean on the mobilization of sciences such as biotechnology, to deliver products for enhancing agricultural production and value addition. Biotechnology indeed holds real promise as the body of scientific knowledge and tools that can strengthen livelihood strategies of farming communities as far as food security, nutrition, health care and environmental sustainability is concerned[1] .

There are many examples from the USA, Brazil, Argentina, India, China and to an in extent South Africa, that illustrate how biotechnology has been used to transform vulnerable agricultural communities into high productivity market-oriented ones. Enhanced productivity calls for sustainable exploitation of the agro-biodiversity. The region is endowed with several terrestrial and aquatic plant, micro-organisms and animal life forms that can be exploited to create wealth, food and nutrition security. Advances in biotechnology can be used to exploit agro-biodiversity in a sustainable manner. Harnessing of biotechnology and biodiversity can contribute to:

- The region being a major actor in agricultural trade and bio-resources;
- Food and nutrition security and wealth;
- Emergence of the region as a strategic player in agricultural Science and Technology and development;
- Sustainable use of the natural resource base.
- Stimulation of economic growth leading to less dependence on donor aid.

1.1 Advances in Agro-biodiversity, Biotechnology and Agricultural Development

Agro- biotechnology refers to a range of diverse technologies derived from molecular genetics, plant physiology (especially tissue culture related techniques), genetic engineering and the emergent sciences such as bioinformatics, genomics and proteomics as applied in crop improvement and management. Today, biotechnology is one of the most rapidly expanding disciplines of biological sciences, underpinning the use of science and technology in development (Box 1). Agro-biodiversity refers to all life forms that are can be used or are currently used in agriculture. Agro-biodiversity can provide additional sources of new traits for domesticated plants and animals and new resources for food, feed and industrial purposes.

The integration of biotechnology and agro-biodiversity is meant to harness opportunities that the two critical areas have in agricultural development. Biotechnology is dependent on natural-resource availability from biodiversity, and in turn, can be used to manage biodiversity in a sustainable manner.

[1] In: Freedom to innovated - Ed. by C.Juma & I. Serageldin

Box 1: Examples of biotechnologies that have been used elsewhere or in ECA

Tissue culture - In-vitro multiplication of plants using meristematic tissues. The process can be used to produce pathogen free planting materials. In vitro conservation of agricultural germplasm.

Marker assisted breeding. The application of genetic markers to characterize germplasm and study genetic diversity. It also includes mapping of QTLS, indirect tagging and selection of desirable agronomic traits during breeding. The process speeds up breeding of complex traits.

Genetic fingerprinting - for seed quality testing and certification

Epidemiology and disease diagnostics - Diverse molecular markers can be used to identify and track pathogens. This strategy was used to identify of the cassava mosaic virus East African strain

Genetic engineering - The transfer and expression of one or several genes from one organism to another. It may also involve the manipulation of gene expression to generate novel traits.

Ecological management - A number of molecular markers are being used in conjunction with population genetics to manage biodiversity.

Emerging approaches - Includes, genomics- focuses on the study of whole genomes and global expression patterns of genes; proteomics- focuses on expression of the total proteins in an organism, **metabolomics**- focuses on expression of all metabolites in an organism and bioinformatics- analysis and management of genetic data. These approaches underpin reverse genetics, a new way for gene discovery and study for novel product development.

Recombinant vaccines - Vaccines developed using recombinant DNA based technologies. There are many such vaccines undergoing trials for control of animal diseases.

1.2 Context of ASARECA: Transition from Projects and Networks to Programmes

In its formative years, ASARECA provided a platform for regional collective action in agricultural research for development. Consequently, the portfolio of activities and networks increased substantially over nine years. To rationalize investment areas for efficiency and effectiveness, in 2002, a review of the ASARECA strategy led to organizational restructure from 17 commodity networks to 7 programmes. One of the seven new programmes created was Agro-biodiversity and Biotechnology, from a merger of the Biotechnology and Biosafety programme (ECABIO) and the Plant Genetic Resources Network (EAPGREN). The newly created programmes of ASARECA aim at aggregating efforts across several small national domains to create regional research domains that can be addressed at appropriate scale. The programmes including the Agro-biodiversity and Biotechnology are informed by the ASARECA Strategy (2006-2016) and an Operational Plan (2008-2014) that illustrates national and regional distributional gains from investments in commodity sub-sectors and development domains.

1.3 The Environment of Agro-biodiversity and Biotechnology in the ECA region

Global perspective: Biotechnology is widely viewed as a pivotal body of science and technology that can deliver technologies and processes to improve agricultural productivity and value addition issues in ECA. Elsewhere, biotechnology has been applied to develop improved crop varieties with resilience to pests especially lepidopterans using Bt. technology, and resistance to herbicides e.g. the round up ready crop varieties[2] . Biotechnology has also

been used to improve multiplication of crop varieties. At a global level, the crop area under bioengineered crops especially herbicide and insect resistant crops has increased annually from 1996 to 2006 (James, 200). Interestingly most of the crop acreage increases have been in the developing world (Gregory et al., 200). There are a number of on going initiatives to bioengineer crop plants with higher productivity, having input traits (related to production) and output traits (related to consumption) (Table 1). The developing world, especially sub-Saharan Africa, ought to harness such technologies in order to assure a doubly green revolution[3] in century.

1.4 Eastern and Central African perspective:

Agricultural productivity in ECA is constrained by low crop yields, new and resurgent crop diseases and the need to expand and/or create new niches through value added products etc. Accordingly, the region is taking bold steps to adopt biotechnology as one of the remedial approaches to address them. The countries that make up ASARECA are in various stages as far as the utilization of biotechnology is concerned. But by and large, bio-safety and bio-policy regulations are being developed to cover experimentation, and use. Almost all countries have tissue culture research capacity; a few have excellent capacity for bioengineering and bio-safety. Some of the ongoing biotechnology related work in the region includes:

- Development of banana resistant to black sigatoka, banana bacterial wilt, weevils and nematodes
- Development of insect resistant maize with BT genes
- Development of weevil resistant sweet potato
- Cassava with modified starch content and resistant to mosaic virus disease
- Maize tolerant to Striga, drought and maize streak virus disease
- Development of Striga and drought resistant sorghums
- Production of virus free planting material (cassava and sweet potato).

What is clear is that the vast majority of ongoing work in the region with exception of the work by Harvest Plus which is focusing on output traits such as enhanced vitamin, most of the ongoing research falls within the domain of generating input traits. This trend clearly demonstrates the constraint areas for where biotechnology will make the largest impact in ECA in the short to medium term.

[2]Thomsom, J.A. (2002)
[3]Conway, G. (1997).

Table 1: Examples of Bio-engineering efforts to improve agricultural productivity

Traits currently under greenhouse and fields trials	Traits currently under laboratory experimentation
Input Traits	
• Resistance to insects, worms, viruses, maize, potatoes, sweet potatoes	• Drought and salinity tolerance in cereals
• Delayed senescence, dwarfing and early flowering in rice	• Enhanced phosphorus and nitrogen uptake in rice and maize
• Tolerance to aluminium, chilling and freezing in cereals	• Resistance to the parasitic weed striga, virus resistance in cassava, maize and bacterial blight
• Male sterility for hybrid production in rice, maize, wheat and oil seed rape	• Resistance to nematodes and black sigatoka in banana
• Increased yield potential in rice	• Rice with capacity for nitrogen fixation and alternative C4 photosynthetic pathway
Output Traits	
• Increased ß-carotene in rice and oil seed rape	• Increased ß-carotene, delayed post harvest deterioration and reduction of toxic compounds in cassava
• Lower phytates in maize and rice to increase bioavailable iron	• Asexual seed production in maize and rice, millet and cassava
• Modified starch rice, potato, maize	• Use of plants to deliver vaccines to humans
• Increased bio-available protein, and sugar contents in maize	• Improved amino acid content of forage crops

1.5 Major trends and implications

The major development trends: Most of the countries in ECA have economies that are largely agrarian with agricultural GDP contributing to over 40% of total GPD. Agriculture is subsistent in these economies and is often vulnerable to external economic shocks and adverse weather. The net result of this is food insecurity, high levels of poverty and weak robustness of livelihood strategies. Addressing these issues is the focus of NEPAD's Comprehensive Africa Agricultural Development Programme (CAADP). Presented in this section are some key development trends that provide a foundation upon which the activities of the biotechnology and biodiversity programme are being planned. The key trends include:

1. Increased focus on generation of output traits rather than input traits which characterise the first generation biotechnologies.
2. A demand for impact oriented mobilisation of science and technology to strengthen livelihood strategies of society.
3. An increased demand by wider public and development partners for science and technology to generate commercial products.
4. A focus on ensuring access to technologies by farming communities hence the need to invest in quick-win technologies farmers can easily adapt to their farming needs as well as integrating technology uptake and learning.
5. Globalization, regionalisation and its ripple effects in the region.
6. More holistic interventions that address systemic issues within the agricultural sector

rather than symptoms of the problems.

7. Increased funding for regional interventions and networks to generate regional public goods with spill over effects in the region. These networks are meant to support aggregation of energies and synergy for higher impact, effectiveness and efficiency in production of public goods.
8. A drive towards cross-sectoral research and training to support rural transformation and economic growth. This is based on the premise that performance of the agricultural sector is clearly affected by performance in other sectors such as health and market related issues.

1.6 The implications of development trends

The need for ASARECA to catalyze agricultural development in the region calls for a responsive and adaptive way to manage the changing demands and needs of the regions agricultural communities. It also requires intense engagement with stakeholders and playing a proactive role in the national and regional innovations system. Some of the key implications to the Agro-biodiversity and Biotechnology programme include:

- Consultative processes in development of R4D agenda.
- Integrating technology uptake and interactive learning approaches in interventions.
- Being integral and active participants in regional and national and innovative systems.
- Developing innovative approaches that promote adaptability, creativity/ entrepreneurship in capacity building, R4D and management.
- Networking (building synergies) with other actors (national, regional and global) knowledge centers for rationalized resource utilization, access to knowledge and reduced transaction costs of R4D.
- Strengthening of existing national R4D initiatives (PhD or MSc).
- Become a regional hub that pro actively plays advocacy, lobbying and resource mobilisation for the NARES of the region.
- Support regional collective action, production of regional public goods, handling trans-boundary issues, creating of a dynamic port of entry and support for innovation to region for universities. This means the programme will focus on areas where it has the highest comparative advantage.

1.7 The generic regional challenges

1. How to manage agro-biodiversity for improved livelihoods and better nutrition of the people in ECA: This challenge focuses on evaluation and quantifying the benefits from components of agro-biodiversity to farming communities as well as support evidence-based linkages between agro-biodiversity, livelihoods and ecosystem health and sustainable management of the natural resource base.

2. How to improve sustainability and productivity of agricultural production systems by harnessing biotechnology and biodiversity: The focus of this challenge is on agro-diversity management and exploitation to maintain resilience, improve productivity and maintain ecosystem service function. It also seeks to address issues of mobilizing agro-diversity to secure stability in the face of climate change, understanding and embedding the full value of ecosystem services in improvement

strategies and community based monitoring of biodiversity and conservation.

3. How to conserve and promote the use of agro-diversity in commodity crops of special importance. The critical areas of focus for this challenge include supporting breeders to make optimum use of genetic resources using modern biotechnologies to produce crop varieties and animal breeds that meet the needs and aspirations of farming communities; identification of traits of value to the farming communities designing effective regional conservation strategies.

4. How to mainstream agro-biodiversity and biotechnology into the NARES. This challenge seeks to strengthen NARES capacities to carry out biodiversity research and manage ex-situ and in-situ conservation. Capacity to use available biotechnology tools and develop appropriate technologies/products. It also seeks to enhance capacities to formulate and implement policies on biodiversity and bio-policy as well as fostering multi-stakeholder research and regional learning.

5. How to optimize linkages between agro-biodiversity and biotechnology. The focus of the challenge is to assure integrated biodiversity and biotechnology interventions that exploit agro-biodiversity for biotech applications to agriculture, uses modern biotechnology tools for conservation, management and genetic improvement.

6. How to develop and implement fewer activities to achieve impact-related success stories. This challenge aims at ensuring that the priority setting and R4D agenda are robust enough to address critical constraints to crop and livestock production in ECA. This challenge also addresses the issue of planning and implementing activities in the context of a product driven research-development-delivery continuum.

7. How to build partnerships with private as well as public sector stakeholders to ensure functionality of innovation systems and impact orientation. It seeks to put in place a framework that ensures breadth and depth of experience and skills present in the region are exploited to deliver impact as innovation systems. This challenge also aims at developing teams and networks, from public and/or private sector to perform special tasks for the region.

8. How to incorporate capacity building into every aspect of the research-development-delivery continuum for each product. This challenge recognizes the need to build capacities at along the product development continuum as a long-term strategy for improving responsiveness, effectiveness and efficiency in R4D.

9. How to develop a funding strategy to support the programme and its partners that ensures continuity and impact of investments. Specifically this challenge aims at developing a resource mobilisation strategy that provides a stable, long-term funding base from a wider donor-base to the programme and its stakeholders. This should include policy sensitization to ensure increased budgetary allocation for agricultural and biotech research by national governments.

10. How to develop and or access the biotechnologies and knowledge from other global knowledge centers to support R4D in ECA. This challenge seeks to address the issues of access to utilization of patented and non-patented biotechnologies such as genes, protocols, processes and products to support R4D in ECA. It also addresses bio-policy and bio-safety issues as they impact on assess to and utilization of biotechnologies.

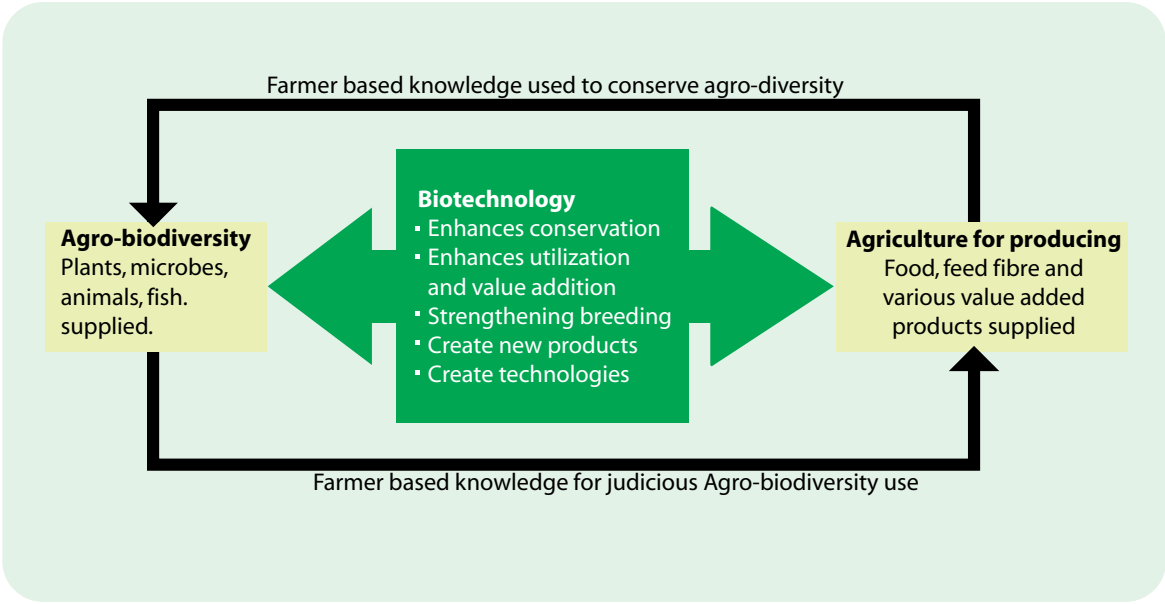
11. How to develop biotechnologies that are relevant for the region's farming and overall agricultural productivity enhancement. This challenge seeks to put in place mechanisms to support generation of biotechnologies to improve crop and livestock production in ECA. This will include developing value chain based development and delivery pathways.

12. How to ensure communication, including public awareness, and learning are integral parts of the programme. Specifically this challenge aims at assuring the development and formalization of communication objectives by the programme and all its projects. The purpose of communication will be for information sharing, learning M&E and marketing.

1.8 Conceptual integration of Agro-biodiversity and Biotechnology

Agro-biodiversity is the result of a human- nature interaction. It reflects the impact of humans on conservation and use of biotechnologies (Swaminathan, 2002) . Non-robust agricultural systems tend to have weak linkages and interactions with the agro-diversity and ecology. Agro-biodiversity thus represents a resource base upon which agriculture is based. In general sharing of benefits and the concomitant increase in the recognized value of resources are the most effective ways to foster the continued availability of agro-biodiversity.
Biotechnology on the other hand provides unprecedented opportunities to strengthen the utilization and conservation of agro-biodiversity. There are many biotechnologies available that can be used to conserve, mass propagate, manage diversity and exploitation, develop novel technologies (vaccines, resistance to biotic and abiotic stresses and other value added products), enhance breeding through marker assisted processes.Thus biotechnology primarily provides tools to enhance utilization of agro-biodiversity. Additionally, is a resource because it provides a platform to develop new knowledge. The interactions between agro-biodiversity and biotechnology become obvious especially within the framework of sustainable use of the natural resources. The development of Biotechnology is closely linked to the conservation of biological diversity . The conceptual framework below demonstrates the interactions between agriculture, biotechnology and agro-biodiversity. The framework shows that farmer knowledge is crucial role in the management and exploitation of agro-biodiversity but this process can be enhanced by biotechnology.

Box 2: Conceptual Integration of Agro-biodiversity and Biotechnology



2 - Programme Focus

A fundamental principle of the ASARECA strategy is to engage in interventions where it has comparative advantage. The programme through its areas will thus provide the research and development agenda to all the 10 member countries for internal or externally funded sub-regional projects including those that are undertaken in regional organizations such as BecA. In this regard, the programme focus therefore addresses 3 interrelated areas:

1. **Technology Generation and uptake:** The programme shall generate new technologies that have broader regional application, horizontal and vertical access and transfer of technologies to the interested stakeholders of ASARECA countries. The programme will in addition strengthen policy support to the ASARECA strategy. Specifically, it will support development of appropriate bio-policy framework encompassing biosafety and IPR for ASARECA. This will promote innovation; facilitate trans-boundary movement of LMOs and creating critical enabling environment for transgenic technology development, transfer and commercialisation. The programme is also expected to contribute to germplasm assess and use in crop/breed improvement programs.
2. **Capacity building:** The programme will develop capacities and competencies of member NARES to effectively harness biotechnologies and agro-biodiversity for the greater good of their countries and the region. The programme will specifically build capacity for priority setting, specialized R4D, develop network for R4D in the region.
3. **Communication and information dissemination and management:** Public information about the importance of agro biodiversity and its conservation along with benefits and risks of biotechnology products is necessary. The new programme deals with these issues. Also create enabling environment for public awareness and dialogue on biotech/biosafety related issues.

2.1 Programme Results Framework

ASARECA during its strategy development process revised its Consolidated Conceptual Framework redefined its objective, purpose and results. The Conceptual framework developed by the program has mirrored the ASARECA Consolidated framework and this will guide implementation of activities in the programme. The results framework is envisaged to be the cornerstone framework that will guide Program implementation in the context of identified priority themes. The Agrobiodiversity and Biotechnology is one of the ASARECA Programmes and is therefore expected to contribute the overall success of ASARECA. In order to do this in the most effective and efficient manner while ensuring better outcome mapping and impact orientation, the Programme has adopted a strategic direction that is properly aligned and nested within the overall ASARECA direction. The detailed ASARECA and Programme log frame are presented in Annex 1, 2 and 3 respectively.

2.2 Programme Goal and Purpose

In line with ASARECA's vision, mission and goal, the goal of the Agro-biodiversity and Biotechnology Programme is "Enhanced sustainable productivity, value added and competitiveness of the sub- regional agricultural system".

Purpose:
In order to achieve the goal of the Agro-biodiversity and biotechnology Programme, the purpose of the programme is "Enhanced utilisation of agro-biodiversity and biotechnology research and development innovations in eastern and central Africa's agricultural systems".

2.3 Results

During this planned 10 year period of this strategy, the Programme intends to realize 3 result areas of the ASARECA log frame. These are described below as follows:

1. Generation and uptake of demand driven Agro-biodiversity and biotechnology innovations facilitated

   There are a wide range of biotechnology tools in the public domains which are yet to be harnessed to bring about regional impact. Under this result area, the programme will aim at strengthening NARS capacity to respond to research needs and contribute to the achievement of the CAADP target through close coordination, facilitation and networking of the different countries in Eastern and Central Africa (ECA). The Programme has set priorities that recognise those that are for NARS (to be addressed by relevant NARs) and those that are regional to be addressed by the Programme.

   The Programme therefore intends to invest in the generation of new technologies or management practices, field testing them and making them available for transfer/ uptake including the policy uptake pathways for testing and validating biotechnologies. In this regard, the program will collaborate with the Policy and Advocacy program (PAAP) to identify priority policy issues in key policy areas such as Regional biosafety harmonization frameworks or common frameworks for the domestication of international agreements in Agro-biodiversity that are critical for product delivery pathways.

   In the former ASARECA Biotechnology and Biosafety Programme (ECABIO), this result area had priorities that covered nine thematic areas, fifty activities, and thirty constraints to crop and livestock production. Under the present programme mode, there will be a focus on fewer activities to achieve impact-related success stories. Thus it will be necessary to select three or four sub projects that could use existing technologies to provide the needed successes in farmers' fields within 5-10 years. In line with this, there will be need to concentrate resources on supporting the research-development-delivery process for these selected sub-projects to generate success. The projects selected must therefore be demand driven with a holistic and integrated approach that considers both technical and non technical issues from the outset .

   To plan and conduct operations in the context of the research-development-delivery

continuum requires a breadth and depth of experience and skills that can only come from a team approach. Teams will include national and international players not only in ECA but in other parts of Africa and beyond in developing and industrialized countries. Team might include private companies that know how to translate research into a product and then deliver it to the end-user; the private sector also has much to offer the ECA sub-region in some areas of strategic research (e.g. Genomics, bioinformatics and bio-engineering). The team members, whether from public or the private sector will be assigned specific tasks that reflect their experience and skills and will work in close coordination from project design to project termination. There is therefore need to build partnerships with private as well as public sector stakeholders on a project by project basis to deliver on this result area. Future projects should start by building a team that adequately addresses all stages leading to and including product delivery.

2. Capacity for implementing Biotechnology research for development in the ECA sub-region strengthened (including gender sensitive biotechnology research)

Capacity mobilisation and development is an issue emerging from Agro-biodiversity and biotechnology regional priorities and demands from programmes. An appraisal of the state of the art revealed that the NARES in the region have varied capacities. The process also noted that some investments had been made in the past and should be built on. Of particular importance is the need to develop networks of excellence to respond to needs and strategically engage in R4D. This will require an appraisal of what exists in the region and developing strategies on how to best deploy them for the regions benefit. Need for partnership with other institutions that have the necessary skills and capacities.

The program under this result area will, strengthen the capacity of NARS scientists and stakeholders in up scaling of the biotechnology/innovations. In this regard, the Program will assist the NARS in building strategic partnerships along the production to consumption continuum. The Program will work with the Capacity building Unit to build capacity of NARS scientists and stakeholders in areas such as:

- Development of human resources and infrastructure for bioinformatics to analyze genetic databases in support of research activities.
- Strengthening of capacity building to coordinate research activities in genetic engineering, genomics and bioinformatics.
- Establishment and maintenance of gene banks.
- Germplasm characterization.
- Strengthening of the technical training capacity to implement biotechnology market support service systems and biosafety risk assessment

Much of the human and infrastructural capacity building initiatives in ECA have so far focused on research. There has also been an increase in efforts to build capacity in regulatory, intellectual property, and communication issues associated with bio-engineering. Less effort, even for bio-engineering, has been directed at other aspects of the continuum such as marketing and distribution. There is need to incorporate capacity building into every aspect of the research-development-delivery continuum for each product

3. Availability of information on Agrobiodiversity and biotechnology innovations enhanced

A central theme in the new ASARECA Strategic Plan is the key role that communications and knowledge management will play in the fulfillment of the ASARECA mission. The importance of well documented and well organized and packaged information addressing Agro-biodiversity and biotechnology research outputs cannot be overemphasized. This result area seeks to:

Make ASARECA visible/known as a champion for the safe and effective use of biotech as a tool in agriculture.

Establish a coordinated mechanism of sharing biotechnology and biosafety information in the ECA for different stakeholders e.g. through policy briefs, newsletters etc.

Communicate effectively ECA position on biotechnology and biosafety issues.

Assisting NARS to develop communication capacities to communicate with their stakeholders.

Communicate information on existing human and financial capacities in the NARS.

Document and disseminate different stages of success stories (e.g. through a newsletter).

Establish mechanisms to counter bad press and to impact/influence positively on policy makers.

It is important to note that all the above will enhance visibility and awareness of the programme given the massive debates about the impacts of biotechnology in agriculture and the environment in general. It will also address the issue of learning both for the programme and ASARECA's stakeholders. Moreover, according to the Operational Plan, ASARECA has institutionalized new approaches to communication, knowledge management, uptake promotion and up-scaling of technologies and best practices that have been developed over the years. It is through a coherent and well coordinated communication and knowledge sharing plan that ASARECA's stakeholders, e.g. farmers and NGOs and private sector will be able to get and use the information about biotechnologies and best practices. This is the way to raise productivity of smallholder farmers, who are by far the majority of farmers in the region, an issue that is central to Pillar IV of CAADP. In this regard, the Program will work closely with the information and communication unit (ICU) to develop an Agro-biodiversity and Biotechnology web-link to the ASARECA website and other websites and facilitate sharing of information between NARS, CGIARs and other stakeholders.

3 - Programme Thematic Focus

Harnessing linkages between biotechnology and the diversity of biological resources provides a good platform for African countries to meet challenges of food security, health, poverty, and raising incomes. There is enormous potential for synergies. Diversity of plant, animal and microbial life provide building blocks for modern biotechnology applications. Biotechnology research could improve the use of germplasm (e.g. crop and livestock improvement and breeding). Research focus on themes that effectively use modern agricultural biotechnology tools to stem the rapid loss of diversity in agriculturally useful materials, particularly vegetatively propagated like cassava and sweet potatoes and recalcitrant seed materials. Examples of relevant tools for conservation of genetic resources, particularly vegetatively propagated materials requiring micro-propagation techniques, include in-vitro techniques, such tissue culture, and cryo-preservation (for long term conservation). Effective use of agricultural biodiversity resources depends on the pursuit of fundamental research activities such as: acquiring good knowledge of species and genes through collection; detailed characterization and documentation of the resources and their associated indigenous knowledge; and understanding the value of the genetic materials for use in applications that will improve the well-being of target communities. These research activities and information generated are essential to a productive application of biotechnology to plants/species (both introduced and under utilized indigenous plants) to resolve biotic and abiotic constraints and/or increase productivity. Molecular-assisted markers provide tools for the characterization of genetic resources. To assuage concerns about environmental threats, through potential reduction in genetic diversity with potential long-term effects on food security, research is needed to devise alternative models of private and public mechanisms (institutional, legal, policy, advocacy) that can be agreed on nationally and regionally to ensure that the pursuit of biotechnology does not compromise the diversity in biological resources on which people depend for food and agriculture, and managing risks. In addition there are no suitable uptake pathways to foster sustainable use of the biotechnologies. There is thus need to critically examine these issues and come up with clear strategic goals that would contribute to the achievement of the Programme goal. The Strategic for ASARECA's Agrobiodiversity and Biotechnology Program are summarised below:

3.1 Programme Strategic interventions

1. Technologies generation networks that are strategic, responsive and impact oriented developed and utilized for the wider benefit of the region:The main focus of this strategic goal is to support innovation systems to generate relevant products and processes in a timely and effective manner. The components include technologies for marker assisted breeding, genomics, tissue culture and related technologies, bioengineering and bio-processing. This strategic goal goes along with harmonised regional bio-policies for biotechnology use and access as well as agro-biodiversity conservation and management which ensure uptake. The components include harmonization of bio-policies for easy movement and access of technologies and germplasm as well as IPR.

2. Capacity and competencies for research for development in the NARES mobilised and or developed for impact oriented activities: The components of this strategic goal include competence development for specialized programmes, strategic infrastructural and human resource development, networking for designated results delivery.
3. Communication and learning framework to support up and out scaling in the region and improvement of performance: Components of this strategic goal include development and operationalisation of communication strategy to address marketing and advocacy concerns within ASARECA and all its stakeholders on the role and use of agro-biodiversity and biotechnology agricultural development.

3.2 Programme Thematic Areas

The large range of possible programmatic thematic areas of intervention (R&D, capacity development, policy, public awareness) in agrobiodiversity to address challenges under strategic objectives will be addressed in five thematic areas. The programme/thematic areas and rationale for their selection are provided below:

Thematic area 1: Technology development, transfer and commercialisation

Rationale: Agriculture depends on the sustainable exploitation of the natural resource base. This implies that success of African agriculture like elsewhere depends on efficient exploitation of agro-biodiversity. Specifically, agro-biodiversity plays a crucial role in the genetic improvement of crops and livestock. Agro-biodiversity exploitation for wider agricultural use has been made possible through application of established, new and emerging tools of biotechnology. This presents a magnificent opportunity for the people of ECA to harness the power of their own genetic resources.

ECA has potential to be self reliant in food, feed and fibre production. The development domains as described in a recent study show that up to 40% of agricultural land lies in high potential areas. However, the poor breeds and varieties used, coupled with existing abiotic and biotic constraints impede production. Given the existing agro-biodiversity in the region and elsewhere, the use of available genetics and biotechnology tools offer opportunities to improve breeding of resilient crops and animals for the region.

Biotechnology also holds promise with respect to expansion of niches through value addition and new product development. In the recent past, several desirable traits have been tagged to specific genes and gene complexes and successfully transferred efficiently across traditional genetic barriers using biotechnology. ASARECA operating at a regional level, has comparative advantages to develop the region's capacity to harness their agro-biodiversity using advances in science and technology including biotechnology.

Sub-themes

1. Improving yield and quality through developing protocols for certified, clean, planting materials of vegetatively propagated crops.
2. Increasing crop yields through development of biopesticides against major phytopathogenic agents.
3. Accelerating crop breeding through marker-assisted selection.

4. Adding value to germplasm and improve the speed, efficiency and precision in crop/ livestock improvement through the use of biotechnology tools and technologies (genomics, markers and genetic engineering).
5. Improving soil fertility through developing bio-fertilizers and bioremediation technologies.
6. Enhancing entrepreneurship through developing business incubation models.
7. Increasing milk production through development and deployment of diagnostic kits for major livestock diseases.

Outcomes

- Improved utilization of agro-biodiversity in ECA for the region: The biodiversity will be used to generate demand-driven improved technologies and products for regional and global markets. The technologies such as new crop varieties and animal breeds, diagnostics for crops and livestock and vaccines will in the short to long run lead to improved production. More efficient and effective biodiversity conservation and prospecting for novel traits.

- Improved natural resource management: This will include efficient management of soil fertility and biodiversity conservation and prospecting.

- More extensive and efficient seed systems that assure access to improved seed and technologies by farming communities: Biotechnology will particularly support mass propagation of disease free seed and planting material, diagnosis of diseases and development and use of standards for cross border seed trade. It will be used in seed quality testing and certification through genetic fingerprinting.

- Improved awareness of biotechnology/biodiversity and usefulness of science and technology to development processes: This outcome will ultimately lead to new public-private partnerships to develop and deliver impact oriented technologies. Moreover increased awareness will improve research need prioritization and the operationalisation of innovation systems in the development process. Awareness will also lead to more public acceptance of biotechnology products

The quick wins will include: (a) Production of certified, clean planting materials (b) Development of disease diagnostics for crops and livestock (c) Vaccines for livestock and (d Tools for biodiversity conservation and utilization.

Challenges and opportunities

With over 40% of the ECA land being of good agricultural potential and just under 70% of the population being agrarian dependent, strategic investment to improve their livelihood strategies becomes crucial. For the outcomes of this thematic area to be fully realized, there are some challenges which this programme will seek to address. The challenges are summarised bellow.

- How to develop and harness the existing R4D capacities in the region to develop public goods.
- How to harness the regions unique agro-biodiversity and technologies developed to address related problems within ECA.
- How to improve public awareness and support for biotechnology usage in development process and practice and its benefits to society.
- How to improve access to technologies, products and processes generated from global investments in science and technology for the wider use of the region.
- How to harness ongoing reforms in NARES to improve R4D processes including partnerships needed to commercialize products for the regional and global markets.

Strategies to address challenges

1. Strategic partnerships and networks established and strengthened to develop critically needed technologies for the region. The programme will largely use networks of specialisation in which strategic partnerships will be developed to harness the excellences existent in the ECA for R4D.
2. Biopolicy and other related agro- policies harmonized to assure free access to and the utilization of biotechnologies and other products in ECA. This strategy will also seek to address the issue of IPR and how to relates to technology acquisition for R4D.
3. A communication strategy to support information sharing, learning, dialogue, advocacy and marketing developed and implemented. This strategy will promote awareness at all levels, build and nurture partnerships at all levels.
4. Strategic partnerships with regional and international actors to improve access to technologies for the wider use of the region.
5. Holistic approaches in the design and implementation of R4D intervention to assure a value chain approach

Managing Spill-overs

The outcomes from this thematic area will be up-scaled and out-scaled for the greater good of the region through:

1. Deliberate design of all interventions to ensure synergy, complementarity and leveraging of resources for the greater good of ECA.
2. Lobbying for additional investment in biotechnology and agro- biodiversity.
3. Technology and product sharing mechanisms/platforms from ASARECA supported projects as well as Technologies and products from other sources (national, regional, or global).

Thematic area 2: Infrastructure and human capacity mobilisation and development

Rationale: Effective and efficient exploitation of the region's agro-biodiversity requires human resource to develop technologies and/or form strategic alliances. The regions human resource is still weak and so is the infrastructure. In order to achieve these results, building human and infrastructural capacity at the national and regional levels is a very critical measure. This is the basis for this programme area through which ASARECA seeks to strategically invest in the development of capacity for biotechnology and agro-biodiversity for the region.

Sub-themes

1. Human and infrastructure capacity building to support innovative, responsive and impact oriented biotechnology and biodiversity R4D undertakings in ECA.
2. Development and support to networks of specialization to undertake commissioned R4D for the region.
3. Capacity building for strengthening partnership arrangements including public private partnerships for R&D, uptake and commercialisation.

Outcomes

Most of ongoing applications of biotechnology for improvement of agro-biodiversity in ASARECA region are geared towards addressing food security, but it is limited in scope and applications. Therefore the proposed strategic plan is expected to enrich the realization of vision and mission through development of market-oriented products. These capacities when put in place will enhance the region's ability to efficiently and effectively harness biotechnologies and agro biodiversity for economic development.

The key outcomes

- NARS scientists are able to breed better adapted crops.
- NARS scientists are able to train their nationals in biotechnology research and development.
- Commercial and business ventures are established to market agro-biodiversity and biotechnology products.

Challenges

Biotechnology development and applications for the improvement and utilization of agro-biodiversity are occurring for most parts in developed countries, but quite limited within ASARECA region. Within this programme area there is need to address the under-listed challenges to improve the utilization of biotechnology in agricultural R4D in ECA.

- How to harness existing capacities to build the regions' human resources to support biotechnology and agro-biodiversity based R4D, exploitation and management. This challenge recognises that the region has several capacity building institutions with whom strategic alliances could be formed to build capacity for the region.
- How to develop and strengthen specialized networks to build biotechnology capacity for the region to engage in R4D. This challenge will be addressed by building on lesson learnt from earlier investments in capacity building as well as developing new strategic partnerships.
- How to build capacity of especially for weak NARES in ASARECA to enhance their capacity to develop technologies for their countries as well as the region.

- How to ensure the long-term sustainability of Universities in the region to train biotechnology and agro-biodiversity specialists for ECA.

Strategies to address Challenges

In order to address the above challenges the Programme will develop strategic partnerships with Universities and other capacity building institutions to develop relevant teaching curricula and training programmes. The programme will seek to enhance institutional capacity for training in agro-biodiversity and biotechnology especially within the region through:

1. Development and strengthening specialized networks and or support existing one in the region to develop capacity for weaker NARES
2. Establishing capacity key gap areas. Examples include gene banking for collection, characterization, evaluation, in-situ and ex-situ conservation, and utilization of agro-biodiversity for the benefit of ASARECA countries.
3. Enhancing the capacity for networking and linkages. This will include development of competencies to develop and sustain partnerships for commercialization and joint business ventures through exploitation of agro-biodiversity and biotechnology products.

Managing Spill-overs

Efforts will be made to design of interventions that ensure synergy, complementarities and leveraging of resources from other actors operating the region. This way the up-scaling costs will be shared. In addition, all programmes will strive to address the issue of solidarity as one of the core ASARECA values. This in itself is a mechanism to ensure spill over take place.

Thematic area 3: Agro-biodiversity conservation and utilisation

Rationale: Agro-biodiversity comprises all biodiversity directly or indirectly used in agriculture. It is the biological foundation of agriculture. For centuries, agro-biodiversity has been used by society to avoid risks, adapt to changing environment, diversify products, generate income and diversify its nutrition. In general agro-biodiversity has ensured the maintenance of ecosystems through nutrient recycling, carbon sequestration pollination, among others. Despite these clear benefits, agro-diversity in the ECA region faces serious challenges. These include continued erosion due to increasing demands for different food types, varieties/breeds to meet diverse nutritional, social and financial needs. In addition there is lack of awareness and low valuation of society's genetic resources. Due to unfavourable weather conditions, diseases, pests, changing farming systems, and war, the region continues to suffer severe genetic erosion. This genetic erosion results in loss of vital sources of genetic materials for assuring sustainable food availability in the region. In addition the heterogeneity of the farming environment in the ECA region dictates that few crops can be cultivated across large areas. This gives agro-diversity a crucial role in strengthening small-holder agriculture, a key element of that underpins the overall ASARECA strategy.

The ECA region has a rich endowment of agro-biodiversity resources. Examples include cultivated plant species wild plant species, trees in agro-ecosystems, soil micro-organisms (fungi, microbes), pollinators, predatory insects and livestock amongst others. Most of these have never been fully exploited for beneficial uses such as food, feed, pharmaceuticals,

industrial uses, or as alternative energy sources. In addition, the full genetic potential of these resources have not been fully characterized and evaluated. Thus, their potential is largely unknown. There is need to mobilization of modern science and technology including biotechnology so as to enhance effective and efficient utilization of these bio-resources for development of the region.
The focus of this programme area is to enhance the conservation and sustainable utilization of the region's agro-biodiversity for the present and future generations. Some of the key outputs to be generated include;

- Development of regional gene banks for conservation of especially crop/plant germplasm;
- Development of in situ conservation strategies for maintenance of germplasm on-farm and in the natural environment
- Development of technologies including biotechnologies for the conservation, characterization and utilization of germplasm;
- Development and or harmonization of bio-policies especially IPR related issues to improve access and use of genetic resources.
- Identification of genotypes for use in plant improvement programs (higher yield, disease resistance, adaptation to climate change, etc.)

Sub-themes

1. Conservation and management of agro-biodiversity for wider use in ECA;
2. Capacity building and R4D to enhance utilisation and characterisation of ECA agro-biodiversity;
3. Policy harmonization for effective and efficient use of ECA biodiversity.

Outcomes

Investing in this thematic area will result in the short run in the following outputs which will lead to efficient and effective utilisation of ECA agro-biodiversity for agricultural development and economic growth in general. Other outcomes include:

- Strategies and methodologies for the exploration, collection, documentation, characterisation, conservation and documentation of ECA agro-biodiversity are developed and utilized to support R4D in agriculture in general.
- Conservation of under-utilised crops and plants and threatened species is enhanced.
- Technologies for propagation and utilization of the regions agro-biodiversity developed in breeding and other agricultural related activities are up-scaled for the wider use in the region.
- Community based conservation and utilisation of agro-biodiversity strengthened through ethno-botanic and socio-economic contextualisation of the agricultural landscape in ECA.
- Collection, documentation and validation of indigenous knowledge is enhanced.
- Networking to facilitate access to germplasm through the established multilateral systems is institutionalised.
- Regeneration and safety duplication of regionally important crop collections is maintained in the region

Challenges to be addressed

Within this programme area there is need to address the following challenges:

- How to harness the region's biodiversity to support R4D and other uses in ECA.
- How to manage ECA's agro-biodiversity in a manner that conserves genetic purity and prevents genetic erosion.
- How to enhance the trans-boundary use of the region's agro-biodiversity for R4D and other uses.
- How to ensure access to germplasm through the MTAs and other existing international mechanisms/treaties.

Strategies to address the challenges

The challenges of this programme area will be addressed using the following strategies:

1. Support regionally ex-situ collection (gene-banking) and conservation systems for the region's agro-biodiversity. This will include putting in place regional facilities such as field genebanks. This strategy will also employ various ex situ conservation methods including in vitro techniques (cryo-preservations), tissue culture and DNA libraries;
2. Develop and implement approaches for in situ conservation of the regions critical genetic resources such as on-farm conservation methods involving farming communities to conserve the biodiversity;
3. Implement bio-policy harmonization activities to support access to the region's biodiversity.
4. Develop projects that enhance the identification and utilization of agro-biodiversity including bio-prospecting.

Thematic area 4: Bio-policy development and harmonization

Rationale: Bio-policy development and harmonization is critical for the success of the programme. National and international conventions and laws governing biotechnology, conservation and use of agrobiodiversity need to be harmonized in order to ensure free access and exchange of germplasm. Policy-makers and politicians in most countries in the sub-region have inadequate awareness of the social, economic, ecological and political values of agrobiodiversity.

The region lacks full appreciation of the importance of agrobiodiversity in addressing food insecurity, poverty alleviation and human health related challenges. These weaknesses have frequently been highlighted by the relatively limited levels of national debate and implementation of key international agrobiodiversity frameworks. Despite this relatively low awareness of the practical applications of agrobiodiversity, all most all the ASARECA countries have ratified several important International Treaties and instruments related to agrobiodiversity. This apparent combination of basic political will with limited awareness of the practical applications of agrobiodiversity suggests that the effective of national and sub-regional implementation of the Treaties risks being a lengthy process. This conclusion is reinforced by the historical trend of slow domestication of international agreements in the sub-region.

As a result of this situation, there is a demonstrable need for greater awareness among policy-makers and potential ground level implementers of the various treaties. Efforts in this

area would serve to highlight the need for nationally and regionally oriented planning for implementation and to build public and political support for such implementation. There is also a complementary need for information and skills among these same groups to support the development of policy options that will recognise the role of agrobiodiversity, and its interaction with, agricultural research priorities and overall economic development. These two areas of activity would also provide policy makers and national delegates to international fora with the necessary organisational and negotiation skills to enable them to participate effectively in both national and international policy fora. The programme has a comparative advantage in this area and it will seek to support NARES in the development of legal frameworks that will facilitate the use of biotechnologies and access to agrobiodiversity.

The lack of relevant policies and legislation is placing the rich agro biodiversity and the benefits that can be derived by the ASARECA region at risk, negatively impacting on sustainable livelihoods of present and future generations. The loss of biodiversity hotspots needs to be urgently addressed to minimize further decline and the urgency should be reflected in the policies and priority actions of governments of the ASARECA member countries. ASARECA recognizes that an appropriate bio-policy framework encompassing bio-safety and intellectual property right (IPR) is critical. This thematic area seeks to address the policy issues by focusing on three objectives:

1. To enhance scientific and technological knowledge, and educational, social, cultural and aesthetic values of biological diversity;
2. To optimize economic benefits from sustainable utilization of the components of biological diversity;
3. To ensure preservation of the unique biological heritage of the nations for the benefit of present and future generations.

To conserve the ECA biological diversity and to ensure that its components are utilized in a sustainable manner for the continued progress and socio-economic development of the region, Policies that are developed should (1) promote regional and international trade; (2) encourage innovation through respect for intellectual property; (3) facilitate access and trans-boundary movement of seed and genetic resources, GMOs through trade and food aid, and; (3) create an enabling environment for technology development, technology transfer and commercialization. These are the focal issues to be addressed by the project.

Sub-themes

1. Strengthening seed systems in ASARECA region (situational analysis, markets etc).
2. Capacity building in development and enforcement of policies and legislation for
3. Policy makers/regulators/scientists market potential for seed in the ASARECA region.
4. Implementing/domesticating requirements for international treaties.

Outcomes

The implementation of this thematic area will result in the following outputs and outcomes:

- A harmonized or compatible bio-policy and legal frameworks that promote the access, collection, characterization, conservation of biological resources and facilitate exploration of new food and industrial products such that indigenous

resources are not over exploited and indigenous people do not lose access to their traditional livelihoods developed.

- Capacities and competencies for the development and enforcement of bio-policies developed and supported to contribute effectively and efficiently to the regional biotechnology and bio-policy R4D.
- Platforms for preparations for active engagement and participation in international negotiations in the field of Agro-biodiversity and Biotechnology.
- Emergence of functional policy and legal frameworks on Agro-biodiversity and Biotechnology in ASARECA member countries.
- Capacities for negotiations enhanced among nations in the region.
- An enabling environment for innovations and effective management and utilization of proprietary technologies in the region with emphasis towards:
- Enhanced capacity for bio-policy analysis advocacy, development and implementation.
- An enabling policy environment for innovations and effective management and utilization of technologies.
- Enhanced capacity for bio-policy analysis advocacy, development and implementation.
- An enabling policy environment for innovations and effective management and utilization of technologies.
- Harmonized or compatible bio-policy and legal frameworks.

Challenges

Currently very few countries in the region have clear-cut policies and legal frameworks on biosafety, IPR and even seed. While most ASARECA member countries are signatories to international instruments on genetic resources, bio-safety and IPR, hardly any has taken appropriate steps to implement the provisions of these laws. There is also the question of limited awareness on the significance of bio-policy on biotechnology and agro-biodiversity development. There is also inadequate skills and capacity for negotiation at international treaties related to agro-biodiversity and biotechnology. Most countries are contracting parties to various international treaties and protocols on biotechnology and biodiversity (, CBD, CPB, ITPGRFA and TRIPS etc) AU, COMESA, EAC have endorsed efforts towards harmonization of policies and regulations ABTT (Seed regulations - EASCOM, RABESA). On-going regional efforts to inform policy makers on policy options (sensitization). The key questions will be:

- How to develop 'clear-cut' policy positions and legislative frameworks to guide harnessing of agro biodiversity.
- How to build adequate capacity for formulating and implementing bio-policies and legislation.
- How to address raging controversies and uncertainties around potential adverse effects of modern biotechnology – may slow down policies decisions.
- How to foster cross-sectoral collaboration among government departments in policy formulation and implementation.
- How to domesticate international conventions and treaties through appropriate national legislation.

Strategies to address the challenges

Effective management of agro biodiversity to achieve the objectives of the ASARECA Policy on biodiversity will be guided by the following seven strategies:

1. Facilitating need assessment with view to identifying gaps related to international and regional treaties on biotech and agro-biodiversity.
2. Facilitate skills development in negotiations at international forums on agro-biodiversity and biotechnology.
3. Facilitate establishment of a platform to prepare for international negotiations.
4. Raise awareness among policy makers and other stakeholders on the importance of bio-policy in the region.
5. Provide basic examples of functional policy frameworks in the region or outside for others to learn from.
6. Provide models or options to showcase harmonization of bio-policy.
7. Analysis to generate evidence for policy options (research).

Managing Spill-overs

Managing spill over requires addressing the issues of economies of scale in terms of large markets. In the context of this thematic area two critical areas will be implemented. (a) Building synergies and ability to adapt (b) Supporting and integrating inter-country learning and sharing of lessons and experiences

Thematic area 5. Communication and outreach

Rationale: This programme area seeks to enhance visibility and awareness of the programme given the massive debates about the impacts of biotechnology in agriculture and the environment in general. It will also address the issue of learning both for the programme and ASARECA's stakeholders. The biggest threat to agro-biodiversity is genetic erosion due to human interventions. This threat is compounded by the limited information on the importance and roles of agro-biodiversity in the region. There have been a number of interventions to fill the information and communication gap by regional and national entities nevertheless, there is need to intensify in the light of bio-policies being formulated in the region. Addressing the whole issue of communication calls for a comprehensive dissemination of information on the importance and need of biotechnology and agrobiodiversity conservation, along with the enormous benefits and possible risks of biotechnology products is essential. Some of the critical issues to consider include:

- Improving ASARECA's public image as a champion for the safe and effective use of biotechnology as a tool in agriculture.
- Establish a coordinated mechanism of sharing biotechnology and bio-safety information in the ECA for different stakeholders including policy makers and users.
- Support NARES to develop capacities to communicate with their stakeholders on biotechnology issues.
- Document and disseminate different stages of success stories as part of a learning process of the programme and its interventions.
- Establish a marketing strategy to mechanism to counter bad press.
- Develop public awareness and information packages for different target groups (communities/farmers, media, policy makers etc.)

The Agro-biodiversity and Biotechnology Programme seeks to address these issues at regional level thereby laying the ground for subsequent related activities to be implemented by member countries.

Sub-themes

1. Communication marketing and learning for policy information, campaigns and information management.
2. Capacity building for improved communication learning and information management in ECA on agro-biodiversity and biotechnology.

Outcomes

Implementation of this thematic area will generate the following outcomes and or outputs which are in line with the overall ASARECA result areas:

- A functional and effective system of communication, learning and knowledge management for the programme will be developed to enhance the access to information, policy formulation and utilisation of agro-biodiversity and biotechnology in R4D and agricultural development in general by the various publics and stakeholder of ASARECA.
- A one stop information portal that eases assess to and availability information developed to support the research and development fraternity in ECA and globally.
- Enhanced development of evidence based biopolicies supported by information and knowledge generated by the project and strategically communicated to the relevant stakeholders.
- Enhance the stakeholders (policy makers, scientists, extension service, farmers) knowledge and capacities to use through information sharing.
- An efficient system to produce public awareness materials that suit the interests of stakeholders at all levels, i.e. scientific communication, reports, interviews, brochures, pamphlets, news papers, posters, etc developed to support publicity, monitoring and evaluation as well as learning frameworks of the programme.

Challenges to be addressed

This thematic area was derived from the need to address the under-listed challenges that should be addressed to improve impact orientation towards the ASARECA result areas. The key challenges include:

- How to harness the existing information on agro-biodiversity and biotechnology for the wider use of the various publics and stakeholders of the programme.
- How to harness the good will from regional governments and general public to market and communicate with especially policy makers to influence policy development and improve understanding on the benefits of biotechnology.
- How to build capacities of the NARES and other critical ASARECA stakeholders on communication and knowledge management to support the programme mission.
- How to implement a regional communication strategy that provides timely and relevant information to diverse stakeholder needs and demands in ECA and within ASARECA.

Strategies to address challenges

The challenges under this thematic area will be addressed using the following strategies:

1. Develop and operational a regional communication strategy that provides for marketing, advocacy and lobbying, learning, information access, policy information and monitoring and evaluation needs of the programme and its stakeholders.
2. Develop and implement a capacity building project for the programmes core stakeholders on communication to enhance their capacity to communicate with the programme and other stakeholders.
3. Develop and operationalise a regional targeting policy.

4 - Priority setting of thematic areas and projects

Consultations to reach consensus on research priorities for the programme IAR4D portfolio led to clear concept ideas for implementation

4.1 Selection of Priority Setting Method

Out of the several methods used in priority setting, stakeholders identified a scoring method to arrive at programme themes and projects. This brought uniformity and enabled comparison of results across the programmes. In addition, the scoring method incorporated multiple criteria to evaluate research themes. Based on ASARECA's mission and strategy, 5 broad criteria (economic growth, social welfare, quality of environment, capacity building and regionality) agreed upon in previous consultative meetings were used. The final agreed upon criteria, sub-criteria and weights for the Agrobiodiversity and biotechnology Programme is shown in Table 2.

Table 2: Criteria, Sub-criteria and their respective weights

Criteria	Weight	Sub-criteria	Weight
1. Economic Growth	30	1.1 Increased value of production	16
		1.2 Increased value added	14
2. Social Welfare	23	2.1 Increased food security	11
		2.2 Improved equity	12
3. Quality of Environment	20	3.1 Enhanced conservation of agrobiodiversity	9
		3.2 Improved utilization of natural resources	11
4. Capacity Building	14	4.1 Enhanced research capacity	6
		4.2 Enhanced development capacity	8
5. Regionality	13	5.1 Number of countries	2
		5.2 Increased regional integration	11
Total	100		100

4.2 Scoring of Thematic Areas and Projects

In scoring Programme and Project themes the potential contribution for each were scored compiled and ranked to give an indication of the relative priority of each project and its contribution to ASARECA's objectives. Table 3 gives the overall running priority ranking of all the programme projects while Table 4 gives priority ranking of projects by Thematic Areas and Table 5 - priority ranking of the programme thematic areas.

Projects and their Thematic number	Weighted Scores	Rank
1. Enhancement of plant tissue culture applications in eastern and central Africa region.	84.31	1
2. Conservation and sustainable utilization of banana genetic resources through the application biotechnology.	82.23	2
3. Conservation and sustainable utilization of cassava genetic resources through the application biotechnology.	79.89	3
4. Conservation and sustainable utilization of sweet potato genetic resources through the application biotechnology.	79.4	4
5. Development of improved methods for controlling and diagnosis of tick-borne diseases in ECA using biotechnologies.	78.51	5
6. Establishment of indexing system for tissue culture materials in eastern and central Africa region.	78.04	6
7. Enhancing the conservation and utilization of the ECA's under utilized plant species.	77.87	7
8. Development of biotechnologies to manage striga on sorghum and banana bacterial wilt in ECA for enhanced productivity in ECA.	77.81	8
9. Speeding up staple cereals breeding for resilience to drought and biotic stresses to diseases molecular marker assisted selection.	72.82	9
10. Developing pilot novel biotechnology and business incubation models and biotech business development training modules for the ASARECA region.	71.18	10
11. Using molecular genetic markers to improve resistance to gastro-intestinal nematode parasites in small ruminants (sheep and goats).	68.2	11
12. Strategic bioengineering of crop plants for niche expansion, improved productivity and conservation.	65.27	12
13. Capacity building and mobilization for biotechnology and agro-biodiversity resources development, transfer and commercialization in the ASARECA region.	64.48	13
14. Developing global access mechanisms for proprietary and non proprietary novel and applied biotechnologies and agro-biodiversity resources for the ASARECA region.	63.21	14
15. Regional and global assessment, validation, selection and documentation of applied biotechnologies and agro-biodiversity resources.	62.31	15

Programme Thematic Areas and their Respective Projects	Weighted Scores	Rank
1.0 Strengthening in vitro production, conservation and access to genetic and clean planting materials		
1.1 Enhancement of plant tissue culture applications in eastern and central Africa region	84.31	1
1.2 Establishment of indexing system for tissue culture materials in eastern and central Africa region	78.04	2
2.0 Enhancing effective and efficient utilization of biotechnologies to improve breeding processes and productivity of crops and livestock in the ECA region		
2.1 Development of improved methods for controlling and diagnosis of tick-borne diseases in ECA using biotechnologies.	78.51	1
2.2 Development of biotechnologies to manage striga on sorghum and banana bacterial wilt in ECA for enhanced productivity in ECA	77.81	2
2.3 Speeding up staple cereals breeding for resilience to drought and biotic stresses to diseases molecular marker assisted selection.	72.82	3
2.4 Using molecular genetic markers to improve resistance to gastrointestinal nematode parasites in small ruminants (sheep and goats).	68.2	4
2.5 Strategic bioengineering of crop plants for niche expansion, improved productivity and conservation	65.27	5
3.0 Conservation, management and use of ECA agro-biodiversity to support sustainable agricultural productivity		
3.1 Conservation and sustainable utilization of banana genetic resources through the application biotechnology	82.23	1
3.3 Conservation and sustainable utilization of cassava genetic resources through the application biotechnology	79.89	2
3.4 Conservation and sustainable utilization of sweet potato genetic resources through the application biotechnology	79.4	3
3.2 Enhancing the conservation and utilization of the ECA's under utilized plant species	77.87	4
4.0 Enhancing Biotechnology and Agro-biodiversity Resources Development, Transfer and commercialization in the ASARECA Region		
4.3 Developing pilot novel biotechnology and business incubation models and biotech business development training modules for the ASARECA region.	71.18	1
4.4 Capacity building and mobilization for biotechnology and agro-biodiversity resources development, transfer and commercialization in the ASARECA region.	64.48	2
4.2 Developing global access mechanisms for proprietary and non proprietary novel and applied biotechnologies and agro-biodiversity resources for the ASARECA region	63.21	3
4.1 Regional and global assessment, validation, selection and documentation of applied biotechnologies and agro-biodiversity resources	62.31	4

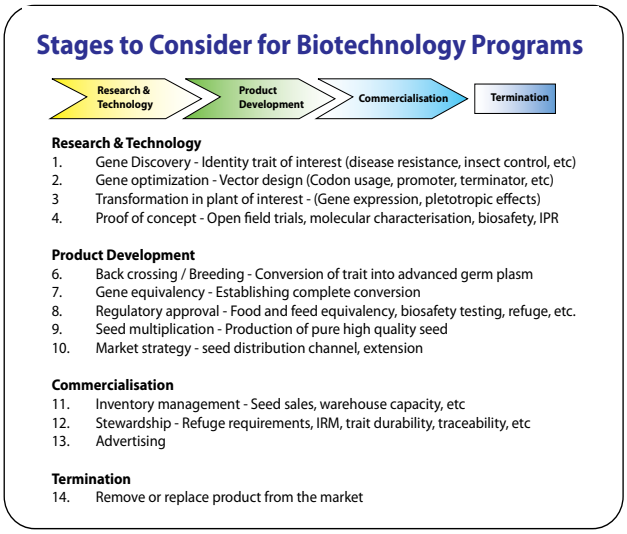
Programme Thematic Area	Weighted Scores	Rank
1.0 Strengthening in vitro production, conservation and access to genetic and clean planting materials.	81.2	1
2.0 Enhancing effective and efficient utilization of biotechnologies to improve breeding processes and productivity of crops and livestock in the ECA region.	72.5	3
3.0 Conservation management and use of ECA agro biodiversity to support sustainable agricultural productivity.	79.8	2
4.0 Enhancing Biotechnology and Agro-biodiversity Resources Development, Transfer and Commercialization in the ASARECA Region.	65.3	4

5 - Strategy Implementation

The Agro-biodiversity and Biotechnology Programme has a regional mandate and approval of the 10 member countries to conduct biotechnology development, transfer and commercialization. The implementation of the strategy will be therefore undertaken through 5 strategic interventions described earlier.

5.1 Implementation approach

Developing partnerships with the key regional and international organizations involved in biotechnology and agro-biodiversity research and development will be the main implementation approach for implementing Programme activities so as to ensure synergy, leveraging and complementarities, coordinated joint planning and implementation along the production to consumption continuum as shown under the various stages below:



Source, Peter Gregory, 2008

The Programme will implement a substantial proportion of its research agenda through its partners, using mechanisms that reinforce synergy, complementarity and coordination. Partners will participate in setting the research agenda, planning, resource mobilization, implementation, publishing and dissemination of research results. The programme will encourage partnership with the private sector as a clear pathway for technology uptake that will benefit researchers and farming communities. The programme management shall therefore pull all the partners together through annual conferences, joint program and project planning, creating a regional forum for interaction that shall among other roles:

1. Provide the research and development agenda to all the 10 member countries by internal or externally funded sub-regional organizations such as BecA, AATF etc.
2. Secure access to public and privately owned technologies or products to avail to interested stakeholders from member countries or elsewhere this is not clear.
3. Serve as an entry point for any regional activity both technology providers, service providers and resource providers.
4. Support and strengthening technology and business incubation facilities in member countries.

5.2 Programme Governance and Management

The Programme governance and management will involve five main levels of governance:
1. The General Assembly
2. Board of Directors (BoD)
3. ASARECA Secretariat
4. Programme Management Unit
5. Project teams

Programme Governance shall be provided through the Secretariat, the Board of Directors will ensure that the Agro-biodiversity and Biotechnology strategic plan is implemented and accomplished and will provide overall policy direction. The Programmes Committee of the BoD will provide the necessary policy guidance required to implement impact-oriented projects. The central Programme Planning Unit of ASARECA through the Technical Advisory Committee (TAC) will advice on the suitability, feasibility and effectiveness of proposed projects and activities. The Programme Management Unit will oversee the development and implementation of projects and will provide a mechanism for regional coordination to harmonize projects and activities. Where necessary, it will develop and implement fund-raising strategies and activities for implementing this strategy.

Programme Management shall be executed through ASARECA rules and procedures both for the competitive grants scheme as well as the direct commissioned activities. In this regard, the regional research agenda shall be executed through regionally-coordinated projects by consortia of NARES, regional and international institutions led by a project team leader or Principal investigator. The design and implementation of projects will based on project teams that bring together all the necessary expertise required to deliver the results. Project team leaders will work under the supervision of the Programme Manager. The mixed team concept is adopted to encourage and facilitate formation of partnerships. Project teams will be headed by a team leader who is responsible for the coordination of project implementation and technical and financial reporting. Engagement of project leaders will be guided by balancing between regionality, complexity of the issue, and competencies required. The AGROBIO Programme Manager will have a significant management role, and be expected to have competencies which include communication, flexibility, innovation and an appreciation of wider regional and international development and agricultural research issues.

To ensure that projects will be able to deliver their desired outputs effectively, and based on past experiences (e.g. CGS and other NPP projects); two management approaches will be adopted. One approach will be hiring of staff time of competent regional project leaders from their institutions in order to secure their time and commitment for the project. This approach will be used for example, in projects where the intensity of coordination is low. The other approach will involve hiring of project leaders for the duration of the project on a full time basis where the project requires a high intensity of coordination. In all scenarios, the host institutions will be expected to give support to the project teams in terms of office space and other support services. ASARECA will cover the operational costs.

Projects will have the following features:

1. All AGROBIO Projects will be of sub-regional significance to deliver sub-regional public goods. Whereas it would be desirable for all member countries to participate in the constituted research teams, it may not be cost effective, and only the expertise and competence necessary for delivery of the project results will be engaged. The outputs will however be made available sub-regionally to all members.
2. Within a Programme, not all commodities or issues may receive funding if no issues with a sufficiently high priority exist. Scientists and stakeholders will need to demonstrate the sub-regional importance and relationship to ASARECA's identified priorities, for resources to be allocated.
3. Formation of task forces, sub-regional platforms, networks and partnerships will be based on specific issues that need to be addressed, and will last for as long as it takes to resolve a particular issue.
4. The Programme will be the entry point for resource allocation, and transparent criteria will be developed for allocation across programmes.
5. The Programme will disburse funds either through the Competitive Grant System (CGS), or by Direct Commissioning (DC). ASARECA has developed guidelines and procedures for the processes following good practice and international standards.The guidelines are reviewed periodically.
6. Research projects will become fewer, but larger, in scale and scope, increasing sub-regional influence and impact and reducing transaction costs.
7. Subsidiarity will be a key to the management of Programmes, with authority, responsibility and decision making being delegated to the lowest feasible level.

With regard to the process for commissioning of projects, ASARECA has developed two comprehensive and transparent types of procedures for commissioning of projects. These are the Competitive Grant System (CGS) and Direct Commissioning (DC). The CGS in principle provides opportunity to all NARS to compete for research grants which also fosters new partnerships. It is thus employed where there is a pool of adequate capacity in the sub-region to address the research issue. DC on the other hand is used where there is a limited number of centres or networks of excellence in the sub-region which are invited by ASARECA to submit proposals for addressing a particular researchable issue. DC can also be employed where there is urgency.

ASARECA has also developed an Environmental Management Framework (EMF) to guide it and its partners in ensuring that activity implementation does not undermine environmental sustainability. Compliance with the provisions of the EMF is part and parcel of the project commissioning procedures both for CGS and for DC. In addition to the EMF, some donors funding projects involving genetically modified organisms (GMOs) require an Initial Environment Examination (I.E.E) of the project before it is funded. The Programme will endeavour to comply with these requirements.

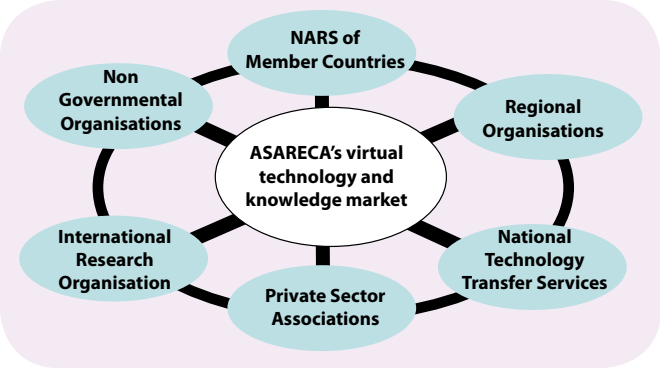
With regard to linkages, partnerships and networking, ASARECA implements its programmes by utilising facilities and expertise of institutions in the sub-region. The networking principle entails creating platforms that bring together interest groups to share information and to create opportunities for collaboration. ASARECA will utilise existing networks and facilitate the establishment of new ones, such as in the areas of extension, education and farmer empowerment to deliver on its sub-regional agenda.

For effective implementation and delivery, the principle of subsidiarity will be applied by ASARECA as regards to its upstream and downstream relationships. ASARECA will continue to collaborate with the CGIAR centres in priority areas both individually and through CGIAR Alliance to benefit from the specialised knowledge, expertise and facilities. Where NPPs were retained by CGIAR centres, ASARECA will coordinate with those networks and build on their achievements. The centres will participate in developing programme strategies and priorities.

5.3 Communication of Programme Results

ASARECA has developed a Communication and Knowledge Management Strategy (CKMS) alongside the new Strategic Plan and Operational Plan. The CKMS is based on many individual and group consultations within ASARECA and amongst its stakeholders. The strategy "maps" the communication linkages within the institution and its stakeholders, and identifies those that need to be strengthened in order to address the existing communication gaps. The Agrobiodiversity and Biotechnology Programme needs to be tracked and monitored with the help of appropriate tracking monitoring tools.
The programme will ensure that its research results are communicated to key constituents in a timely and credible manner. It will use an array of communication channels for this effort that will include scientific publications, posters, brochures, websites, and mass media.

Box 3: Envisaged Technology and Knowledge sharing Mechanism



5.4 Programme Interface with other Programmes

Agro-biodiversity and Biotechnology Programme is in principle a supply entity that is meant to supply technologies and managerial options to enhance delivery of the ASARECA result areas. As such, the programme in its design will seek to synergise with all ASARECA programmes (Staple Crops and Non-staple Crops Livestock and Fisheries, Natural Resources and Forestry, Policy Analysis and Advocacy, Uptake and Knowledge Management Programme that equally contribute to achievement of its results. Partnerships will also be strengthened to include relevant regional and international research institutions including IARCs, particularly IITA, CIMMYT, CIP, CIAT, ICRISAT, ILRI, Biodiversity International, World Fish, Universities, relevant UN organisations particularly FAO,UNEP-GEF, continental bodies such as African Union (AU), NEPAD, regional economic communities such as COMESA, East African Community, Private sector research laboratories, NGOs and Regional programmes such as ISAAA, AATF, BTA, ABSPII, ABSF, AATF, Africa Harvest Biotech Foundation International,

BIO-EARN, BECA, CABI and initiates such as Harvest Plus, CC3P, AGRA, WEMA, RUFORUM, Farmers organisations among others to build on collaborative advantages and positive synergies, based on comparative advantage.

5.5 Gender considerations

The programme will be implemented in line with all the core values of ASARECA in line with the newly formulated ASARECA Gender Strategy , Gender issues are already in built in the Programme log-frame and these will be taken into cognizance at all implementation phases of the strategy. This in making calls, proposals which demonstrate deliberate effort to capture all the relevant gender perspectives will be considered.

5.6 Performance Management, Monitoring, Evaluation and Learning

The ASARECA Strategic Plan lays emphasis on impact orientation/result based approach to agricultural research in order to deliver on its strategic objectives. The principal objective in the medium term is to institutionalize the result based M&E system in ASARECA. The concept of hierarchy of objectives was adopted by ASARECA during the development of the CCF to inform the planning monitoring and evaluation process. This will enable ASARECA to deliver on its Purpose of enhancing sustainable productivity, value added and competitiveness of the regional agricultural research system.
A consultancy commissioned by ASARECA in 2005 revealed that "M&E tools and procedures have not been sufficiently internalized despite adequate M&E concepts and guidelines having been developed and passed on to the NPPs." The agro-biodiversity and biotechnology Programme has developed its log-frame that is integrated with ASARECA's.
The Agro-biodiversity and Biotechnology programme performance will be judged from several perspectives:

1. Impact in contributing to the ASARECA's focus of facilitating together with stakeholders and partners, increased generation, promotion, sharing and utilization of knowledge, information, technologies and innovations to benefit individuals, society and the environment in the ECA sub-region;
2. Bio-technologies developed for agro-biodiversity improvement and management;
3. Biotechnology products, tools and strategies as elements of these technologies;
4. Capacity built at individual level and in institutional strengthening;
5. Scientific outputs, as measured by the number and quality of research publications and reviews;
6. Networks, learning alliances and platforms, and communities of practice facilitated through strategic collaboration with other actors;
7. Increased funding from enhanced donor confidence in the Agrobiodiversity and Biotechnology programme management, research and development.

Monitoring and evaluation (M&E) will be an integral part of the implementation of this strategy. For compatibility purposes, a uniform monitoring system based on the existing ASARECA Performance Management Framework and indicators will be adopted and applied at regional level by the Agrobiodiversity and Biotechnology Projects Consortia. To enable Programme to measure the effects and impacts of the interventions, baseline surveys will be carried out and impact pathways mapped out at the onset of projects.
Finally, through capacity building activities, the stakeholders and policy makers will

disseminate lessons learnt, important results and other relevant information. The implementers will monitor the projects continuously as part of the social learning process, while external evaluation of the strategy and the results will be carried out through mid and end term intervals. Individual projects through supervision missions by the Programme Manager will be responsible for monitoring and implementing the Programme strategy.

5.7 Programme funding

Financial resources will be critical in the effective implementation of the Agro-biodiversity and biotechnology strategy. Funding of the programme will come in two major forms as described below:

1. Direct funding: From ASARECA core budget through the Multi donor Trust Fund (MDTF) managed by the Programme to cover the costs of core activities of programme. These funds will be used to maintain the Programme activities such as support to task forces and short-term consultants, stakeholder consultations, priority setting, monitoring, evaluation and impact assessment. The funds will also be used to implement central and cross-cutting projects especially in the synthesis of information, building of knowledge bases as well as sharing and dissemination.
2. Contributions: Research funds will be raised directly from contributions of participating NARES, donors. Regional and international programmes and other global funding facilities for R4D in biotechnology and agro-biodiversity will be explored. An additional mechanism for raising contributions will be by entering into twinning agreements between ASARECA and other research initiatives by other programmes. Institutional contribution (especially in kind) to projects funded through the previous two sources will be another form of funding the Programme agenda.

5.8 Assumptions and risks

The following are key assumptions underlying the realisation of Agro-biodiversity and Biotechnology strategic objectives:

1. Availability of adequate financial resources for the implementation of the Agro-biodiversity and Biotechnology strategy in ASARECA.
2. Availability of the minimum critical capacity (human resources and facilities) in the NARS.
3. Political will, support and enabling environment will be provided by governments in the ECA sub-region.
4. The GMO debate will not degenerate into a blanket hate campaign for GMOs.
5. Willingness and collaboration between the research teams, private sector and the consumers.
6. Trans-boundary movement of plant and animal germplasm will not be impeded in the sub-region.

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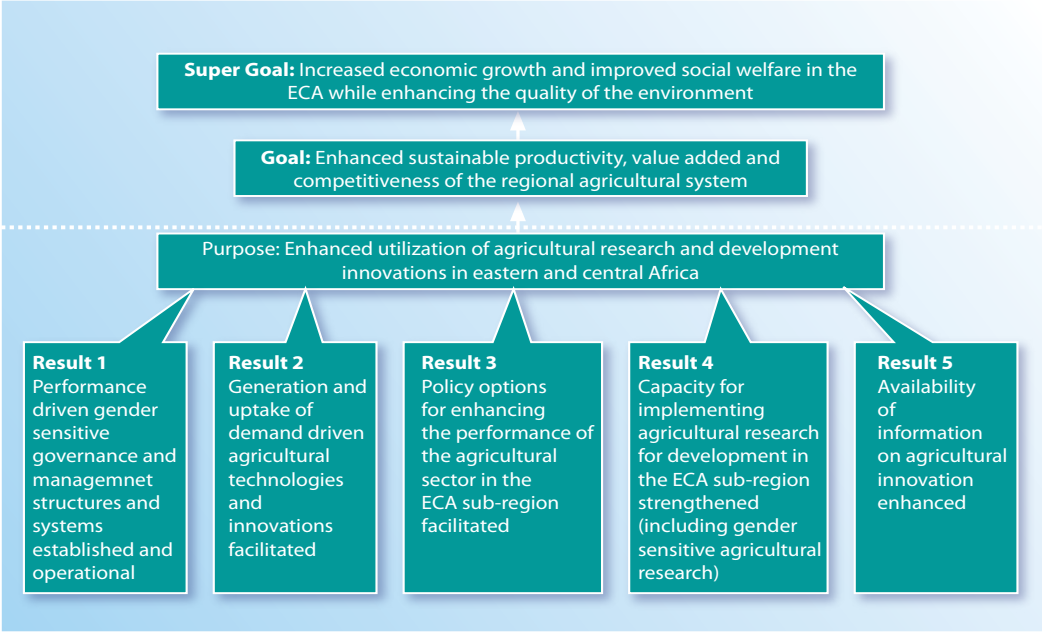
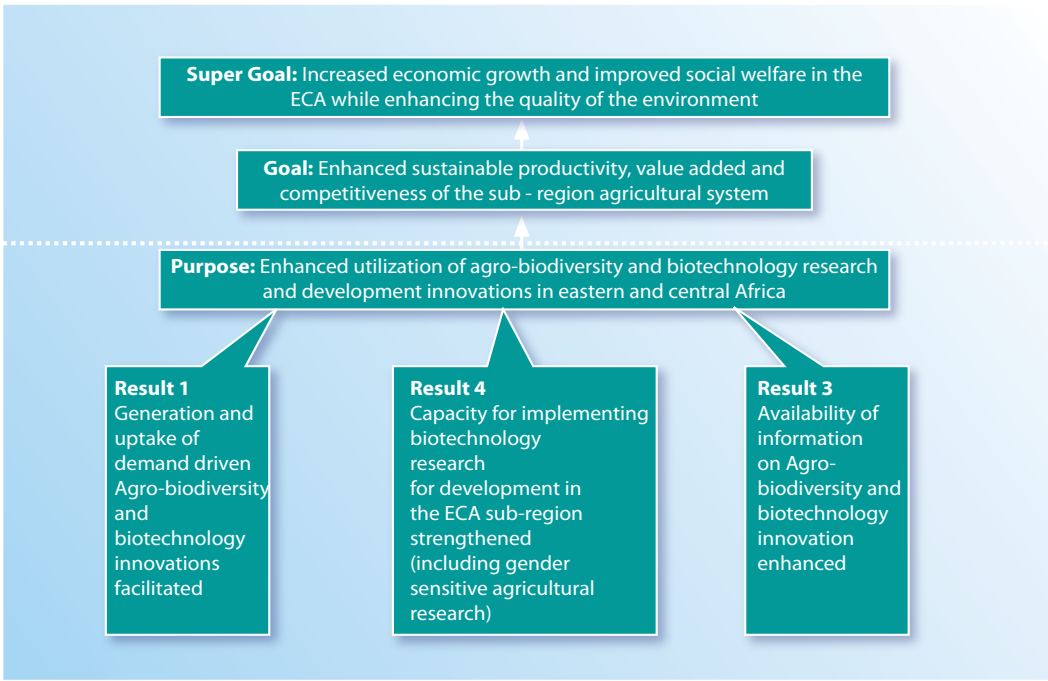
Annex 1: ASARECA Performance Monitoring Framework



Annex 2: Programme Performance Monitoring Framework



Annex 3: Detailed Programme (Log frame)

Objective Statement	Verifiable Indicators	Sources of Verification	Assumptions
Super Goal: Increased economic growth and improved livelihoods in the ECA while enhancing the quality of the environment	6% annual increase in GDP from agricultural sector by 2014. 50% increase in people living on more than 1$ per day by 2014. 10% increase in biodiversity and forest cover by 2014	Government statistics FAO and World Bank, ADB, Economic Commission for Africa statistics and reports COMESA and other regional organization reports UNEP statistics and reports	Relevant regional and national policies are implemented Governments continue to support agriculture and poverty reduction as priorities Equitable distribution of benefits occurs Agricultural transformation occurs in the ECA region occasioned by technical change Governments, non-government, regional and national organizations operate effectively at appropriate levels.
Goal: Enhanced sustainable productivity, value added and competitiveness of the sub-regional agricultural system	% increase in yield of selected crops % increase in labour productivity % decrease in production costs of selected commodities % increase in volume of processed agricultural products % increase in value of agricultural output **ASARECA will not track this set of indicators: Instead we shall rely on activities of partner organizations such as COMESA and NEPAD**	Government statistics , FAO and World Bank, ADB, Economic Commission for Africa statistics and reports, COMESA and other regional organization reports, UN COM-Trade statistics and reports, UNEP statistics and reports	
Purpose: Enhanced utilization of agro-biodiversity and biotechnology research and development innovations in eastern and central Africa	% increase in adoption of modern biotechnology tools in the breeding crops by national Programmes by 2012 % increase in adoption of biotechnology tools in the pig industry by national Programmes by 2012 % increase in the use the high quality planting materials available to end users by 2012. % increase in the adoption of best practices for plant genetic resources by 2012.	Government statistics Economic Commission for Africa statistics and reports FAO statistics COMESA and other regional organization reports Selected CGIAR reports and publications, e.g. - IFPRI - CYMMIT - Biodiversity - IITA ASARECA commissioned studies Appropriate UN organisations	Relevant regional and national policies are implemented effectively. Governments continue to support agriculture and poverty reduction as priorities. Governments, non-government, regional and national organizations operate effectively at appropriate levels.
Result/Output 1: Generation and uptake of demand driven Agro-biodiversity and biotechnology innovations facilitated	1.1 Demand driven articulation of Agro-biodiversity and biotechnology research portfolio developed and documented by 2008 1.2 Priority research and development issues identified and documented by 2008 1.3 80% of research and development portfolio addressing the needs identified during priority setting process implemented by mid-term and 100% by 2012 1.4 Number of demand-driven innovations generated by 2012 1.5 Number of demand-driven technologies made available to uptake pathways by 2012 1.6 Number of gender responsive innovations generated in Agro-biodiversity and biotechnology by 2012 1.7 50 % of generated demand-driven technologies/innovations made available to uptake pathways by 2011 and 80% by 2012 1.8 Appropriate strategies for Agro-biodiversity and biotechnology innovations recommended to policy makers by 2012.	NARS annual reports ASARECA annual reports Agrobio Programme reports Project partners reports and their annual reports Regional organization annual reports.	Researchers, managers, producers and processors are able to adopt new knowledge. Efficient and effective international and national agricultural support services exist. Effective mechanisms for widespread technology, innovation and knowledge uptake exist and are accessible. External trade and market conditions do not compromise gains. Government, non-government, regional and national organizations operate effectively at appropriate levels. Adequate agricultural inputs are available. Capabilities of client institutions radically enhanced to engage in IR4D. Target institutions use new knowledge to improve effectiveness of staple crops R4D. Socio-cultural environment in target areas conducive for uptake and adoption of staple crops improved technologies.
Result/Output 2: Capacity for implementing biotechnology research in the IAR4D approach in the ECA sub-region strengthened (Including gender).	2.1 Capacity strengthening needs for Agro- biodiversity and biotechnology research and development identified and prioritized by 2008. 2.2 50% of the identified capacity strengthening needs for Agro- biodiversity and biotechnology research and development identified and prioritized by 2008. 2.3 80% of the identified capacity strengthening needs for Agro- biodiversity and biotechnology research and development needs implemented by 2008. 2.4 50% of the relevant partners involved in biotechnology and Agro-biodiversity capacity strengthening identified by 2008 and 100% by 2012 2.5 100% of the relevant partners involved in biotechnology and Agro-biodiversity capacity strengthening supported by 2012 2.6 Number of male scientists and technicians receive short term training in biotechnology by 2012 2.7 Number of female scientists and technicians receive short term training in biotechnology by 2012	**AS ABOVE**	

	2.8 Number of male scientists and technicians receive long term training in agrobiodiversity and biotechnology identified by 2012 2.9 Number of female scientists and technicians receive long term training in agrobiodiversity and biotechnology by 2012		
Result/Output 4: Availability of information on Agro-biodiversity and biotechnology innovation	3.1 Knowledge and information needs for Agro-biodiversity and biotechnology identified and prioritized by 2010. 3.2 Number of appropriate information packages on Agro-biodiversity and biotechnology addressing identified stakeholder needs prepared by 2012 3.3 At least 80 % of the appropriate information packages addressing Agro-biodiversity and biotechnology needs prepared and availed by 2012. 3.4 Number of referred journal publications published by 2012	**AS ABOVE**	