

annualreport 2012

**Transforming Agriculture for Economic Growth
in Eastern and Central Africa**



ASARECA is addressing challenges to agricultural production in a regionally coordinated manner by working with its partners, who include farmers; national, regional and international research, extension, and training organizations; public and private sector actors; non-governmental organizations (NGOs); regional economic communities; and developmental agencies.





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Transforming Agriculture for Economic Growth in Eastern and Central Africa

**Association for Strengthening Agricultural Research
in Eastern and Central Africa (ASARECA)**

PO Box 765, Plot 5, Mpigi Rd, Entebbe, Uganda

2013

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Agricultural Research in Eastern and Central Africa

Correct citation

[ASARECA] Association for Strengthening Agricultural Research in Eastern and Central Africa. *ASARECA Annual Report 2012: Transforming Agriculture for Economic Growth in Eastern and Central Africa*. ASARECA: Entebbe, Uganda; 2013.

Editorial committee

Fina Opio, Francis Wachira, Hezron Mogaka,
Lydia Kimenye, Joseph Methu, Jacqueline Nyagahima, Ben Ilakut

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**Association for Strengthening Agricultural
Research in Eastern and Central Africa (ASARECA)**

Plot 5, Mpigi Road, PO Box 765
Entebbe, Uganda
Tel: +256 414 320212/320556/321885
Fax: +256 414 321126/322593
Email: asareca@asareca.org
Website: www.asareca.org

Editing and design: BluePencil Infodesign, Hyderabad, India (www.bluepencil.in)
Printing: Pragati Offset, Hyderabad, India (www.pragati.com)

Disclaimer

This document has been produced with the assistance of the World Bank administered Multi Donor Trust Fund to ASARECA, financed by the European Union, the UK Department for International Development, the Canadian International Development Agency and the United States Agency for International Development. The contents of this document are the sole responsibility of ASARECA and her implementing partners and can in no way be taken to reflect the views of the contributors to the Trust Fund.



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Communication from Dr Fidelis Myaka

Chairperson, Board of Directors

Firstly, I wish to pay tribute to Dr Seyfu Ketema, who was the Executive Director of ASARECA up to February 2013. I thank him for his dedicated leadership and service to the Association. Under his stewardship, the ASARECA Strategic Plan (2007–2016) was developed, and ASARECA underwent massive restructuring that resulted in greater efficiency and effectiveness in service delivery. In the same vein, I would like to welcome Dr Fina Opio, the new Executive Director of ASARECA and wish her all the best as she takes charge of ASARECA.

As the year 2012 drew to a close, we were confident that the first ASARECA Operation Plan (OP1), which ends in 2013, will be fully delivered and will epitomize a celebration of great milestones, success and priceless lesson learning.

Building on capacities developed over the years, innovations generated and information shared, ASARECA continued to commission new projects that consolidate gains made to attain food and nutrition security in Eastern and Central Africa.

The Board of Directors is satisfied with the work done by ASARECA constituent partners and the Secretariat in delivering impressive returns on investment in agricultural research for development (AR4D). Through these initiatives, a total of 104,125 smallholder farmers' households have directly benefited from applying the new technologies, innovations, and management practices generated and promoted during 2012. As a

result, there was increased agricultural productivity in the intervention areas and increased incomes for smallholder farmers, processors, small-scale traders and in-put suppliers.

We, the Board of Directors, are committed to ensuring quality performance by ASARECA. We have ensured that ASARECA Secretariat continues to involve a broad range of stakeholders at all levels of our research for development discourse. Tapping from our broad range of stakeholders including the National Agricultural Research Institutes (NARIs), universities, NGOs, farmer organizations, and the public and private sector actors, ASARECA maintained and continued to attract diverse skills and strengths.

The ASARECA development partners jointly provided solid support by championing regular participatory review missions to keep us on track in meeting the goals set in our OP1. Recommendations from the review missions have played a vital role in keeping us focused on positive results and impacts.

On a sad note, during 2012 we lost our fellow Board member, Prof Al Tahir Siddiq, in a plane crash in Sudan. May his soul rest in peace.

Finally, I invite you to join us during the 2nd ASARECA General Assembly and Scientific Conference scheduled for December 9–13, 2013 in Bujumbura, Burundi.

Thank you



Communication from Dr Fina Opio

Executive Director

This is the first Corporate Annual Report that is being released since I took office early this year. I wish to thank my predecessor, Dr Seyfu Ketema, for his strategic leadership and oversight that saw ASARECA achieve these remarkable outcomes.

In 2012, we took stock of the technologies, innovations and management practices (TIMPs) that we had generated or promoted since 2008. New projects were rolled out to either validate or scale out the most promising of these TIMPs to other ASARECA countries. This was in line with the ASARECA mandate of developing agricultural TIMPs through the collective action of scientists in the member countries, and sharing them as regional *public goods* in the Sub-region.

We enhanced our efforts in seed multiplication and distribution by drawing in more farmer groups, private seed companies and NGOs who got involved in the production of certified seed and quality declared seed for beans, quality protein maize (QPM), and orange fleshed sweet potato among others. Our efforts in D R Congo got a boost from President Joseph Kabila who initiated a government project that availed 500 ha of land to the national agricultural research institute, INERA, to produce QPM seed for further distribution.

Amazing strides were made from our biotechnology work. The government of Sudan released four lines of *Striga* resistant sorghum varieties that were generated using molecular marker breeding strategies. In addition, nine indigenous maize lines that were

transformed with drought resistant genes in the previous year underwent further scientific testing which prepared them for confined field trials in Kenya, Tanzania, Ethiopia and Sudan.

We introduced options for conserving and managing water at the farm level and in selected watersheds and these gave us encouraging results. Over 1,500 households in Eritrea, Ethiopia, Kenya, Madagascar, and Rwanda selected and adopted water efficient technologies from these options and about 5,000 hectares of land was recovered through construction of water conservation and management structures in selected watersheds in the same countries. These interventions increase the amount of water available both at the watershed and farm level to support agriculture.

On the policy front, the East African Community approved 13 Standards for cassava and sweet potatoes that we helped develop. These standards will assist farmers and traders in Kenya, Tanzania, Uganda, Rwanda and Burundi access markets across their borders.

This Corporate Annual Report highlights these and many other gains that were made in collaboration with several partners in AR4D in our sub-region and beyond.

I wish to thank the Directors General of our member NARIs for their dedication and guidance and for deploying scientists, professionals and national resources to implement our work. I also thank

Development Partners for their commitment and dedication to improve livelihoods of our people in the sub-region through their guidance and financial support. These include the African Development Bank, UK Department for International Development, Canadian International Development Agency, European Union, International Development Research Centre (Canada), Swedish International Development Cooperation Agency, United States Agency for

International Development, and the World Bank Multi Donor Trust Fund.

I thank the Board of Directors, for their oversight and stewardship, and thank the scientists and professionals from the national and international institutions who executed the activities. Last, but not least, I thank all the ASARECA Secretariat staff for their dedication, commitment and enduring hard work.



ASARECA at a glance

Vision

To become a regional leader in agricultural research and development for improved livelihoods in Eastern and Central Africa.

Mission

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

Our coverage



About ASARECA

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a not-for-profit inter-governmental sub-regional organization. ASARECA comprises 11 member countries: Burundi, the Democratic Republic of Congo (DRC), Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan, Tanzania and Uganda.

ASARECA brings together national agricultural research institution (NARI) scientists of the 11 member countries, national agricultural extension service providers and other strategic partners to generate, share and promote knowledge and innovations to solve the common challenges facing agriculture in the member countries. ASARECA enables the member countries to work collectively to assist smallholder farmers to practise productive and profitable agriculture.

ASARECA enables the member countries to work collectively to assist smallholder farmers to practise productive and profitable agriculture

Context of ASARECA work

Smallholder farmers in Eastern and Central Africa (ECA) face similar challenges. Many do not have access to good quality seeds and farm implements and have to make do with sub-standard inputs. Their farms are often under the threat of attack by menacing pests and diseases, and weeds. Variable weather and a declining natural resource base further aggravate the situation. All these factors result in farmers getting poor yields from their crops and animals. The situation is further worsened by lack of access to input and output markets and limiting agricultural and trade policies. Poor agricultural returns engender high levels of poverty among the farming communities in the sub-region. It also makes agriculture unattractive. In fact, the youth have abandoned farming in search of money-making ventures in urban areas, leaving farming to the elderly, women and children. Although these can be tackled at the national level, the national systems have inadequate capacities to manage these challenges comprehensively.

ASARECA is addressing these challenges in a regionally coordinated manner by working with its partners, who include farmers; national, regional and international research, extension, and training organizations; public and private sector actors; non-governmental organizations (NGOs); regional economic communities; and developmental agencies.

Scope of work

The member countries established ASARECA to:

- Address the common challenges to and opportunities in agricultural research and development through collective action. Combine efforts to produce cost-effective technologies, knowledge, innovations and best practices to be shared among member countries as regional public goods.
- Complement the activities of national institutions to deliver essential products and services.

Using the above mandate outlined by the national agricultural research systems (NARS), ASARECA strives to ensure that women, the youth and smallholder farmers in ECA are able to:

- Harvest and store water for agriculture and domestic use.
- Increase their yields by planting improved (high-yielding, nutritious, disease- and pest-resistant) varieties.
- Improve the on-farm management of natural resources, including soils, water, genetic resources and trees.
- Improve production and profits from livestock and fisheries enterprises.

- Access improved input and output markets.
- Operate their farm-based enterprises in a favourable policy environment.
- Access and use agricultural information to improve their enterprises.

ASARECA operates through multi-stakeholder projects in collaboration with multi-disciplinary partners in the 11 member countries. These projects are currently organized around the following seven programmes: Staple Crops; High-Value Non-Staple Crops; Livestock and Fisheries; Agro-biodiversity and Biotechnology; Natural Resources Management

Offseason onions, a product of response farming in Madagascar

and Biodiversity; Policy Analysis and Advocacy; and Knowledge Management and Upscaling.

Statement of achievement

Projects supported by ASARECA have developed and promoted technologies, innovations and management practices such as improved varieties and seeds, water management, integrated soil fertility, agronomic packages (seed selection, planting and crop management), storage, value addition and marketing. ASARECA initiatives have covered various staple



and non-staple crops such as banana, millet, maize, sweet potato, potato, sorghum, wheat and cassava; non-staple crops such as fruits, vegetables and legumes; and improved animal husbandry practices (breed selection, feeds, disease management) and fisheries. ASARECA has also been involved in developing harmonized regional policies and standards that influence agriculture and trade.

Between 2008 and 2012, ASARECA developed 364 agricultural technologies, innovations and practices. These interventions have directly benefited over

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1,370,000 smallholder farmer households consisting, on an average, of six family members; in other words, over 8 million individuals have been direct beneficiaries. The interventions have enabled them to access and adopt new and relevant varieties of selected commodities, livestock breeds, seeds, disease and pest management packages, and extension and veterinary services. Their capacities to engage in productive and profitable agriculture have been strengthened. ASARECA initiatives also opened up market opportunities for the farmers to buy farm inputs and sell their produce, motivating them to increase productivity. The final outcome has been improved access to food, nutrition and increased income for households.

Making sustainable development choices

ASARECA interventions have been consistently environmentally friendly. ASARECA endeavours to balance the relationship between our development choices and the natural systems.

Gender mainstreaming

ASARECA is conscious that gender disparities undermine agricultural productivity and escalate the problems of poverty. Over the last five years, ASARECA has incorporated gender mainstreaming in all its agricultural research for development activities. This process has encouraged women, men, and the



Children enjoy Quality Protein Maize at a feeding centre in Kilosa, Tanzania

youth in the project areas to use productive resources for their mutual benefit.

Why work with ASARECA?

- ASARECA is an African-led institution with a pool of experts in agricultural research and development from the ECA region.
- We have a unique structure built on partnership with farmers, national, regional and international research, extension, and training organizations, the public and private sector actors, NGOs and development agencies.
- ASARECA has a good understanding of the ECA region and the ability to deal with problems facing the agricultural sector.
- ASARECA facilitates linkages between stakeholders from different organizations, thus helping them to work more cost efficiently.
- ASARECA is a regional agricultural knowledge hub that facilitates various partners to learn from one another by generating, accessing and sharing information.
- ASARECA provides high-quality backstopping. It ensures that there is technical knowledge sharing and learning in all its projects. Additionally it provides advisory services and training, thereby strengthening its projects. All ASARECA projects are well managed and supervised.
- The organization has a track record of good financial management and effective use of funds, grounded on value-for-money ethics, in other words, behaviour that promotes value for money.

- Among our greatest strengths is our ability to work in partnership with different types of organizations in the public, non-profit and private sector. ASARECA develops and implements collaborative projects among national, regional and international organizations.

At the national level, ASARECA works with agricultural research institutes, universities and extension agencies, farmer and producer organizations, the private sector, NGOs and regulatory agencies. It supports national bodies in various ways, including generating and promoting agricultural innovations, capacity building, policy harmonization, and accessing information.

At the regional level, ASARECA works with regional economic bodies such as the Common Market for Eastern and Central Africa (COMESA) and the East African Community (EAC). We also work with the Forum for Agricultural Research in Africa (FARA). ASARECA supports regional bodies in various ways, including providing technical advice on strategy, programme development, capacity building of stakeholders and hosting or managing their programmes.

The organization's international partners include, among others, advanced international agricultural research laboratories such as the Danforth Centre, and CGIAR. For example, ASARECA and the CGIAR

ASARECA is a regional agricultural knowledge hub that facilitates various partners to learn from one another by generating, accessing and sharing information.

Research Programmes (CRPs) have identified mechanisms of collaborating on research and development issues. In addition, ASARECA has linked the CGIAR/CRPs with her member countries' CAADP processes.

Our team

The ASARECA team comprises professional staff at the secretariat, who manage, coordinate and backstop regional multi-disciplinary teams of scientists, farmers, social economists, development workers, extension agents, policy analysts and decision makers, and knowledge and communication specialists from the national agricultural research systems.

Starting 1 January 2014, ASARECA initiatives will be organized around three themes: Natural resources management and eco-systems services; Markets, market linkages and trade; and Sustainable agriculture, food security and nutrition. ASARECA has targeted to reach a minimum of 1.8 million households with innovations, technologies and management practices. This is projected to positively impact the livelihoods of 11 million individuals, 50% of whom are below the poverty line.

Future focus

1. Natural resources management and eco-system services

Under this thematic area, ASARECA will work with smallholder farmers to develop and implement climate-smart initiatives to:

- Promote harvesting and storage of water for agricultural and domestic use and for micro-irrigation.
- Improve management of farm-based natural resources—soil, water, trees and biodiversity.
- Conserve biodiversity (micro-organisms, plants and animals) by promoting activities such as agroforestry, seed banks and genetic reserves and providing incentives for investment in conservation.
- Develop and implement mechanisms of coping with harsh conditions such as shortage of water and pasture, and diseases.

ASARECA will support smallholders to engage in commercial farming and work with other stakeholders to improve access to input and output markets for strategic crops, livestock and fisheries

- Promote equal participation of men and women at the community level in the governance of their natural resources.
- Promote the value of ecosystem services such as clean air and water, soil fertility, clean environment, pollination, pest control and conservation.

2. Markets, market linkages and trade

Under this theme, ASARECA will support smallholders to engage in commercial farming and work with other stakeholders to improve access to input and output markets for strategic crops, livestock and fisheries. Among other things, it will:

- Strengthen value chains for key crops, livestock and fisheries.
- Facilitate farmers to develop group-based enterprises. This will enable them to access services such as the assembly, storage and marketing of their produce, and other business development services such as financing.
- Promote formulation and implementation of policies, to facilitate free trade and easy movement of agricultural commodities within the ECA region.
- Accelerate private sector investment in agricultural innovations by promoting business incubation models.

3. Sustainable agriculture, food security and nutrition

Through this theme, ASARECA will address issues of nutrition and food security with links to human, plant and animal health. Areas of focus will include:

- Enhancing the production and availability of quality, safe and nutritious foods for improved health and wellbeing of the people in ECA.
- Developing innovations to address and mitigate the effects of climate change. This will include promoting adaptation strategies, and adoption of new and indigenous knowledge for weather forecasting and interpretation.
- Enhancing regional capacity for surveillance and control of emerging diseases and pests that affect crops, livestock and fisheries.
- Guiding advocacy for implementing regional policies related to food security and the environment that address the needs of men, women and the youth.
- Improving post-harvest handling and processing of crops, livestock and fisheries resources.
- Maximizing production and profits while reducing the cost of inputs for crops, livestock and fisheries.
- Conserving crop, livestock, fish, neglected plant species, and genetic resources with traits preferred by the market.

Funding

In the past five years, ASARECA has been funded by national governments of member countries in ECA and international development partners. The development partners include the European Union, the UK Department for International Development, Swedish International Development Cooperation Agency, Canadian International Development Agency, United States Agency for International Development (USAID, East Africa), African Development Bank and Canada's International Development Research Centre. Some of these funds have been managed through a multi-donor trust fund managed by the World Bank.



**Highlights of
2012**



Responding to the need for demand-driven agricultural technologies

Developing tools for the genetic improvement of food security crops: The case of cassava and sweet potato

Highlights

ASARECA and its partners have made significant progress in the conservation of cassava and sweet potato in the sub-region by storing germplasm in the form of test tube plantlets and artificial seed, and through cryo-preservation. Using these tools, 360 cultivated and landrace cassava accessions have been collected as of 2012, and DNA from 179 accessions sent for molecular characterization. As for sweet potatoes, 449 accessions were collected and, of them, 210 samples sent for molecular characterization.

Cassava and potato have been identified as crops that can help poverty reduction and spur growth in ECA. The New Partnership for Africa's Development (NEPAD) has launched a Pan African Cassava Initiative (PACI) that seeks to tap the enormous potential of the crop for food security and income generation. Consequently, cassava has been prioritised as a strategic commodity in the Comprehensive African Agricultural Development Programme (CAADP) – as a means to increasing food supply, reducing hunger and

improving responses to emergency food crises. Cassava production in ECA, however, has been constrained by major diseases such as cassava brown streak disease (CBSD) and cassava mosaic. CBSD is the main viral disease and accounts for 74% of the cassava production-related problems in the sub-region, in some cases even causing total root loss. Cassava productivity in ECA is, on an average, around 10 tonnes per hectare, which is three times less than the yields recorded in Asia.

Sweet potato is the third most important food crop in seven of the ASARECA countries. Some varieties like the orange fleshed sweet potato are rich in beta carotene (a precursor to vitamin A). Yet an estimated 43 million African children under the age of five suffer from vitamin A deficiency, a condition causing blindness, disease and premature death.

The potential of sweet potato has remained largely untapped in ECA, with average yields 10-times

CBSD is the main viral disease and accounts for 74% of the cassava production-related problems in the sub-region, in some cases even causing total root loss

lower among small-scale farmers than those seen among commercial growers with access to irrigation, fertilizers, and credit. This yield gap can be bridged by providing clean planting materials and locally adapted improved varieties to farmers.

Clean cassava planting materials like this are a product of research into better varieties



ASARECA and partners have focused on the conservation of cassava and sweet potato in the sub-region by conserving germplasm in form of test tube plantlets, artificial seed, and through cryo-preservation

To address these constraints, ASARECA and partners have focused on the conservation of cassava and sweet potato in the sub-region by conserving germplasm in the form of test tube plantlets, artificial seed, and through cryo-preservation. Using these tools, a total of 360 cultivated and landrace cassava accessions were collected and DNA from 179 accessions sent for molecular characterization. A total of 449 accessions of sweet potatoes were collected and 210 samples sent for molecular characterization. ASARECA has promoted long-term ex situ conservation and sustainable utilization of cassava and sweet potato plant genetic resources for the benefit of present and future generations.

ASARECA and partners, including International Institute for Tropical Agriculture (IITA), have successfully developed a genetic linkage map for field resistance to CBSD. The map enables understanding of the genetic basis of CBSD tolerance in cassava cultivars. This, in turn, could facilitate rapid and efficient breeding of improved varieties.

The maps were developed through marker-assisted breeding since conventional methods of breeding are known to be relatively inefficient. Marker-assisted breeding has the potential to drastically increase the efficiency of breeding and reduce the time taken for breeding products to reach the farmers.

The project has also been able to make available all the cassava simple sequence repeats (SSR) primer pairs. This was necessary because there are several thousand SSR markers for cassava, some of which have been published while others, though available, have not yet been; again, several target the same SSR, yet have different names.





A woman in Tanzania harvests potato vines. ASARECA and partners are preserving sweet potato germplasm for future research into clean materials

Developing maize for future generations

Maize is arguably the most widely grown staple crop in Africa. More than 300 million people depend on maize as their primary source of food. Maize production, however, is severely affected by drought, which leads to low yields, and, in some cases, complete crop failure. Three-quarters of the world's most severe droughts over the past 10 years have occurred in Africa, making farming a risky business for millions of smallholder farmers. In 2011 alone, over 12.5 million people were affected by drought that ravaged the Horn of Africa. Among the staple crops on the continent, maize has been identified as one of the crops that is sensitive to water deficit and, therefore, most vulnerable to drought.

Against this setting, ASARECA, in 2008, mobilized, facilitated and backstopped scientists from ECA to develop drought-resistant maize. The experts were drawn from the NARIs of Ethiopia, Sudan, Kenya and Tanzania, to constitute a core research team under the project *Genetic Engineering of Maize for Drought tolerance in Eastern and Central Africa*. Its primary task was to mitigate drought. Kenyatta University, with its superior biotechnology laboratories and supervisory team, was chosen to host the research in the cherished spirit of complementarity.

In 2011, the scientists made a resounding breakthrough when they successfully transformed nine farmer-

The first seeds harvested from the transgenic maize research



preferred maize lines with drought-conferring genes. The lines included two Ethiopian lines, three Kenyan lines, two Sudanese lines, and two Tanzanian lines. The lines (one of them named the ASARECA gene—*PNOV-ASARAnxm3*) showed more resistance to water deficiency. Even if the maize plants from these transformed seeds dried up, they could be revived through rehydration within 24–72 hours, and are capable of returning to full recovery.

In 2012, the lines were further tested for tolerance under severe drought, toxicity and seed bulking at the screen house at Kenyatta University.

Why engineer maize?

Conventional breeding aimed at generating drought-resistant varieties has not yielded little success, and the region still lacks varieties that perform well under insufficient and erratic distribution of rain, which is common due to climate change. Yet, maize remains the most important staple food crop in ECA Africa, with 80% of the rural and urban populations depending on it for their calories.

According to FAO, from 2006 to 2009, maize production in ECA has decreased from 15.7 million tonnes to 14.7

million tonnes. The current maize yield stands at 1.3 tonnes per hectare compared with the potential of up to 7.0 tonnes per hectare as projected by CIMMYT. Drought causes 70% of the maize yield loss. The ability of smallholder farmers to cope with drought is greatly hampered by lack of crop varieties that do well in insufficient and erratic rainfall conditions. This has sadly exposed many farmers to the devastating effects of drought, including crop failure, leading to hunger and poverty.

The ability of smallholder farmers to cope with drought is greatly hampered by lack of crop varieties that do well in insufficient and erratic rainfall conditions

Striga-resistant varieties to boost sorghum production

Key highlight

Four out of the 51 lines of striga-resistant sorghum varieties that were generated using ASARECA-supported molecular marker breeding technology were released by the Government of Sudan in 2012. The new sorghum varieties have mechanical barriers, which make it impossible for striga to penetrate. Without overstating the significance, the released lines are capable of yielding up to 3.6 tonnes per hectare.

Sorghum is ranked second, after maize, as the most important cereal staple crop in the ASARECA region. However, its production is constrained by *Striga*, a parasitic weed that can cause yield losses

as high as 100%. After drought, *Striga* is a major cause of low yield of staple food crops in Africa.

It is important to prevent *Striga* because it severely affects the growth of staple crops that are critical for poor smallholders. Almost 21 million ha are estimated to be infested with *Striga* in Africa. The change in farming systems from shifting cultivation to permanent cropping, amid loss in soil fertility and frequent cultivation of susceptible host plants are the main factors responsible for increased *Striga* infestation.

In 2008, ASARECA mobilized, supported and coordinated a team of scientists from the Agricultural Research Corporation of Sudan (ARC), the University of Nairobi, NARI of Eritrea, Rwanda Agricultural



One of the newly released varieties of sorghum

Board (RAB), and International Centre for Agricultural Research in Arid and Semi Arid Tropics (ICRISAT). Their task was to develop *Striga*-resistant sorghum lines using a biotechnology tool known as marker-assisted selection, which is reputed for precision and effectiveness of breeding for *Striga* resistance.

The team employed backcrossing, a technique that used a donor *Striga*-resistant sorghum line, N13, and three farmer-preferred sorghum cultivars that were *Striga*-susceptible, Tabat, Wad Ahmed and AG-8.

The outcome was the development of four lines of the four *Striga*-resistant varieties, which have been code named ASARS1, ASARS2, ASARS3, and ASARS4.

Thirty-one lines are being evaluated in Sudan, Eritrea, Kenya, Uganda, Tanzania and Rwanda for agronomic performance and *Striga* resistance to release them for commercial use in the respective countries. These lines have incorporated between one and five *Striga*-resistant quantitative trait loci (QTLs) successfully using marker-assisted backcrossing. With the four release varieties and the 22 being evaluated, progress towards restoring the productivity of 17 million hectares of land threatened by *Striga* is in sight. This will make a huge contribution in eliminating hunger for 300 million people in ECA.

To scale out the new varieties, a GIS map of the study sites has been generated to target the promotion of *Striga*-resistant and drought-tolerant sorghum varieties in the sub-region.

Taming hunger, malnutrition and poverty using quality protein maize

A happy Enkanga Malio with her twins



Highlights

- During 2012, in DRC, 430 farmers accessed Quality Protein Maize (QPM) technologies, thus benefiting directly through improved nutrition. As a result, 300 malnourished children were reported to have recovered, while 255 emaciated children were rehabilitated and 27 mothers were reported to have had a significant increase in the breast milk production after eating QPM.
- The DRC government is supporting QPM dissemination by purchasing seed and distributing it to farmers. It gave 500 ha of land to Institut National pour L'Etude et la Recherche Agronomiques (INERA) to produce QPM. INERA has effectively become champions for QPM promotion. The Statehouse agricultural department, "Initiative Kabila", now produces QPM in the Kinshasa hinterland, which has also contributed to QPM promotion.

Poverty, hunger and malnutrition are chronic problems that many communities in ECA face, especially those that have just emerged from conflict. Lack of adequate food, especially proteins and carbohydrates, often leads to severe malnutrition among children, leading to stunting and even death. In response to these challenges, ASARECA, with support from the African Development Bank (AfDB), through FARA, initiated the Dissemination of New Agricultural Technologies (DONATA) project to promote adoption of technologies in QPM. The project is implemented by NARIs and their partners in DRC, Kenya, Tanzania and Uganda.

A total of eight QPM varieties (Mudishi 1, 2 and 3, Lishe K1, KH631Q, KH 500Q, Longe 5 and Longe 5D) and associated agronomic practices and value addition were promoted. In addition to the QPM varieties, the technologies covered agronomic and pest-management practices, post-harvest handling practices, and value addition methods such as making bakery products (QPM-wheat bread, cakes and

doughnuts), and substituting soybean, fishmeal and artificial lysine with QPM in poultry feeds.

QPM has nearly twice the amount of lysine and tryptophan. It offers 90% of the nutritional value of skimmed milk – the standard for adequate nutritive value. Therefore, QPM products can supply the essential proteins and trigger improved rates of growth among malnourished children. It is also good for production of feeds for monogastric animals such as poultry and pigs, enabling farmers to sell surplus QPM grain to feed manufacturers or to use it for their own poultry.

Participating countries have reported a number of benefits. For example, in DRC, where QPM is being widely adopted, it is being used to treat malnutrition. Over 300 children have so far recovered from severe malnutrition after they were fed with QPM porridge, which has also helped to boost milk production in

QPM products can supply the essential proteins and trigger improved rates of growth among malnourished children. It is also good for production of feeds for monogastric animals

A woman sells QPM buns at a village meeting centre in D R Congo





Mothers at nutritional centre in Gandajika in D R Congo

lactating mothers. These health benefits have made doctors in DRC prescribe QPM as one of the treatments for severe malnutrition. Furthermore, it has generated a lot of interest among high-level government officials and politicians, who have strongly endorsed it and want the technology to be disseminated to other parts of the country.

When the DRC president, Joseph Kabila, heard about the benefits and impact of QPM on the livelihoods of the people, he donated 1,500 hectares of land to INERA Research Station to produce more quality seed so that the government could buy and distribute

them to farmers. In line with the government's efforts to facilitate wider dissemination of QPM technology, notable entrepreneurs, including one farmer, have been contracted to produce QPM seed and now sells about 25 tonnes/year to the government. In 2010, the farmer earned an equivalent of about US\$ 10,000 and was able to build a permanent iron roofed house. Out of the proceeds, he was also able to send his son to the university.

In northern Uganda, DONATA Orange-Flesh Sweet Potato (OFSP) and QPM projects are working with schools, prisons and the media to promote utilization

ASARECA and its partners have established more than 20 platforms promoting QPM technologies across the four countries

of the improved varieties. So far, they have promoted OFSP and QPM in 25 schools.

The Innovation Platforms for Technology Adoption (IPTA) approach

The QPM technology is being promoted through the innovation platform for technology adoption (IPTA) approach, which brings together relevant actors along the value chain to address the key challenges hindering uptake, utilization and impact of the technologies. ASARECA and its partners have established more than 20 platforms promoting QPM technologies across the four countries. IPTA has proved an effective vehicle for scaling out QPM technologies. Since 2008,

there has been a growing recognition and acceptance among stakeholders, including farmers, NARIs, NGOs and higher-level actors in the relevant ministries, of its role in scaling up improved technologies. For example, the IPTA approach has facilitated the involvement of stakeholders from the nutrition and health sector and the child health departments. Some doctors in DRC have incorporated QPM into the meals served to patients in the hospitals and nutrition centres. During 2012, in DRC, 430 farmers accessed QPM technologies. As a result, 300 malnourished children were reported to have recovered, while 255 emaciated children were rehabilitated, and 27 mothers were reported to have had a significant increase in breast milk production after including QPM food in their diet. This level of participation has enabled a systematic validation of QPM use in the rehabilitation of severely malnourished children and in improving nutrition and health status of pregnant and lactating women. QPM dissemination was further augmented by the endorsement it received from health and nutrition practitioners, who included it in their medical prescriptions for treatment and management of malnutrition.

In Tanzania, the IPTA has enhanced relationships between the promoters of the technologies and different potential end-users, for example, food vendors, grain millers, supermarkets, schools and orphanages, who provided the demand pool that led to increased production of QPM seed and grain.

Testimonies

Ms Enkangaza Malio: “When I gave birth, I did not have the right diet to stimulate breast milk production. I remembered having heard about QPM benefits, and I tried eating it as porridge and ugali. As a result, my breast milk production increased and I had to change blouses 2–3 times per day, and the baby was always full and would not disturb me. When the stocks of QPM grain and flour were over, I returned to the usual maize diet; unfortunately, I discovered that my breast milk production decreased. From then onwards I started growing QPM for my family. This has enabled my children to be healthy, reducing the frequency of sickness; and, even when they are sick, they remain strong and do not become weak.”

Ms Solange: “I got pregnant again when the baby was only 6 months old. The baby’s suckling did not provide him with the same quantities of breast milk that was available before I got pregnant. He became unhealthy and weak. Mrs Enkangaza advised me to give QPM diet to my baby. I tried this, and the child was able to move, and he recovered fully. We named him QPM baby.”

Mr Samy Ntumba (a QPM seed multiplier in DRC I who started producing QPM seed and grain three years ago): I earn over \$ 5,000 yearly from QPM alone by selling QPM to (the) government and providing seed to other farmers. I have been able to send my son to Kinshasa University to study agronomy. I am currently providing QPM seed to the central government and a Belgian-funded project. I feed my pigs QPM and this has cut down the feeding cost.”

OFSP farmers enjoy improved health and break into new markets

Key highlight

- 3.3 million OFSP cuttings and 9,936 OFSP tissue culture plantlets were produced and distributed to the farmers. Of these, over 1.35 million cuttings were distributed to three tertiary multiplication sites and five secondary multiplication sites for further multiplication and distribution to farmers. In Tanzania, a total of 1,304 bundles of OFSP vines were distributed to farmers and in Uganda, over 112,000 cuttings. In Ethiopia, a total of 995,000 cuttings of OFSP were distributed to farmers for further multiplication. In western Kenya, 474,700 OFSP vines were distributed to new farmer groups. The number of farmers who have adopted OFSP technologies and associated value chain benefits has grown exponentially.
- In Kenya, OFSP has greatly improved the food security of the vulnerable population. For example, in western Kenya, for about 30 groups of people running orphanages, OFSP is their staple diet. While, in Nairobi, the Siwongo farmer group has transformed itself into a company and has secured a contract to supply the Azuri supermarket with OFSP flour. The incomes and the livelihoods of over 30 farmers in this group have improved from flour sales.

Malnutrition, including vitamin A deficiency among young children, is a serious problem in ECA. It undermines disease resistance and growth, and increases mortality. To address this problem, ASARECA, in partnership with FARA, in 2008, introduced OFSP varieties under the DONATA programme. ASARECA has been promoting OFSP technologies in Uganda, Kenya, Rwanda and Tanzania. OFSP varieties have enormous potential to address both challenges of food insecurity and malnutrition associated with vitamin A deficiency. The varieties are high-yielding and rich in beta carotene, which prevents stunting and blindness among children and a host of diseases among adults.

Following the ASARECA intervention, 11 OFSP varieties and its associated agronomic systems and value addition technologies were adopted in uptake pathways in DRC, Kenya, Rwanda, Tanzania and Uganda. As a result, over 102 ha of land were devoted to multiplication of OFSP varieties in the five countries.

In Rwanda, 10,874 OFSP plantlets were planted in a nursery for hardening. A further 1,346,000 cuttings were distributed to three tertiary multiplication sites and five secondary multiplication sites for further multiplication and for distribution to farmers.

In Tanzania, 1,304 bundles of OFSP vines were distributed to farmers, while, in Uganda, over 112,000 cuttings were distributed to farmers. In



ASARECA has been promoting OFSP technologies in Uganda, Kenya, Rwanda and Tanzania. OFSP varieties have enormous potential to address both challenges of food insecurity and malnutrition associated with vitamin A deficiency

Ntumba's seed store





Farmers in Busia, Kenya, weed an OFSP secondary multiplication garden

Ethiopia, 995,000 cuttings were distributed to farmers for further multiplication.

ASARECA promoted the IPTA approach. This approach ultimately provided a platform for the value chain actors to share experiences and knowledge on the technologies. It also encouraged innovations among the members. Several farmers managed to break into new markets by using OFSP as a niche product. In

Several farmers managed to break into new markets by using OFSP as a niche product

Tanzania, for instance, the Umoja Women’s Group in Msozi, Ukerewe district, managed to find a market for their produce and could sell the OFSP roots at better prices compared to the white-fleshed sweet potato (see box 6).

Similarly, a number of positive outcomes arising from the implementation of the OFSP project have been reported in Kenya. For example, farmers in Bungoma and Busia counties earned US\$ 17,000 and US\$ 20,000 respectively, from the sale of vines to the One Acre Fund Project in 2011.

In western Kenya and northern Uganda, OFSP has also been used by community health organizations and traditional birth attendants to improve the health of expectant and nursing mothers and ensure safe delivery. For example, in northern Uganda, Earth Birth, a community-based organization, has partnered



A happy woman displays OFSP tubers in Kenya

A farmer from Busia, Kenya, displays a motorcycle he bought from OFSP income

with DONATA OFSP to provide nutritive OFSP to expectant mothers. As a result, maternal antenatal clinic attendance has more than doubled, which has improved health and ensured safe deliveries in remote and rural areas of northern Uganda.

In Rwanda, the project has partnered with NGOs such as Africare, which is now working with groups of people affected and living with HIV/AIDS. It has been noted consistently that the health of AIDS patients on a diet of OFSP has improved to a level where they





OFSP chips and flour packed by Siwongo group in Kenya. These products are now available in some high-end supermarkets in Kenya

With a guaranteed market and a sustainable seed system, Bungoma farmers are now opting to grow OFSP seed and root instead of sugarcane

can be safely put on anti-retrovirals (ARVs) drugs. In northern Uganda, DONATA OFSP and QPM projects are working with schools, prisons and the media to promote utilization of OFSP in the region. To date, ASARECA has worked with 25 schools, where OFSP and QPM utilization has been promoted.

In Kenya, OFSP has greatly improved the food security of vulnerable people in certain communities. For example, in western Kenya, about 30 groups taking care of orphans depend on OFSP as their major food item. In Nairobi, the Siwongo farmer group transformed itself into a company and has now secured a contract to supply the Azuri supermarket with OFSP flour. The lives of over 30 farmers in this group have improved due to regular incomes earned from flour sales.

In Bungoma county, DONATA promotional and sensitization activities have reached over 10,000 people directly and 50,000 indirectly. As a result, many households have taken up root and seed production commercially. Many farmers are now getting good returns from production of both seed and root. With a guaranteed market and a sustainable seed system, Bungoma farmers are now opting to grow OFSP seed and root instead of sugarcane.

Testimonials

Constantine Binaleta, a member of Umoja Women’s Group, which sells OFSP in Nansio market

“I borrowed a bicycle and took one bag of OFSP roots to Nansio town for sale. On the first day, I hardly got any buyers until late in the evening, when I managed to convince a customer on the benefits of OFSP, and why I was selling it at twice the price of white-fleshed sweet potato. In the evening, as I was leaving for home, I kept my bag in one of the market vendor’s homes, and also gave her and other vendors some roots to try. The following day, more customers were interested in OFSP, and were surprised to see the orange colour of its flesh. They listened intently as I mentioned the benefits, and, within no time, I had sold all the sweet potatoes. From then on, I established contacts with vendors in the market, who now come down to Msozi to buy our sweet potatoes.”

Richard Bwiso, Mwanza, Tanzania

“I am 48 years old and a member of the Wajasiriamali Buyagu Group. I have a family of 7 members (2 children studying in secondary school and one in primary school). My wife used to grow sweet potato in a garden (0.2 acres). After several training sessions, I decided to translate the experience I gained from the training into action by using the OFSP vines to establish a small garden of OFSP near my house in 2011. After multiplication, my wife and I, we decided to expand the area for vine multiplication and roots. I could produce seed even in the dry season because I got the irrigation pump from DASP. I am now selling the vines and roots throughout the year. From these activities, I have managed to pay the school fees for my children and built a modern house. OFSP is a saviour.”

Crop-livestock integration initiatives put a smile on farmers' faces

Highlights

- Through integrated crop–livestock innovations, ASARECA and partners increased the availability of feed resources on smallholder farms by planting and fencing an extra 0.5 to 2.5 acres of *Cenchrus ciliaris* on each of the targeted 11 household farms in Tanzania. In Tanga, 4 out of the targeted 7 household farms grew Napier grass to supplement the *C. ciliaris*. Four farms in Morogoro introduced *Leucaena diversifolia* on contour bands. In Rwanda, new forage plots of *Brachiaria mulato 2*, *Mucuna pruriens* and Napier grass were established on an additional 18 smallholder farms.
- Forty-seven improved hybrid calves (23 females, 24 males) were born following closer collaboration and linkage of farmers in Tanga with private artificial insemination services providers through the ASARECA initiative. In Rwanda, 80 calves (42 females, 37 males) were born as a result of a similar initiative.

Dairy production is a major source of income, livelihood and nutrition to mixed farming communities in ECA. Similarly, vegetables contribute significantly to household nutrition and income. While livestock products like urine and cow-dung are some of the best organic fertilizers, crop residues are a source of livestock feed. Motivated by the benefits of this interdependence, ASARECA and partners set out to stimulate livestock–crop integration by supporting farmers in the region to grow crops and keep livestock.

ASARECA and partners increased the availability of feed resources on smallholder farms by planting and fencing an extra 0.5 to 2.5 acres of *Cenchrus ciliaris* on each of the targeted 11 household farms in Tanzania. In Tanga, four out of the targeted seven farms established Napier grass to supplement the *C. ciliaris*. Four farms in Morogoro introduced *Leucaena diversifolia* on contour bands. In Rwanda, new forage plots of *Brachiaria mulato 2*, *Mucuna pruriens* and Napier grass were established on an additional 18 smallholder farms.

One among many calves that were born



Totally, 47 healthy calves (23 females, 24 males) were born following closer collaboration and linkage of farmers in Tanga with private artificial insemination services providers through the ASARECA initiative. In Rwanda, 80 calves (42 females, 37 males) were born as a result of a similar intervention.

New feeding packages using maize stover-calcium bentonite nutrient blocks as a supplement have been developed to enhance dairy production. This feed supplementation is highly cost effective, since US\$ 0.1 used in the control supplement leads to US\$ 0.8 from supplementation with calcium-bentonite nutrient blocks. The profitability is also higher than supplementation with premix concentrates, which generated US\$ 0.5 as compared to US\$ 0.1 for the control group. The positive results from the calcium-bentonite blocks were attributed to its capacity to absorb mycotoxins like aflatoxins.

In Tanzania, a feeding ration composed of maize bran, cotton seed cake and minerals containing 75% energy, 20% protein and 5% mineral produced significantly higher milk yield per animal per day than any other ration. This is now being promoted and up-scaled to constitute the standard ration for livestock for small-scale farmers in the area. To address the needs of pastoralists, demonstration water points were constructed at strategic positions along the major migration routes. The water reservoir, consisting of a dug shallow well equipped with a motorized pump, has been used as a model for supporting pastoralism in the drylands.

In Burundi, farmers were introduced to quick silage making technologies using polyethylene sheets. The technology is currently being promoted in the country. Similarly, in collaboration with small-scale artisans, a new forage chopper technology with fixed knife was modified and made available to the farmers. It has significantly reduced their workload, improved feed intake and minimized forage wastage, besides being easy to operate.

In Kenya, 508 kg of forage seed was produced and distributed to farmers at the project sites. Besides, feeding packages and conservation innovations were upscaled. For example, rain-fed forage plots, including *Cenchrus ciliaris*, *Enteropogon machrostachus* and *Eragrostis superba*, were established at Challa

In Tanzania, a feeding ration composed of maize bran, cotton seed cake and minerals containing 75% energy, 20% protein and 5% mineral produced significantly higher milk yield per animal per day than any other ration

and Salabani community sites. Similarly, irrigated forage plots of *Cenchrus ciliaris* and Sudan grass were promoted at Mbalabala, Bura and Maho community sites, thereby increasing forage availability for dry season feeding. Through this innovation, up to 35 tonnes/ha of Sudan grass was produced.

Besides working with individual farmers, three community-based organizations (CBOs) were formed in Salabani, the Jarajara Aws Group in Mbalabala and the Jabesa Group in Bura for market-oriented forage production. Similarly, in Taveta, the project trained and facilitated the Wajane (vulnerable group of widows) to establish pastures. As a result, 49.5 ha of forage was produced in the demonstration plots. Similarly, in Tanzania, almost 3 ha of community grazing reserves were improved through planting of *Cenchrus ciliaris* and forage legumes like *Clitoria ternatea* and *Stylosanthes guianensis*.

Additionally, in Uganda, smallholder vegetable-processing technologies were promoted, especially the solar dryer on raised racks using tarpaulins and high-density black sheets. This dryer produced good results in terms of product quality, and farmers who adopted the technology reported improved income through enhanced access to markets throughout the year. Increased acreage (by more than 50%) under vegetables was also recorded.

Raising smallholder incomes through goat-keeping

Significant areas of ECA are either arid or semi-arid lands (ASALS). Some of these lands are largely barren due to unreliable rains and poor soils. Farmers in these areas have poor harvests. Yet these areas could also be used to generate incomes. In fact, goat rearing offers a viable solution and can make a great contribution to the economy and nutrition of ASALS. Goats are multifunctional animals – a range of milk products, meat, wool and skin can be extracted for both household and economic uses. The African goat is hardy and able to survive under harsh environmental conditions.

To enhance goat productivity in ECA, ASARECA partnered with the United States Department of Agriculture, Animal Research Service (USDA/ARS)

and other collaborators to collect information on the common genes of the goat species in the region. This was to form a basis for improved preservation of species and also serve as a precursor to large-scale genetic improvement programmes in Africa. Already, 40 goat populations from ECA had been characterized using a technology called the Single Nucleotide Polymorphism (SNP) chip. This technology was used to increase milk production in cattle.

Increasingly, goat farming is taking root even in non-ASAL areas of ECA owing to the attractive features associated with it, including low feed requirements and low general investment costs. Goat farming is viewed as a profitable business and it is now becoming an important smallholder enterprise.

ASARECA has embarked on work to raise the profile of goats in household income generation



Investing in fisheries development

The fisheries sector in ECA is underdeveloped, yet it has the potential to spur economic development in the sub-region. Per capita fish supply in the region is declining – currently at 6.6 kg per person per year, compared to the global average of 16.6 kg/person/year. Among other challenges, fish farming is not substantially developed, contributing less than 2% of the fish supply. This is due to limited research into fish farming, poor quality fish seed for aquaculture and high mortality rate of farmed fish. If the population growth continues as projected, sub-Saharan Africa will need about 61% more fish per year in 2020 just to maintain the current consumption level.

As part of the regional efforts to revive the fisheries sub-sector, ASARECA and its partners at the National

Fisheries Resources Research Institute (NaFIRRI) carried out on-farm testing of two live feeds, namely de-capsulated Artemia and Molina, and an artificial dry feed (Ranan CSO) as weaning feeds for catfish larvae. The best results were achieved with Artemia, which improved catfish larval survival from less than 25% to about 65%. NaFIRRI also tested the effects of three feeds (Kajjansi CP 35%, Ugachick CP 35% and TIF feed) on catfish hatchery fecundity. The Kajjansi feed gave the best results, raising fecundity from 35% to 65%, besides producing relatively larger ovaries (gonado-somatic index of 14% compared to 10% by the Ugachick feed). Comparison of the two commercial feeds of similar protein content (35%), Kajjansi and Ugachick, on on-farm catfish farming indicate that the former elicits faster growth than Ugachick in four months. To tap into the higher consumer segment in Kampala and Wakiso

Cat fish at a farmer's collection in Kenya





Ornamental fish

Among other challenges, fish farming is not substantially developed, contributing less than 2% of the fish supply. This is due to limited research into fish farming, poor quality fish seed for aquaculture and high mortality rate of farmed fish

districts, NaFIRRI embarked on product development and value addition. This has led to improved marketability and profitability of both catfish and tilapia fish products. Different packaging methods have been developed and product information is being disseminated to potential consumers.

In Tanzania, experiments to identify the best feeding packages for larvae rearing indicated that catfish fry fed with *Artemia* had the highest growth, followed by the fry fed with *Moina mocrura*. An assessment of market potential and consumer preferences for tilapia and catfish were carried out at the project sites. In Tanzania, the results showed that, among the cultured species, tilapia was the most preferred fish (71.9%) because of availability (41%), good quality (25%), and affordability (5%). Rapid assessments indicated that 56% of the targeted population preferred farmed fish as against the 39% preferring wild fish.

ASARECA partner farmer (right) displays ornamental fish



Improving productivity through integrated water management techniques

Over 1,500 households in Eritrea, Ethiopia, Kenya, Madagascar, and Rwanda have adopted water-efficient technologies, such as drip irrigation. In addition, in the same countries, up to 5,000 ha of land has been recovered through construction of appropriate water conservation and management structures within selected watersheds. The farming communities, in these watersheds, chose to employ the following technologies: water terraces, tied ridging, check dams, siltation dams and on-farm tree growing.

In Kenya, for instance, most of the participating farmers have adopted tied-ridging, improved crop varieties and better agronomic practices. About 70% of the participating farming households in Machakos and Makindu areas in Kenya are now considered food secure. These interventions have increased the amount of water available both at the watershed and farm levels to support agriculture. The interventions also enabled over 1,000 households that were previously dependent on food relief become food secure.

An ASARECA project, Integrated Management of Water for Productivity and Livelihood Security under Variable and Changing Climatic Conditions in Eastern and Central Africa “to scale out water productivity enhancement technologies in selected watersheds in Eritrea, Ethiopia, Kenya, Madagascar, and Rwanda” was adopted, at both household and community levels, in 2011.

Through in-country consultations, key stakeholders identified and prioritized the technologies to be adapted and tested. For instance, in Kenya, the targeted farmers chose management practices such as seed priming, tied ridging, micro-dosing, composting/farm yard manure (FYM) and terracing at the farm level. At the community level, they selected construction of dams and weirs as well as afforestation. In Ethiopia, the farmers opted for afforestation, rehabilitation of degraded lands, and pasture improvement at the watershed level.

Several milestones were attained through community-based participatory testing, adaptation and promotion of best-fit and end-user preferred interventions. In order to boost management of water at the farm level, a combination of 10 technologies and innovations were promoted in over 1,500 farming households in Ethiopia, Kenya and Eritrea. Some of these technologies include: tied-ridging, micro-dosing, downscaled forecasting systems, compositing, terracing, drip irrigation, improved mouldboard plough and ridger, and conservation agriculture. Stakeholders in Ethiopia, Kenya and Madagascar set up trials to evaluate the best combinations of viable technologies and management practices along with other productivity-enhancing options. First season trials were concluded in Kenya, Ethiopia and Madagascar, and results were compiled and analysed for discussion with stakeholders.

Preliminary results indicate that the farmers got bumper harvests as a result of adopting some of these interventions. Smallholder farmers in Eritrea constructed terraces and check dams covering nearly 10 km. This significantly controlled soil erosion and prevented siltation of Amadir and Molqi dams. Now the fields neighbouring these dams and watersheds get clean water. In the last season, farmers around the rehabilitated hills of Adulala and Ketchema,

In order to boost management of water at the farm level, a combination of 10 technologies and innovations were promoted in over 1,500 farming households in Ethiopia, Kenya and Eritrea

Farmer explaining terracing





Water harvesting

in Ethiopia, experienced reduced run-off and had sufficient pasture for livestock during the dry spell.

The project encouraged effective learning alliances, and exchange visits were conducted. Project team members visited India's national integrated watershed management programmes. Their key observations were: the existence of numerous, inexpensive, gender-responsive water productivity enhancement technologies and approaches; the need for communities of practice; and the need to focus interventions at both farm and watershed levels. These lessons were incorporated into the project. In addition, the project partnered with the National Remote Sensing Agency of India, especially in the use of satellite data in characterizing and monitoring changes in the identified and targeted watersheds. This should increase the availability of quality watershed data.

Across all the participating countries, farmers have embraced the productivity-enhancing technologies and have subsequently realized significant increases in yields

Across all the participating countries, farmers have embraced the productivity-enhancing technologies and have subsequently realized significant increases in yields. In Kenya, for instance, most of the participating farmers have adopted tied-ridging, improved crop varieties and better agronomic practices. About 70% of the participating farming households in Machakos and Makindu areas in Kenya are now food secure. The farmers enjoyed a bumper harvest of maize, cowpea and green gram. Aware of the need to conserve soil moisture and improve fertility through cost-effective measures, towards the end of 2012, the participating farmers in Kenya had raised about 20,000 seedlings for planting. These trees also include fertilizer trees. In addition, in Ethiopia, maize yields increased by about 85%, teff by 3.5%–13%, haricot bean by 24.6% and wheat by 29.5%–43.8%. Further, pastureland has increased through the rehabilitation of degraded hills. Over 3,000 hectares of key high altitude watersheds were secured in Ethiopia (Kechema) and Madagascar (Ankazomiriotra, Avaratrambolo). These are areas with extreme degradation, dense population and high poverty levels.

These interventions in Ethiopia, Eritrea, Kenya, and Madagascar were successful because key stakeholders formed strategic innovation platforms that brought together numerous players, from the respective sites, to address production, conservation and livelihood challenges. Plans were underway to develop a stakeholder knowledge base on integrated water management.

Response farming: The magical solution for mitigating lives in ECA

Highlights

Through response agriculture, about 50 participating households in Ethiopia increased maize productivity by 58%, while soil fertility enhancement in Tanzania and Uganda increased amaranth and groundnut yields by about 50% and 100% respectively. As for farmer engagement, through mother–baby trials, farmer field schools and farmers’ groups, the adoption of soil fertility management technologies rose by 50% over the baseline in Ethiopia, Tanzania and Uganda.

Semi-arid areas in ECA suffer high climate variability. The erratic nature of rainfall, its quantity, distribution and cessation hamper farmers in ECA. Besides, agriculture in the ECA is rain-fed, predominantly subsistence farming and supported by poor management practices, which makes it vulnerable to climate variability. Through the project “Enhancing the adaptive capacity of smallholders to climate variability through response farming innovations”, ASARECA and partners mitigated these effects. It was built on the rationale that improved information about water supply or rainfall prospects will enable farmers to plan their actions and practices.

Through response agriculture and innovative mechanisms that farmers have adopted to produce crops even in unpredictable climatic conditions, about 50 participating households in Ethiopia increased maize productivity by 58%, while soil fertility enhancement techniques in Tanzania and Uganda increased amaranth and groundnut yields by about 50% and 100% respectively.

Technology dissemination was enabled through mother–baby trials, farmer field schools and group farmers, and adoption of soil fertility management technologies rose by 50% over the baseline in Ethiopia, Tanzania and Uganda.

Approximately 5,000 households have been directly engaged in the implementation of activities supported under this project, with over 80% adopting agricultural productivity-enhancement technologies and innovations.

Response farming innovations enabled up to 500 smallholder farmers in Ethiopia, Kenya and Madagascar to realize over 50% yield increment over and above the normal by the close of 2012). The increase in yield was mainly attributed to the farmers’ ability to factor climate variability into their farming as information on climate was made available through downscaled forecasting. The increased yield resulted in households having more food for the family and, through sales, increased income.

Maize crop under ridging



Bean innovations for food security and improved livelihoods

Highlights

Twenty-eight tonnes of foundation and basic bean seed produced both at the research station and by contracted farmers in Uganda, Rwanda, Burundi and DRC was distributed to farmer associations, progressive farmers, seed companies and NGOs for production of certified seed and quality declared seed.

During the same period, 47.8 tonnes of certified and (Quality declared seed) QDS were produced by farmer associations, progressive farmers, NGOs and seed companies. These seeds include climbing beans, bush beans and snap beans.

In Uganda, a partnership was formed with CAXA, a bean-trading firm, to export certain varieties of beans to Europe for canning.

Developing bio-fortified nutrient-dense bean varieties that are popular in the diets of many vulnerable groups offers a potential and sustainable solution to malnutrition and hunger related deficiencies. The national bean research programmes across the ECA region developed nutrient-dense bean varieties with iron and zinc content above 70 ppm and 30 ppm, respectively, for farmer use in the region. Twenty-one micronutrient-dense bean varieties have been released across the region, while 20 varieties are at pre-release stage in eight countries.

There are three major types of beans: bush beans, climbing and semi-climbing and snap (French) beans. Beans are a rich source of protein, energy, fibre and micronutrients, especially iron and zinc and part of the staple diet of many people in Burundi, DRC, Rwanda and Uganda. However, many farmers view

Micro-irrigation of beans





Quality climbing bean seed in Burundi

ASARECA carried out several interventions with the objective of increasing bean production, promoting beans as a good source of income for farmers and seed companies

beans as a subsistence crop and not an income earner. Consequently, they have continued to grow poorly performing bean varieties on a small scale on marginal land (less than 0.5 acres). Due to reduced yields and increased populations, the consumption of beans has dropped in many households in both rural and urban areas. They have resorted to eating starch foods, whose prices are relatively cheaper. This has led to increased malnutrition and hunger-related deficiencies among the resource poor. The most affected are the vulnerable groups – the elderly, HIV-infected, widows, orphans and children below the age of 5. To address these challenges, ASARECA carried out several interventions with the objective of increasing bean production, promoting beans as a good source of income for farmers and seed companies. These interventions are expected to increase the incomes of smallholder farmers while at the same time enhancing food and nutrition security and protecting the environment. The projects address the following areas: bio-fortification of beans to increase nutritional value; seed multiplication and distribution by researchers, farmers and their associations, and seed companies; capacity development of multi-stakeholders, including

the establishment of common platforms; and value addition, including development of new bean food baskets and bean flour.

Seed multiplication and distribution

In Uganda, on-farm trials of 14 promising bean varieties were run and nine varieties were selected by farmers. As a result, 207 kg of the preferred varieties were redistributed among farmers for further verification. In addition, 9.1 tons of foundation seed of selected improved bean varieties was produced both on-station and by contracted partners. The seed was distributed to small-scale seed farmers' associations and seed companies in 10 districts. Totally, small-scale

seed farmer groups, associations and partner seed companies produced 37.8 tons of both certified and quality declared seed. The bulk of the seed produced was of the climbing bean variety.

In addition, in Uganda, there are on-going trials to test snap bean varieties from partner countries and 16 bean varieties (5 bush and 11 climbers) from Rwanda.

In Burundi, 754 kg of breeder seed of improved bean varieties was produced and used to produce 8.81 tons of foundation seed. Up to 95 acres of 10 improved bean varieties (semi-climbing and climbing beans) were planted. As a result, through active participation of farmers, 10 tonnes of certified bean seed was produced. The farmers formed action groups to multiply seed

Snap beans in Uganda



and make it available to other farmers. Four farmer associations established 36.51 acres for the production of certified seed.

In Rwanda, 3.6 tons of foundation bean seed of the targeted 10 new bush, climbing and snap bean varieties was distributed to 800 households. In addition, up to 15 tons of pre-basic and basic seeds of climbing, bush and snap beans were produced in the RAB stations with support from ASARECA and the Alliance for Green Revolution in Africa (AGRA). Of this, 5.1 tons of new climbing beans and snap beans were distributed to the farmers based on the farmers' capacity to absorb the seeds. Small packets (weighing 1 kg –10 kg) were distributed to more than 200 small-scale farmers, while large bags (weighing 50 kg–500 kg) were distributed to 27 progressive farmers, 10 NGOs, farmers' cooperatives and private seed companies. The varieties being promoted were nine drought-tolerant and early maturing bush varieties, three high-yielding and early-maturing climbing beans, and two newly released bush snap bean varieties.

In DRC, 707 kg of foundation seed of three bio-fortified varieties was produced. In Uganda, 30 iron and zinc-rich varieties were tested for their nutritional quality and identified for their processing or value addition qualities. Seeds of these varieties have been distributed to farmers for multiplication and production. In addition, on-farm trials were established, in DRC, to test various management practices, such as: (i) intercropping bio-fortified bean varieties with cassava; (ii) intercropping bio-fortified bean varieties with corn variety "Bambou"; and (iii) assessing the effect of amendments on the mineral concentration of bio-fortified bean varieties.

Value addition

In Uganda, the National Agricultural Research Organisation (NARO) Food Biosciences Research Centre developed new bean-based food baskets and products. Seven bakery and fried products (cookies, pancakes, cakes, bagia, doughnuts, ugali and flat bread) were processed by substituting common ingredients with beans, and taste tests were undertaken.

Plans are underway to promote and train participating partners, especially farmers, to cater to such bean-

In Burundi, a training of trainers (ToT) for 80 stakeholders was offered to strengthen the capacity of scientists and extension officers in seed systems, platform development, M&E, marketing and business plan

based food baskets. Also, four processing methods (steaming, roasting, boiling, sprouting) have been applied on four bean varieties and milled into flour for subsequent tests and use. The four types of flour are being analysed for their nutrient composition (protein, total fibre, fat, moisture, total ash, iron and zinc).

Additionally, ASARECA has facilitated capacity development for bean production in the project countries. In Uganda, nine district-level multi-stakeholder platforms, which will constitute the national bean platform, have been established. Totally, 138 farmers and extension agents from two districts (Lira, Apac) have been trained in the following areas: bean seed production and marketing; maintenance of seed purity; general agronomic practices (including integrated soil fertility management and integrated pest and disease management); collective marketing; and record keeping.

In Burundi, a training of trainers (ToT) for 80 stakeholders was offered to strengthen the capacity of scientists and extension officers in seed systems, platform development, M&E, marketing and business plan. In INERA, a group of 30 farmers, extension agents, and socio-economists were trained in snap bean production.

Positive outcomes are already unfolding. As a result of a combination of interventions, farmers and traders alike have benefited from the increased good quality beans in the market. More farmers are planting beans today because of assured markets in their countries and across the borders.

Pearl millet innovations for arid and semi-arid lands in ECA

Highlight

Regional trials for pearl millet identified four high yielding hybrids from germplasm sourced from India (ICRISAT) with some varieties that had yields of over 5.40 tonnes per hectare. Farmers have identified 15 early maturing varieties that have desirable traits, like colour and smell, for porridge.

Most subsistence farmers in the arid and semi-arid lands of Eastern and Central Africa are poor, food-insecure and malnourished due to inherent poor conditions for crop production. Pearl millet is a cereal that can improve food security and increase the income of farmers in these lands, being suited to the extreme limits of agricultural terrain. However, adoption of pearl millet has been low. This is because the pearl millet value chain is constrained by many factors, ranging from production, post-harvest handling, processing and utilisation and policy institutions to knowledge and information access.

ASARECA initiated a project that aimed at enhancing the livelihoods of subsistence farmers in the arid and semi-arid lands through the introduction of pearl millet. The project, which is running in Kenya, Tanzania, Sudan and Uganda, is exploiting opportunities along the pearl millet value chain – integrating improved varieties with crop management options (e.g. intercropping with legumes), market opportunities, institutional and policy innovations.

Under the project, pearl millet germplasm from various sources, including hybrids from India, was subjected to regional trials in Kenya, Tanzania, Sudan and Uganda and also disseminated to other ECA countries for adaptation. The trials included biotic and abiotic stress screening, evaluation for food and feed, identification of traits such as high biomass and grain yield, tolerance to bird harvesting and other pests and diseases. The regional trials noted that the highest yielding pearl millet hybrids were sourced from India (ICRISAT). Some varieties had yields of over 5.40 t/ha. Farmers also identified 15 early maturing varieties that had desirable traits in colour and smell. During the reporting period, several hectares were set aside for seed multiplication both for pearl millet and legumes (pigeon peas, cowpeas, green gram) intercrop. A total of 2.1 tonnes of pearl millet seed was distributed to farmers in Kenya, Sudan and Eritrea. The farmers in Eritrea received 1.2 tonnes and over 230 kg of legumes. Project team members and various stakeholders in the value chain received training in a number of areas.

Fifty-one project team members were trained in monitoring an evaluation as well as agricultural innovation systems. A total of 486 stakeholders were trained in areas such as pearl millet technologies, on-farm trials, crop production in pearl millet and legume cropping system, soils and water conservation, pearl millet production, processing and utilisation, marketing and business skills. Trained stakeholders

ASARECA initiated a project that aimed at enhancing the livelihoods of subsistence farmers in the arid and semi-arid lands through the introduction of pearl millet



In Kenya the project demonstrated the creation of a number of products using pearl millet and legumes

included farmers, scientists, extension, millers, traders and regulatory authorities. The project also engaged in promoting use of pearl millet and legumes by substituting them as ingredients in a number of national snacks and dishes. In Kenya the project demonstrated the creation of a number of products using pearl millet and legumes. These included samosas, mandazi, chapatti, ugali, fried cow pea's leaves, pigeon pea leaves chapatti, pigeon pea githeri and cow pea githeri.





Enhancing agricultural production through favourable policies

Policies and regulations that make things move

Highlight

In 2012, **eight** policy options (out of the **16** targeted) were presented for legislation. Following a series of dialogues, a total of five policy options were presented for endorsement, legislation or decree by responsible policy organs. Among these, 13 standards developed by PAAP in conjunction with the Uganda National Bureau of Standards (UNBS), through a series of national consultations to rationalise the working drafts were approved by the EASC for declaration by the EAC Council of Ministers as East African Standards in their 16th annual meeting held in Arusha, Tanzania, 7–8 June. The standards were set to be presented to the Council for declaration in their meeting of November 2012 or latest March 2013. The full text of the Standards can be viewed at <http://www.eac-quality.net/the-sqmt-community/standardization/public-drafts.html>

Through the ongoing projects under the Policy Analysis and Advocacy Programme, ASARECA and partners analysed a total of 24 out of 23 targeted policies, laws, regulations and procedures. Some of the highlights include:

Analysis of Food Price Trends: Food Price Trend Analysis and Policy implication project was launched in February 2012 to monitor food price trends in Tanzania, Uganda, Kenya, Rwanda and Ethiopia. The food crisis of 2007 had awakened the need to periodically monitor food price movement across markets within the region to promote trade between surplus and deficit areas. This project was responsible for setting up a food price data portal. It hosts continuous updating of the food price charts and the online data portal (<http://eafpdp.org/>) using data collected by project partners. Tracking of the data portal user satisfaction and perception indicator can now be initiated online. The tracking system is now in place, along with a real-time web counter and guest book monitored by an administration panel. Downloading of data in Microsoft Excel format has also been activated.

Enhancing adoption of harmonised seed standards, regulations and procedures: Through the project on enhancing adoption of *harmonised seed standards, regulations and procedures* in ECA, accelerated domestication and implementation of harmonized agreements has been noted in the pilot project countries of Burundi, Kenya, Tanzania, South Sudan and Uganda. Country-based taskforces (except Uganda) have been formed, while training on advocacy and roadmap development has also been initiated. It is anticipated that these initiatives will lead to increased seed trade, production and distribution in ECA.

Regional COMESA seed regulations: The progress on seed policy harmonisation in ECA was presented at the COMESA's awareness creation and sensitisation workshop on the proposed COMESA-SADC seeds regulations held in Lusaka, Zambia in March. These regulations are expected to be presented for consideration of approval in the joint Ministerial meeting to be held in July 2013.

Regional Intellectual Property Rights (IPR) policy: This is aimed at providing innovators and generators of intellectual assets such as technologies and research

The food crisis of 2007 had awakened the need to periodically monitor food price movement across markets within the region to promote trade between surplus and deficit areas

protocols with recognition and protection of their rights through an appropriate policy and regulatory framework. This has been proven to provide incentives for further innovation, investment and development. An analysis of the status of the IP regime in the Eastern Africa Agricultural Productivity Programme (EAAPP) participating countries was undertaken and the key gaps documented. A draft regional IPR policy was developed and shared with key stakeholders in October 2012. The draft policy defines a common framework and guidelines for national and institutional IP policies necessary for agricultural development in the region. It also provides modalities for material transfer and germplasm exchange.

Protocol for National Performance Trials: This is a follow up to the implementation of the ASARECA-supported harmonised seed policies, laws and regulations. Analysis of the variety evaluation, release and registration process for the four Eastern Africa Agricultural Productivity Programme (EAAPP) commodities (wheat, cassava, dairy, rice) was undertaken. A draft regional standard for the national performance trials procedure has been developed. Some of the key parameters include a number of testing sites, seasons, conduct of on-farm trials, data requirements for national performance trial applications, number and selection of testing sites, methods for determining the variety to use in the checks, statistical procedures

for NPT evaluations, number and composition of evaluation committees, quantity of pre-basic seed for post plot control tests, etc.

Enhancing commercialisation of standards for cassava and potato in ECA: As part of promoting rapid commercialisation of standards for cassava and potato in the region, ASARECA collaborated with the International Institute for Tropical Agriculture (IITA), Dar es Salaam office, in the drafting of awareness tools and print, audio and electronic materials. These materials (currently under review) are intended to create awareness, especially on the 13 gazetted East African Standards. The integrated water management policy options and institutional arrangements to minimise smallholder farmers' vulnerability to climate uncertainties were analysed for Kenya, Madagascar and Ethiopia. For example, the irrigation policy seemed outdated and unable to handle the current NRM/IWM challenges, while in Ethiopia, it was established that despite massive investment in SWC interventions by the government and other agencies, these efforts did not have much impact on the livelihoods of farmers in Adama.

Five policy options for the dairy sector: Previous ASARECA engagements had focused on outputs from the dairy sector. To consider the inputs side, analysis was undertaken to identify key policy gaps that need to be addressed to enhance performance and improve productivity in the sector. Options were generated in five key areas – animal feeds and forages; animal registration and breed performance evaluation; delivery of Artificial Insemination services; procedures for movement of heifers and germplasm; standards and regulations for inspection of dairy premises; and standards for dairy processing. Actual drafting of the various options will be spearheaded by a regional dairy inputs steering committee.

EAC seed potato Standard: The final draft East African Standard for seed potato was presented to the Ministerial Session of the EAC Sectoral Council on Trade, Industry, Finance and Investment held on 31st May in Arusha, Tanzania. The standard was approved and declared an EAC standard and is lined up for publication in the EAC standards gazette (a full report of the Ministerial Session is available).

Regional biosafety policies: The harmonised regional biosafety policies on commercial planting, commercial trade and emergency food aid containing GMOs were adopted and recommended for approval in a high profile regional workshop attended by 15 of the 19 COMESA member states in May 2012 (see Box 3 for details). Details of additional policy initiatives undertaken by ASARECA are presented in Boxes 4 and 5.

Seed Policy Harmonisation Agreement begins to bear fruit

The Harmonisation Agreement on seeds provides for a shortened release and registration period for foreign varieties onto national catalogues. This provision allows those with seeds listed on other catalogues to publicise their varieties in any of the ASARECA countries for commercial purposes and to enter the variety intended for release into national performance trials for only one main season as supported by data used for release in the applicant's country. In 2008, Uganda evoked this provision to release two hybrid maize varieties (Yara 41 and Yara 42) from Kenya into the Ugandan market after only one season of tests. On 29 March 2012, Tanzania followed suit, releasing three potato varieties from Kenya (Asante, Sherekea, Tigoni) and the Victoria potato variety from Uganda. The varieties are now under commercial production, signifying improved farmer access to high yielding varieties and heightened space for trade in the region.

The integrated water management policy options and institutional arrangements to minimise smallholder farmers' vulnerability to climate uncertainties were analysed for Kenya, Madagascar and Ethiopia

A committee member submits final amendments before the Bukwo district council adopted the district Land Care Bill 2013



Box 1**Laws for livelihoods: ASARECA-supported Council approves new land care ordinance**

ASARECA's efforts to create conducive policies, regulations and incentives for farmers in Bukwo district in Eastern Uganda could soon pay off. After four years of support to the district to make laws on land use, on 27 February 2013, Bukwo district council overwhelmingly adopted a Bill that could enable residents to use their land in a manner that benefits them and future generations.

The Bukwo District (Land Care Bill) for Ordinance No 2/2013 is the second to be approved for formulation and could become the first to be passed into law by the Council since the district was established in 2005.

“ASARECA’s approach of involving multi stakeholders, especially farmers in the development of the law has motivated them to own it. The Ordinance has incentives and penalties and punishments that have been agreed to by the communities,” said Chebet after the session. “That means the beneficiaries will be the implementers, enforcers and beneficiaries.”

Bukwo district, with a population of 67,500, faces acute shortage of productive land after years of reckless use that has left it bare. The communities depend on water from the slopes of Mt Elgon, which gets to them through gravity flow. Any further degradation of the environment or failure to enhance the eco-system could adversely affect the water source.

Efforts to regenerate natural vegetation and a wide range of technologies to mitigate farm soil and water degradation have been generated by researchers. Adoption, however, is minimal. Through the project “Going to scale: Enhancing the adaptive management capacities of rural communities for sustainable land management in the highland of Eastern Africa”, ASARECA has been supporting the local governments of Kapchorwa, Kween and Bukwo in Uganda and Were Jarso and Dendi in Ethiopia to create regulatory and incentive structures to build a sustainable land management culture. ASARECA facilitated a multi-stakeholders’ dialogue in the districts to undertake participatory analysis of existing by-laws and develop district ordinances to guide and regulate land use.

ASARECA facilitated the team’s conduction of wide consultations among sub-county representatives at the District Council. A draft-amended Bill was produced and taken to Council for the first reading. After the first reading, the Council mandated the Committee in-charge of Agricultural Production to carry out further consultations. This culminated in a report of amendments and comments on the Bill which was presented to the House for approval during an extraordinary session on 27 February. Council approved it without a hitch. The Bill is due to be published in the *Uganda Gazette* and will be sent back to the constituencies for further consultation before returning to the House, where it will be passed into law.

Because of the consultative nature of its formulation, the Bill has attracted significant community and political buy-in.

Proactive farmer

Ms Miriam Sawane from Cheboy village, Amanang parish in Bukwo sub-county, is an example of the proactive farmers whose efforts to use land sustainably cannot pay off if the entire community is not well mobilised. Miriam believes she knows how to use her undulating two-acre piece of land optimally and keep it productive for future generations.

On the upper end of the plot, she manages a zero grazing unit from which she gets over 80 kg of cow-dung and urine per day. She has directed the dung and urine to her biogas facility, just about three metres away. The biomass generates enough gas for family cooking and lighting. The rest of the dung flows down to a point where it gets distributed to a mixed farm of banana, coffee and vegetables.

Miriam has also planted trees in strategic points on her compound and plot. Apart from keeping the soil unexposed and intact, the trees provide the family a mini climate and a resting shade. Leaves from some trees are harvested for feeding the animals. Every year, Miriam harvests timber from one or two mature trees earning her anything between Ushs 700,000 (about \$265) to Ushs 2 million (about \$750), depending on the size of tree or the type of timber. The processing of timber leaves her with enough firewood to last a whole year. From the coffee sales of 2012 alone, she earned Ushs 1.5 million (about \$ 569), which she used to pay school fees for four school-going children.





The district speaker consults before the Bill was adopted

Miriam has dug trenches across her land to check runoff from gaining momentum and carrying away soil nutrients. She has also planted Napier grass to stabilise the contour bands. She knows these measures have a positive impact on the soil and the climate of area. But not every resident of the area appreciates this. Most homesteads around her do the reverse—cutting down trees and grass that they did not plant and making no effort to replace, leaving animals to roam all over the place and creating similar nuisances.

Hopefully the Ordinance, backed with massive sensitisation of the populace to appreciate the regulations, guidelines and penalties, will help Miriam and folks of Bukwo, Kapchorwa, Kween, Were Jarso and Dendi to tame landslides and floods, soil nutrient depletion and declining water catchments.

Article by ASARECA Information and Communications Unit and PAAP. For more information, contact: paap@asareca.org

Opposite page: Mirriam Sawane expects a big harvest



Catalysing agricultural research through capacity development

Highlights

Among other mechanisms, ASARECA integrated capacity building in its regional projects and targeted activities. To date, 53,000 individuals have benefited from ASARECA's capacity building initiatives ranging from plant breeding training at the MSc, BSc and PhD levels, farmer training in banana tissue culture methods and potato production and marketing methods.

ASARECA has continued to play its role towards strengthening agricultural research for development in ECA. ASARECA provided strategic capacity building that encompasses short- and long-term training, infrastructure support, as well

as partnership development, among others. Some of the highlights include:

Capacity development to generate and utilise research outputs

Through ASARECA support, a total of **11,503** people (**6,029** males; **5,080** females) have benefited from short-term training on post-harvest management, food security, AIS, value chain analysis and development, integrated soil and water management, linkages to market, business planning, gender mainstreaming, M&E and basic agronomy among others. These include farmers, traders, processors and other value chain actors.

Institutional mentoring with ILRI-BecA hub

As part of enhancing the capacity of selected scientists from six less-resourced ASARECA NARs, a total of **two** (out of the first group of six) research scientists targeted for this exercise have successfully completed their six month placements.

In addition to SCARDA, a total of 31 students have also benefited from long-term training in various disciplines (nine Ph.D., 20 MSc and two BSc). This buttressed earlier efforts for long term training through SCARDA.

SCARDA took three approaches:

- i. Engagement with management teams of the focal institutions in a learning process through a series of learning workshops of key management issues and challenges facing their institutions. A total of

ASARECA provided strategic capacity building that encompasses short- and long-term training, infrastructure support, as well as partnership development, among others

Participants at one of the training programmes organized by ASARECA





Participants at one of the training programmes organized by ASARECA

In 2008 ASARECA sponsored a total of 34 young mid-level scientists from Eastern and Central Africa to undertake leadership and mentorship training and an array of masters’ degree courses

37 leaders and managers (25 males; 12 females) of different agencies involved in the implementation of EAAPP benefited from a detailed training on leadership and management.

- ii. Mentoring and coaching: Participants experienced the concepts of mentoring and coaching and

learned how the mentor can support the mentee – e.g., personnel they supervise over other colleagues in their teams or in the organization. Following obtaining a grasp over the concepts, mentoring orientation workshops were held for mentors and mentees to deepen their understanding and to develop clearer mentoring tools.

- iii. Long-term training: In 2008 ASARECA sponsored a total of 34 young mid-level scientists from Eastern and Central Africa to undertake leadership and mentorship training and an array of masters’ degree courses. These included Plant Breeding, Soil Science, Agricultural Information and Communication Management, Research Methods, Range Management, Agricultural Extension, and Breeding in various universities.

Through the project, Strengthening Capacity for Agricultural Research and Development in Eastern and Central Africa (SCARDA-ECA), ASARECA teamed up with the Forum for Agricultural Research in Africa (FARA), the Regional Universities Forum

(RUFORUM), to place the students in acclaimed universities in and the region.

The students were selected from the Agricultural Research Corporation (ARC) in Sudan, Institut des Sciences Agronomiques du Burundi (ISABU), Institut des Sciences Agronomiques du Rwanda (ISAR), now Rwanda Agricultural Board (RAB). These countries were chosen following an institutional assessment

of the National Agricultural Research System, which indicated that the lack of adequate human resource capacity was a major weakness in delivering research outputs to meet the needs of the poor. The scientists successfully completed their courses in 2010, returned to their countries in early 2011 and are making priceless contributions there. At the close of 2012, ASARECA tracked them down. Below are highlights of their work:

Case studies

Rwanda, Burundi governments deploy SCARDA scientists to drive research

Rwanda



Leonidas Dusengemungu

Leonidas' latest appointment is National Head for Innovation Platforms in Rwanda. He did an MSc in Agricultural Extension and Education at Makerere University. He was introduced to the innovation platforms of the Forum for Agricultural Research in Africa (FARA), which are considered models for participatory research on the continent. When he completed his studies in 2010, he was immediately appointed the head of the outreach programme of Rwanda Agricultural Board (RAB). This put him at the helm of 'taking' all agricultural and associated technologies to the farmers. He was faced with 24 usable technologies waiting to be transferred to the farmers. Leonidas and team have created innovation platforms for technology adoption which are aiding greatly in their mission. This explains his latest appointment.



Gafishi Kanyamasoro

Gafishi is in charge of maize in all high altitude areas of Rwanda. He has been tasked to develop inbred lines of maize for all high altitude areas in the country. Currently, Rwanda is importing hybrid maize from Kenya. The government, however, wants inbred varieties adapted to the Rwandan highlands to be developed urgently to propel maize production. Gafishi is also working towards developing a farmer-preferred white open pollinated (OPV) variety from the only variety adapted for the highlands, which unfortunately, the farmers do not like because it is yellow. Rwanda faces an acute shortage of maize breeders. Currently there are only three maize breeders in the country. Gafishi did an MSc in Plant Breeding at Makerere University.



Cyamweshi Rasangama

On returning to RAB in the early 2011, after completing an MSc in Soil Science at Makerere University, Cyamweshi was appointed a researcher in soil conservation. He was tasked to initiate research related to soil conservation and formulate fertilizer use recommendations for priority crops (maize, wheat, rice, potato and bean). Previously a junior researcher, Cyamweshi now boasts of a cocktail of research milestones directly linked to his name. "I can now do any form of research, and when I interact with researchers the world over, I feel comfortable," he states.



Mathilde Uwizerwa

Mathilde, is now the head of the National Soybean Programme. She is tasked to conduct research and extension in soybean. This means she leads efforts to produce quality soybean, promote soybean inoculated through farmer field schools and link the farmer cooperatives to the soybean oil processors. "My thesis: 'Co-deployment of legume nodulating bacteria and arbuscular mycorrhizae fungi for improved bean in acid soil', was spot on to our current production challenges," she notes.



Maximillan Manzi

Maximillan was appointed the Director of Livestock Research and Extension in the Eastern zone, putting him at the top of the country's livestock sector. "I monitor and coordinate activities of 26 livestock staff engaged in livestock nutrition, health and breeding," he states. "I am tasked to champion research on reproduction physiology for indigenous cows and cattle genotypes in Rwanda, conduct research on embryo transfer, artificial insemination, maintain a system for collecting, documenting, analysing goat and cattle breeding data." Maximillan owes this to the MSc in Range Management that he did at the University of Nairobi in Kenya under SCARDA.



Wilson Dufitumukiza

Wilson is the head of the National Tea Research and Extension Program for Rwanda. This puts him at the helm of promoting public-private partnerships nationally, regionally and internationally to improve tea production and conservation. He is charged with ensuring that technical capacity for tea research and development is boosted. He is also involved in tea policy and strategy formulation. Before his MSc in (Soil Science) at Egerton University, Wilson was an assistant researcher.

BURUNDI



Nepomusecene Ntukamazina

Nepomusecene was appointed the in-country representative of the Bean Innovations project funded by ASARECA in July 2012. In September 2012, he was appointed to assist the Director General in managing the research component of a five-year programme funded by the Belgian and the Burundian governments. The component, worth 5 million euros, covers research, infrastructure, equipment and foundation and breeder seed development. This assignment has placed him in charge of planning, coordinating and facilitating scientists to implement activities under the project. "I have developed tools to facilitate the programme to take

off, disbursement of funds and monitoring and evaluation," Nepomusecene explains. Before his MSc in Research Methods at Jommo Kenyatta University of Science and Technology, he was just like any junior scientist—limited!



Michelin Inamahoro

When Michelin returned to Burundi in 2011 after completing an MSc in Plant Breeding and Seed Systems at Makerere University, she was appointed the Head of the National Biotechnology Laboratories and Screen Houses. She was also allocated funds under a project funded by the Belgian Technical Corporation to collect samples of potato country-wide and to characterise samples of Taro (colocase) country-wide for diseases and other stress factors. "I have initiated research activities in the laboratories to come up

with disease-free coffee varieties. I have already set up banana experiments in the laboratories and I am in the process of evaluating CIP potato varieties for disease-free Irish potato seed," Michelin explains. "Besides this, I have evaluated sweet potato varieties and produced plantlets and handed them over to the potato programme of my institute."



Fulgence Niyongabo

Fulgence was appointed team leader in 2011 for rice research upon his return from Makerere University where he had completed an MSc in Plant Breeding and Seed Systems. He is charged with collaborating with other research entities such as the International Livestock Research Institute in Burundi and the University of Burundi with which he shares knowledge and varieties. "I consider myself the most experienced rice scientist in IZABU. I lead a team of three researchers and seven technicians. Our key role is to release rice varieties which answer the questions of quality, yield, and tolerance to other stresses," he says.



Cyrille Mbokihankuye

Cyrille is head of the climate change programme of ISABU. He is also working on the African Indigenous Vegetables Project to produce quality vegetable seeds and link farmers to the market. Currently the fruits and vegetables programme has only one PhD holder, who also happens to be the only doctorate in IZABU. Cyrille has exhibited exemplary performance in the evaluation of cow pea, tomato and cabbage varieties in semi-arid areas for drought tolerance. He studied at Sokoine University of Science and Technology.



Gloriose Habonayo

Gloriose is involved in the fruit and legume research and crop livestock integration activities. She is actively contributing to protocol elaboration on improving the quality of organic manure and improving bean production using highly nutritious weed, *Tithonia diversifolia*. This weed is available in large quantities in Burundi and is useful in maize and bean production because it is rich in nitrogen, calcium and potassium. Gloriose did an MSc in Crop Science and specialised in agronomy.

Conclusion

It has only been two years since the scientists completed their MScs. Considering the strategic nature of assignments their countries have entrusted to them, there is no better way to explain the dire need for capacity development in some ASARECA countries.

Building research capacity through infrastructural development

ASARECA funded the development or refurbishment of 335 different types of infrastructure in the National Agricultural Research Institutes (NARIs). These include structures, systems equipment, services, hardware and software, installations, building, procedures and institutional arrangements that facilitate the

flow of agricultural goods and services. Some of the facilities include laboratories and refurbishing buildings, irrigation kits, providing forage choppers, computers, etc. This led to the formation of over 166 different types of partnerships to manage and sustain the infrastructure. Through the infrastructure and partnerships, research outputs (increased marketing of commodities, institutional mentorship of scientists, adoption of selected TIMPs, etc.) have been noted.

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Powering technology transfer through information and communication

ASARECA has been compiling and disseminating data of sub-regional importance to key partners. These data consist of relevant, high quality, timely and appropriate scientific knowledge, technologies and policy-relevant research evidence.

During the reporting period, 95 different information packages were produced (out of the annual target of 102). This included an assortment of 225 publications comprising 24 peer-reviewed journal articles, 47 manuscripts, 3 books, 41 conference proceedings, 21 electronic newsletters, 10 documentaries and 79 other publications.

The Information and Communications Unit (ICU) supported a number of new projects (e.g. QPM-AIS;

the OFSP-AIS; and the Pearl Millet projects) in developing their communication plans using the ASARECA Guidelines, as well as backstop end-of-project write-shops.

Success stories emerging from the closed and ongoing projects have been captured for mass circulation. The stories have been generated through field interviews with selected farmers in order to bring out peoples' voices. For example, Case Study stories have been done for the banana wine project in Rwanda, and the GMO maize story. Additionally, success stories on the ex-SCARDA students in Rwanda were compiled. These stories have been shared via the ASARECA website, the Agriforum, as well as Case Studies in the ASARECA corporate Annual Reports.

Information generated from ASARECA projects has been broken down or tailored for use by different audiences. A total of 33 different information delivery pathways have been used to reach the various stakeholders within the region. These include print and electronic media, participation days such as field days and field trips and publications.

A few examples that can be cited are:

- Gezira Radio Station in Sudan prepared a radio programme for the farmers, covering intensification of sorghum system and the available technologies to deal with climate changes. Additionally, two field days were held at Wad Madani and Managil in which 150 participants, farmers, private sector, extension officers, researchers' traders, processors, and policy makers participated. Sorghum legume technologies were showcased on these field days.
- In Tanzania, a total of four farmers (two females; two males) and one extension staff from Kishapu participated in the farmer field day at Ukiriguru in July. Support was also provided to eight selected farmers (four females; four males) and two extension staff from Kishapu and Singida to participate in the National Agricultural Show in August in Mwanza and Dodoma. Furthermore, Radio Free Africa RFA & STAR TV has aired shows on pearl millet production in the target areas.
- ASARECA organised significant media publicity for the CAADP meeting on the CGIAR CRPs and

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NIPs alignment in Nairobi, Kenya. The event, officiated by the Agriculture Secretary in the Ministry of Agriculture, Kenya, saw the press interview ASARECA Executive Director and Head of PCD Unit. Stories appeared in a number of print papers as well as local television news. The water productivity project activities were filmed and featured on television (NTV).



ANNEX 1

FINANCIAL STATEMENTS, 31 DECEMBER 2012

Overview of ASARECA

Background

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a not-for-profit Sub-regional Organization (SRO), which was formally established in September 1994 by the Directors of the National Agricultural Research Institutions (NARIs) representing the ten member countries of the Eastern and Central Africa sub-region. These institutes include: ISABU of Burundi, INERA of D R Congo, NARI of Eritrea, EIAR of Ethiopia, KARI of Kenya, FOFIFA of Madagascar, ISAR of Rwanda, ARC of Sudan, DRD of Tanzania and NARO of Uganda. This step was taken with the aim of increasing the efficiency of agricultural research in the sub-region so as to facilitate economic growth, food security and export competitiveness through productive sustainable agriculture. As soon as South Sudan became a nation, it too applied to join ASARECA and has been accepted as the 11th member country.

The Headquarters of ASARECA is located in Entebbe, Uganda and hosted by the National Agricultural Research Organization (NARO) of the same country. ASARECA was established by the NARIs following the approval of the “Framework for Action” for agricultural research in eastern and central Africa out of realisation of the need to:

- i. Promote efficiency through attainment of economies of scale and scope by pooling together and sharing resources for tackling common constraints;
- ii. Create common pools of knowledge to avoid duplication and repetition; and,
- iii. Facilitate technology and information spillovers and spillins among member countries.

Mission, strategic objectives and planned results

Mission

“To promote economic growth, fighting poverty, eradicating hunger and enhancing sustainable use of resources through regional collaboration in agricultural research for development.”

Strategic objectives

“Enhanced sustainable productivity, value added and competitiveness of the agricultural research system in the sub-region.”

ASARECA has planned and committed itself to delivering the following results/outputs:

1. Performance-driven governance and establishment of operational management structures and systems.
2. Generation and uptake of demand-driven technologies and facilitation of innovations.
3. Facilitation of policy options for enhancing the performance of the agricultural sector in the sub-region.
4. Strengthening capacity for implementing agricultural research in IAR4D paradigm in the sub-region.
5. Enhancement of availability of information on agricultural innovations.

Operational mode

ASARECA operates in a programme-based mode and through regional networking by bringing together agricultural research communities from NARIs, Universities, Farmer Organizations, IARCs, Extension Service Delivery Systems, NGOs and the Private Sector. All these organizations then work together to achieve demand-driven and result-oriented agricultural research in the sub-region.

ASARECA has developed a five-year Operational Plan (2008/09-2013) to implement its ten-year Strategic Plan (2007 - 2016) which shows the direction ASARECA intends to take for the coming decade. ASARECA's operational plan sets forth new governance and management structures and systems and the directions of programmes necessary and sufficient for the conduct and implementation of sub-regional projects in agricultural research, extension and training and education, mainly through greater involvement by stakeholders to focus research on needs and opportunities of sub-regional importance and promoting stakeholder ownership of the activities of ASARECA.

ASARECA has been in the process of change management and continues to restructure the management of the Secretariat and the Programmes in order to effectively and efficiently implement its regional projects and fulfil its Operational Plan. It follows a programme-based approach that led to the collapsing of the former 17 NPPs into seven new Technical Programmes based at the Secretariat. These include:

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

The management support units include:

1. Office of Deputy Executive Director for Programmes
2. Monitoring and Evaluation
3. Partnership and Capacity Development
4. Internal Audit
5. Financial Management
6. Administration and Human Resources
7. Procurement & Contracting
8. Information & Communication.

In order to meet its operational plan objectives, ASARECA has also developed a Performance Monitoring Plan (PMP) as its management tool to effectively monitor and evaluate its programmes and projects for performance based delivery of their outputs.

Financing

ASARECA receives assistance to finance its operations and programmes from grant contributions sponsored by member country institutions and international development partners (DPs) as detailed in the forgoing text. The contribution from development partners comes in two ways: 1) through the Multi-Donors Trust Fund (MDTF) which was established in 2008 by three DPs (EC, DFID and CIDA) to support ASARECA in a consolidated manner and is administered by the World Bank on behalf of the DPs and 2) other donors directly channelling their funding to ASARECA.

Report of the Directors

For the year ending 31 December 2012

Governing body and management structure

ASARECA is governed by a Board of Directors (BoD) comprised of the ten Director Generals of the National Agricultural Research Institutions of the member countries, which form the founding and core members. The others are ordinary members selected by appointment from stakeholders' groups representing one each from Farmers' Organizations, Universities, Extension & advisory service organizations, NGOs, private sector, COMESA, CGIAR Centres, NGOs and development partners' representatives.

The BoD is the highest organ and has the overall responsibility in the operations of ASARECA.

The BoD elects its Chairman and Vice Chairman from among the founding core members, whose term in office rotates on a two-year basis following defined sub-sub-regional groupings.

Board of Directors (BoD)

The current members of the ASARECA Board of Directors (BoD) include:

1	Dr Razafinjara Lala	Chairman, Director General – FOFIFA (Madagascar)
2	Dr Solomon Assefa	1 st Vice Chairman, Director General – EIAR (Ethiopia)
3	Dr Fidelis Angelo Myaka	2 nd Vice Chairman, Director – DRD (Tanzania)
4	Dr Jean Jacques Mbohigaba	Member, DG – RAB/Rwanda, up to July 2012
5	Dr Daphrose Gahakwa	Member, Deputy DG – RAB (Rwanda), from August 2012
6	Mr Dieudonne Nahimana	Member, Director General – ISABU (Burundi)
7	Dr Iyassu Ghebretatios	Member, Director General – NARI (Eritrea)
8	Dr Emily K. Twinamasiko	Member, Director General – NARO (Uganda)
9	Prof Paul Mafuka	Member, Director General – INERA (D.R. Congo)
10	Dr Ephraim A. Mukisira	Member, Director – KARI (Kenya)
11	Prof Adil Omer Salih	Member, Director General – ARC (Sudan)
12	Dr Leju George Lugor	Member, Director General – Research and Training MoAF (South Sudan)
13	Mr Philip Kiriro	Member, Farmers' Representative (President of Eastern Africa Farmers' Federation)
14	Dr Kallunde P. Sibuga	Member, Universities Representative, Sokoine University
15	Dr Chungu Mwila	Member, COMESA Representative, COMESA Secretariat
16	Dr Jimmy Smith	Member, CGIAR Centers Representative DG, ILRI
15	Prof Nafisa Elmahi Ahmed	Member, Extension Services Representative (Sudan)
16	Mr Richard Sahinguvu	Member, NGOs Representative (Burundi)
17	Mrs Lucy Muchoki	Member, Private Sector Representative (Kenya)
18	Ms Darran Belgrave	Member, Development Partners Representative (DFID-UK)
19	Dr Seyfu Ketema	Ex-Officio Member, Executive Director-ASARECA

Statement of management representation

The management of ASARECA is required to prepare financial statements which give a true and fair view of the state of affairs of the Association as it stands at the end of the financial year and of the operating results of ASARECA for that year. The management is also required to ensure that the Association keeps proper accounting records which disclose with reasonable accuracy at any time the financial position of ASARECA. They are also responsible for safeguarding the assets of the Association.

The management is responsible for the preparation and fair presentation of the financial statements in accordance with Section 4: Financial Management Policies & Guidelines as contained in the ASARECA Operations Manual (Version 1.0, 17 December 2009) and for such internal controls as the management determine are necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

The management accepts responsibility for the annual financial statements, which have been prepared using appropriate accounting policies supported by reasonable and prudent judgement and estimates in conformity with the requisite Financial Management Policies & Guidelines (Section 4) of ASARECA Operations Manual. Management is of the opinion that the financial statements give a true and fair view of the state of the financial affairs of ASARECA and its operating results. Management further accepts responsibility for the maintenance of accounting records which may be relied upon in the preparation of the financial statements, as well as adequate systems of internal financial control.

Nothing has come to the attention of the directors to indicate that the Association will not remain a going concern for at least the twelve months dated from the release of this statement.

The accompanying financial report is based on an audit by the independent audit firm of Deloitte & Touche and signed on behalf of ASARECA by:

Executive Director

21 March 2013

Head of Finance

21 March 2013

Independent auditors' report

To the Board of Directors of ASARECA

We have audited the financial statements of ASARECA set out on pages 9 to 26 which comprise the statements of their financial position as of 31 December 2012, statements of revenue and expenditure, statements of changes in fund reserves and statement of cash flows for the year then ended, together with the summary of significant accounting policies and other explanatory notes. The financial statements have been prepared by management in accordance with the ASARECA guidelines.

Directors' responsibility for the financial statements

The Association's directors are responsible for the preparation and fair presentation of these financial statements in accordance with ASARECA guidelines and for such internal control as the directors determine is necessary to enable the preparation and presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with International Standards on Auditing. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance as to whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment and include an assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we considered internal controls relevant to the association's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by directors, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, proper books of account have been kept by the Association and the financial statements, which are in agreement therewith, give a true and fair view of the state of affairs of the Association as of 31 December 2012 and of its surplus and cash flows for the year then ended in accordance with the accounting policies described in Note 1 of the financial statements and compliant with the ASARECA guidelines.

Basis of accounting and restriction on distribution and Use

Without modifying our opinion, we draw attention in Note 1 to the financial statements, which describe the basis of accounting. The financial statements have been prepared to comply with the Financial Management Policies and Guidelines of ASARECA. As a result, the financial statements may not be suitable for other purposes. Our report is intended for ASARECA and its partners. However, upon release by ASARECA, its distribution is unlimited.

Certified Public Accountants (Uganda)

09 April 2013

Kampala

Statement of financial position as of 31 December 2012

	Notes	2012 US \$	2011 US \$
Assets			
Non-current assets			
Property and equipment	2	523,990	203,407
		523,990	203,407
Current assets			
Cash at bank	3	5,741,676	8,051,162
Accounts receivable - NARI membership	4 (a)	181,000	201,787
Accounts receivable - Donors	4 (b)	130,723	175,707
Accounts receivable - Project sub-grantees	4 (c)	3,396,264	1,730,939
Accounts receivable - Others	4 (d)	5,091	259
		9,454,754	10,159,854
Total assets		9,978,744	10,363,261
Reserves and liabilities			
Capital reserves			
Investment in fixed assets	5 (a)	523,990	203,407
Capital reserve fund	5 (b)	713,245	920,216
Accumulated operating surplus	5 (c)	3,517,311	3,317,693
		4,754,546	4,441,316
Liabilities			
Accounts payable - donors	6 (a)	4,390,138	5,201,821
Accounts payable - others	6 (b)	224,733	470,961
Accruals and provisions	6 (c)	609,327	249,163
		5,224,198	5,921,945
Total reserves and liabilities		9,978,744	10,363,261

The financial statements on pages 9 to 26 were approved by the Board of Directors on 21 March 2013 and were signed on its behalf by:

Executive Director

Head of Finance

Statement of revenue and expenditure for the year ending 31 December 2012

	Notes	2012 US \$	2011 US \$
Revenue			
Income from donations	7 (a)	13,366,932	14,422,743
Membership Contribution	7 (b-i)	55,000	50,000
Other earned income	7 (b-ii)	268,660	199,912
Total revenue		13,690,592	14,672,655
Expenditure			
Governance and secretariat management	8(a)	2,458,571	2,149,564
Programme management support	8(b)	2,917,803	2,079,555
Technical programmes and networks	8(c)	7,990,558	10,232,897
Total expenditure		13,366,932	14,462,016
Surplus for the year		323,660	210,639

The financial statements on pages 9 to 26 were approved by the Board of Directors on 21 March 2013 and were signed on its behalf by:

Executive Director

Head of Finance

Statement of changes in fund reserves for the year ending 31 December 2012

	Capital reserve fund US \$	Accumulated operating surplus US \$	Total reserve Fund US \$
At 1 January 2011	949,086	3,204,192	4,153,278
Investment in fixed assets – 2010	(126,008)	-	(126,008)
Gain on disposal of assets	3,921	-	3,921
Surplus for the year	-	206,718	206,718
Capital charge transferred to capital fund	93,217	(93,217)	-
Investment in fixed assets – 2011	203,407	-	203,407
Status on 31 December 2012	1,123,623	3,317,693	4,441,316
At 1 January 2012	1,123,623	3,317,693	4,441,316
Investment in fixed assets – 2011	(203,407)	-	(203,407)
Gain on disposal of assets	11,939	-	11,939
Surplus for the year	-	311,721	311,721
Capital charge transferred to capital fund	112,103	(112,103)	-
Investment in fixed assets – 2012	523,990	-	523,990
Utilisation of reserve*	(331,013)	-	(331,013)
Status on 31 December 2012	1,237,235	3,517,311	4,754,546

*Part of the capital reserve fund (US\$ 331,013) was utilised to purchase leasehold land for the construction of the Secretariat head office in Entebbe.

Statement of cash flows for the year ending 31 December 2012

	2012 US \$	2011 US \$
Cash flows from operating activities		
Surplus for the year	323,660	210,639
(Increase)/decrease in current assets		
Accounts receivable – NARI members	20,787	20,762
Accounts receivable - Donors	44,984	(39,618)
Accounts receivable - Project sub-grantees	(1,665,325)	1,250,734
Accounts receivable - Others	(4,832)	(5,561)
	(1,604,386)	1,226,317
(Decrease)/Increase in current liabilities		
Accounts payable - donors	(811,683)	(271,648)
Accounts payable - others	(246,228)	162,114
Accruals and provisions	360,164	34,019
	(697,747)	(75,515)
Net cash flows from operating activities	(1,978,473)	1,361,441
Cash flows from investing activities		
Acquisition of assets	(331,013)	-
Net (decrease)/increase in cash and equivalents	(2,309,486)	1,361,441
Reconciliation of movement in cash and equivalents		
Balance as of 31 December	5,741,676	8,051,162
Less: Balance as at 1 January	(8,051,162)	(6,689,721)
Net cash (outflow)/inflow	(2,309,486)	1,361,441

Notes on the Financial Statements for the year ending 31 December 2012

1. Significant accounting policies

(a) Reporting compliance

The accounting policies applied in the preparation of the Financial Statements are in accordance with the ASARECA Financial Management policies and guidelines (Section 4 of ASARECA Operations Manual, Version 1.0, issued 17 December 2009).

(b) Accounting conventions

The Financial Statements are prepared under the historical cost convention and comply with ASARECA guidelines.

(c) Accounting methods

- i) ASARECA prepares its financial statements under the accrual basis of accounting, except for some specific donor agreements that require application on a modified cash basis.
- ii) Under the accrual method of accounting, revenue and costs are recognised when they are earned or incurred and recorded in accounting books, and reported in the financial statements of the period to which they relate.
- iii) Under the cash basis of accounting, revenue is recognised when received and expenditure is recognised when payment is made. For modified cash basis, year-end adjustments are made for obligations that have not been liquidated.

(d) Translation of currencies

- i) ASARECA's financial statements are presented in United States Dollars (USD). Values of assets and liabilities denominated in other currencies, other than USD, are translated to US Dollars using the market exchange rate applied by the bank at the time of transaction or during transfer of funds from the dollar account to local currency accounts.
- ii) Grants received in currencies other than USD are recoded at bank exchange rates in effect at the time the grant is received. For grants due and outstanding by the year end, the bank closing rate prevailing on 31 December is applied.

(e) Revenue recognition

- i) All donor grants to ASARECA are restricted and hence are recognised as income when actually expended and the unspent portion is deferred as donors' payable for the coming year depending on the duration of the project or activity. Income from donors is matched to the actual total expenditure of the programme projects and the operational costs that a donor supports. The grants recognised as income in the financial statement are equal to the actual expenditure incurred in the financial year.
- ii) Core grants from member institutions are recognised as income from membership contributions when the membership amount falls due.
- iii) Other earned incomes are recognised as income at the time of receipt, which includes Secretariat-generated incomes through providing services to third parties, interest earned from bank on Secretariat funds, discounts received from the service providers, administrative overhead charges on special projects, proceeds from the sale of ASARECA's properties and any other miscellaneous items.

(f) Fixed assets and capital charges

- i) Fixed assets are fully expended at initial acquisition, and are reported as capital expenditure in the income and expenditure statement in the year they are acquired.

- ii) The value of Fixed assets is stated in the Statement of Financial Position as net of used up value (depreciation) for memorandum purposes. The corresponding contra is reported as an investment in fixed asset accounts under capital reserve fund.
- iii) Capital charges (used-up value) on fixed assets are calculated on a straight line basis at annual rates estimated to write-off each asset over the term of its expected useful life and transferred to capital reserve fund accounts. The annual rates used are:

Motor vehicles	7 years	14.29%
Computers & printers	3 years	33.33 %
Office equipment	4 years	25.00 %
Office furniture	8 years	12.50 %
House furniture/equipment	8 years	12.50 %

(g) Fund balance

- i) Fund balance is a balance sheet account that represents the difference between the total value of assets and the total value of liabilities in the statement of the financial position of ASARECA.
- ii) ASARECA's fund balance is comprised of the capital reserve fund and the accumulated operating surplus.
 1. The **capital reserve fund** consists of the following:
 - i) **Capital fund** that represents funds reserved for future replacement and/or acquisition of fixed assets. The capital fund account is financed annually with funds from the operating fund that are equivalent to the used-up value of fixed assets (i.e., depreciation charge) for the financial year. Any gain or loss from disposal of fixed assets is also charged to the capital fund account.
 - ii) **Investment in fixed assets** – This is the contra account for the value of fixed assets acquired by the Secretariat. All fixed asset additions in the financial year shall be recorded as a contra entry to the investment in a fixed assets account for memorandum purposes. The fixed asset disposals and/or the used-up portion of the asset values are deducted from the investment in fixed assets account in order to show the actual value of the Investment.
 2. **Accumulated operating fund** represents the accumulated excess of earned income over expenditure at the end of the financial year less the used up value of assets or depreciation amount reserved for future replacement and/or acquisition of assets. Operating fund is derived from the Secretariat earned income from operations comprising of interest income, overhead income, discount and other miscellaneous income and exchange gains/losses net of any non-donor funded expenditure. Excess of income from donor funds over donor funded expenditure is not charged to the operating fund account, but to the donor's payable account as deferred income if the project is still on-going.

2. Property and equipment

COST	Land (leasehold)	Motor vehicles	Computers and printers	Office equipment	Furniture	Total
	US\$	US \$	US \$	US \$	US \$	US \$
As of 1 January 2011	-	131,011	238,450	234,127	12,988	616,576
Additions	-	113,714	50,526	6,375	-	170,615
Disposal	-	-	(6,160)	(5,888)	-	(12,048)
As of 31 December 2011	-	244,725	282,816	234,614	12,988	775,143
As of 1 January 2012	-	244,725	282,816	234,614	12,988	775,143
Additions	331,012	-	83,673	18,000	-	432,685
Disposal	-	-	-	-	-	-
As of 31 December 2012	331,012	244,725	366,489	252,614	12,988	1,207,828
Depreciation						
As of 1 January 2011	-	113,772	215,358	153,119	8,319	490,568
Charge for the year	-	24,770	30,290	37,457	700	93,217
Eliminated on disposals	-	-	(6,160)	(5,889)	-	(12,049)
As of 31 December 2011	-	138,542	239,488	184,687	9,019	571,736

	Land (leasehold)	Motor vehicles	Computers and printers	Office equipment	Furniture	Total
	US\$	US \$	US \$	US \$	US \$	US \$
As of 1 January 2012	-	138,542	239,488	184,687	9,019	571,736
Charge for the year	-	20,602	54,377	36,423	700	112,103
Eliminated on disposals	-	-	-	-	-	-
As of 31 December 2012	-	159,144	293,865	221,110	9,719	683,838
Net book value						
As of 31 December 2012	331,012	85,581	72,624	31,504	3,269	523,990
As of 31 December 2011	-	106,183	43,328	49,927	3,969	203,407

3. Cash and cash equivalents

Cash and cash equivalents comprise cash balances held in current accounts and short-term deposits and are both readily convertible to cash.

	2012 US \$	2011 US \$
Current accounts	3,225,355	5,548,875
Time deposits	2,516,321	2,502,287
	5,741,676	8,051,162

4. Accounts receivable

Receivables are carried at original historical cost of anticipated realisable values and are categorised under donors, member institutions and other institutions or suppliers.

a) Account receivables - Member NARIs:

Receivables from member institutions (NARIs) are membership fees that have not been paid by the member institutions by the end of the financial year:

	2012 US \$	2011 US \$
INERA – D R Congo	65,000	65,000
ISABU – Burundi	42,000	42,000
FOFIFA – Madagascar	47,080	42,080

Continued...

...Continued from page 75

RAB – Rwanda	-	30,787
ARC – Sudan	15,000	15,000
DRD – Tanzania	11,920	6,920
	181,000	201,787

b) Accounts receivable - Donors

Receivables from donors are grants which donors are obligated to pay and for which the required conditions have been fulfilled by ASARECA, but remain uncollected at the end of the financial year. The following were amounts due from donors as of 31 December:

	2012 US \$	2011 US \$
CIAT	-	71,151
USAID-East Africa	-	91,543
Greenwich University/NRI	-	13,013
IDRC	47,486	-
Kenya (EAAPP)	48,927	-
Uganda (EAAPP)	34,310	-
	130,723	175,707

c) Accounts receivable - Project sub-grantees

All funds disbursed to project sub-grantees but unaccounted for are treated as advances until accountability has been submitted and accepted by ASARECA.

Advances made to various sub-grant recipients of CGS and direct commissioned project implementing institutions whose accountabilities have not been received as of 31 December:

	2012 US \$	2011 US \$
KMUS Projects Sub-Grant advances – USAID	-	5,860
AGROBIO Project Advances – USAID	-	687
Staple Crops Project Advances – USAID	-	39,984
KMUS DONATA Project Advances - FARA	211,657	95,205
AGROBIO Project Advances – MDTF	389,655	42,478
PAAP Project Advances – USAID	-	10,812
Staple Crops Project Advances – MDTF	810,230	292,736
Non-Staple Crops Project Advances – MDTF	200,834	367,679
Livestock & Fisheries Project Advances - MDTF	850,555	484,943
NRM & Forestry Project Advances – MDTF	308,175	225,757
PAAP Project Advances – MDTF	130,913	21,423
Up-Scaling & KM Project Advances – MDTF	494,245	143,375
	3,396,264	1,730,939

d) Accounts receivable - Other

Other receivables are advances or collectable debts that include advances to staff and suppliers or any other third parties during the financial year and whose obligations have not been met as of 31 December:

	2012 US\$	2011 US\$
Staff advances	5,084	-
Sundry debtors	7	259
	5,091	259

5. Reserves

ASARECA's reserves comprise the capital reserve fund (investment in fixed assets and capital fund) and the accumulated operating surplus.

a) Investment in fixed assets

This is the contra account for the value of fixed assets acquired by the Secretariat. The movement in the balance is as follows:

	2012 US\$	2011 US\$
As of 1 January	203,407	126,008
Acquisitions made during the year	432,686	170,616
Disposals/write offs	-	-
Capital charges	(112,103)	(93,217)
As of 31 December	523,990	203,407

b) Capital fund

Represents funds reserved for future replacement and/or acquisition of fixed assets. The movement in the fund is as follows:

	2012 US\$	2011 US\$
As of 1 January	920,216	823,078
Acquisitions of land	(331,013)	-
Proceeds from disposal	11,939	3,921
Capital charges	112,103	93,217
As of 31 December	713,245	920,216

c) Accumulated operating surplus

Represents excess of income earned over expenditure at the end of the financial year less the used up value of assets. The movement in the fund is as follows:

	2012 US\$	2011 US\$
As of 1 January	3,317,693	3,204,192
Operating surplus	311,721	206,718
Transfer to capital reserve fund	(112,103)	(93,217)
As of 31 December	3,517,311	3,317,693

6. Accounts payable

The accounts payable consist of donor funds unutilised, value of services and/or materials received from third parties who are entitled to repayment of amounts equivalent to what they have provided during the financial year.

a) Accounts payable – Donors

These include grants received in advance during the year for projects yet to start or unexpended donor fund balances that are either refundable to donors for completed projects or deferred grant funds for on-going projects and operations.

These include unexpended grants received from donors during the year, those whose obligations have not yet been fulfilled, and funds received in advance for the subsequent year.

	2012 US\$	2011 US\$
SIDA-Sweden	77,427	28,067
FARA-AfDB (DONATA)	749,654	351,381
World Bank – MDTF	3,385,013	4,361,051
IDRC	-	78,608
Uganda-EAAPP	-	114,459
IFPRI	-	4,761
CIMMYT (ACIAR)	156,235	113,409
Ethiopia-EAAPP	5,406	28,322
Kenya-EAAPP	-	34,313
Tanzania-EAAPP	16,403	87,450
	4,390,138	5,201,821

b) Accounts Payable - Other

Other accounts payable represent benefits of employees that require reimbursement and amounts due to third parties for services rendered or materials supplied, for which payments have not been made.

	2012 US\$	2011 US\$
Sub-grants payable	70,679	82,088
Other/Sundry	147,587	387,391
NSSF payable	6,467	1,482
	224,733	470,961

c) Accruals and provisions

Accruals represent amounts due at the end of the year as a result of services already received but for which payment has not been made, while provisions are estimates of amounts due for services already received, but the exact cost of which is unknown.

- i) ASARECA is providing gratuity (a defined contribution scheme) covering eligible employees as stipulated in Human Resources Policy and staff employment contracts. Gratuity represents staff entitlements in lieu of pension and is based on the respective employees' salary and tenure of employment. The provision for staff gratuity is expensed on a monthly basis and accrued/credited to each staff's personal account and reported in the financial statement.

Gratuity is payable in arrears at two year intervals, coinciding with the end of two years contract tour.

- ii) Severance pay is an entitlement to staff accrued annually on the basis of one month basic salary for each completed year of service up to a maximum of six years (even if the staff member has served for more than six years) and is payable only at the time of staff separation from service with ASARECA. The board instituted this benefit in the current year.

	2012	2011
	US\$	US\$
Staff accrued gratuities (i)	253,081	249,163
Staff severance pay (ii)	356,246	-
	609,327	249,163

7) INCOME

a) Income from donations

	Funds available US\$	Accounts receivable US\$	Carry-over to 2013 US\$	2012 Net grant US\$	2011 Net grant US\$
Development partners					
World Bank – MDTF	14,701,699	-	3,385,013	11,316,686	9,663,796
USAID-EA	54,439	-	-	54,439	2,690,357
FARA/AfDB (DONATA)	1,446,225	-	749,654	696,571	866,391
SIDA-Sweden	274,880	-	77,427	197,453	180,851
IDRC	100,750	47,486	-	148,236	40,129
Greenwich University/DFID	-	-	-	-	354,520
Greenwich University/NRI	-	-	-	-	77,413
CIMMYT (ACIAR)	543,809	-	156,235	387,574	200,941
Ethiopia - EAAPP	108,323	-	5,406	102,917	83,280
Kenya – EAAPP	114,313	48,927	-	163,240	74,649
Tanzania - EAAPP	167,450	-	16,403	151,047	58,652
Uganda - EAAPP	114,459	34,310	-	148,769	77,652
FARA – UniBrain	-	-	-	-	24,599
IFPRI	-	-	-	-	14,563
ILRI (CCAFS)	-	-	-	-	14,441
Global Crop Diversity Trust	-	-	-	-	508
Total donations	17,626,349	130,723	4,390,138	13,366,932	14,422,742

b) Membership fees and other earned income

	Funds received US\$	Accounts receivable US\$	Carry-over to 2013 US\$	2012 Net grant US\$	2011 Net grant US\$
i) NARI membership fees					
ISABU - Burundi	5,000	-	-	5,000	5,000
INERA - Congo, D R	5,000	-	-	5,000	5,000
NARI - Eritrea	5,000	-	-	5,000	5,000
EIAR - Ethiopia	5,000	-	-	5,000	5,000
KARI - Kenya	5,000	-	-	5,000	5,000
FOFIFA - Madagascar	-	5,000	-	5,000	5,000
RAB - Rwanda	5,000	-	-	5,000	5,000
ARC - Sudan	5,000	-	-	5,000	5,000
MoAF- South Sudan	5,000	-	-	5,000	-
DRD - Tanzania	5,000	-	-	5,000	5,000
NARO - Uganda	5,000	-	-	5,000	5,000
Total membership fees	50,000	5,000		55,000	50,000

	2012 US\$	2011 US\$
ii) Other earned incomes:		
Interest income	10,883	6,732
Overhead income	218,955	141,185
Discount and miscellaneous	24,816	46,584
Exchange gain/loss	2,066	1,490
Sales proceeds	11,939	3,921
Total other earned income	268,659	199,912

8) Expenditure

a) Governance and Secretariat management:

	2012 US\$	2011 US\$
Board of Directors	217,906	566,415
Executive Director's office	862,305	354,722
Financial management unit	401,503	287,888
Administration and Human Resources	288,363	369,036
Information & Communications	538,062	447,169
Procurement & Contracting	150,432	124,334
Total governance and management	2,458,571	2,149,564

b) Programme support unit:

	2012 US\$	2011 US\$
Deputy Executive Director's office		
Coordination/operations	400,495	249,057
Project activities	358,548	412,138
Capital expenditure	6,975	1,514
	766,018	662,709
Monitoring & Evaluation		
Coordination/operations	178,859	125,072
Project activities	195,119	180,020
Capital expenditure	5,903	847
	379,881	305,939
EAAP		
Coordination/operations	133,468	-
Project activities	427,398	-
Capital expenditure	5,107	-
	565,973	-
Partnerships & capacity development		
Coordination/operations	185,966	183,119
Project activities	1,015,176	927,788
Capital expenditure	4,789	-
	1,205,931	1,110,907
Total programme management support	2,917,803	2,079,555

c) Programmes and networks:

	2012 US\$	2011 US\$
Staple crops		
Coordination/operations	241,908	205,222
Project activities	963,586	1,422,543
Capital expenditure	5,724	1,673
	1,211,218	1,629,438
High value non-staple crops		
Coordination/operations	84,930	144,028
Project activities	552,571	506,405
Capital expenditure	919	3,300
	638,420	653,733
Livestock & Fisheries		
Coordination/operations	190,606	183,718
Project activities	1,463,104	1,597,521
Capital expenditure	4,681	3,144
	1,658,391	1,784,383
Agrobiodiversity and Biotechnology		
Coordination/operations	217,704	196,056
Project activities	378,146	1,283,089
Capital expenditure	2,589	3,646
	598,439	1,482,791
EAPGREN		
Coordination/operations	184,234	152,886
Project activities	13,219	-
Capital expenditure	-	28,473
	197,453	181,359
NRM & Biodiversity		
Coordination/operations	172,328	133,174
Project activities	833,435	1,099,138
Capital expenditure	1,365	2,405
	1,007,128	1,234,717
	2012	2011
	US\$	US\$
PAAP		
Coordination/operations	313,400	276,931
Project activities	495,559	1,357,936
Capital expenditure	2,287	1,281
	811,246	1,636,148
Knowledge management & up-scaling		
Coordination/operations	209,030	161,449
Project activities	1,652,404	1,468,879
Capital expenditure	6,829	-
	1,868,263	1,630,328
Total technical research programmes	7,990,558	10,232,897
Total expenditure	13,366,932	14,462,016

Programme expenditure and funding sources (by donors): Summary

For the year ending 31 December 2012

Appendix-I

CC/Programmes and donors	2012 B/B/F US\$ A	Funds received in 2012 US\$ B	Funds receivable for 2012 US\$ C	2012 Total grant funds US\$ D=A+B+C	2012 Actual expenditure US\$ E	Balance carry over to 2013 US\$ F=D-E
USAID-EA (Phase-II):	-	54,439	-	54,439	54,439	-
Financial Management Unit	-	1,374	-	1,374	1,374	-
Administration & HRD unit	-	2,089	-	2,089	2,089	-
Staple Crops Program	-	39,853	-	39,853	39,853	-
Agro-Biodiversity & Biotech	-	8,723	-	8,723	8,723	-
Knowledge management & up-scaling	-	2,400	-	2,400	2,400	-
World Bank – MDTF	4,361,051	10,340,649	-	14,701,700	11,316,686	3,385,014
Board of Directors	39,395	262,404	-	301,799	217,906	83,893
Executive Director's Office	115,612	833,488	-	949,100	845,145	103,955
Financial Management Unit	17,026	355,920	-	372,946	400,132	(27,186)
Administration & HRD Unit	36,747	239,134	-	275,881	286,274	(10,393)
Information & Communications	86,549	506,730	-	593,279	402,122	191,157
Procurement and contracting	-	154,900	-	154,900	150,432	4,468
Deputy Executive Director's Off.	53,290	1,047,650	-	1,100,940	766,018	334,922
Monitoring & Evaluation	221,545	422,005	-	643,550	333,768	309,782
Partnerships & Capacity Development	199,537	973,468	-	1,173,005	1,205,931	(32,926)
Staple Crops Program	473,293	1,280,874	-	1,754,167	1,171,365	582,802
High Value Non-Staple Crops	496,677	297,173	-	793,850	638,420	155,430
Livestock & Fisheries Program	1,089,347	855,708	-	1,945,055	1,658,391	286,664
Agro-Biodiversity & Biotech	265,313	798,934	-	1,064,247	589,716	474,531
NRM & Biodiversity Program	252,887	995,569	-	1,248,456	876,301	372,155
Policy analysis & advocacy	210,647	720,583	-	931,230	748,389	182,841
Knowledge management & up-scaling	630,252	596,107	-	1,226,359	1,009,216	217,143
HQ building	172,934	-	-	172,934	17,160	155,774
SIDA-Sweden:	28,067	246,813	-	274,880	197,453	77,427
EAPGREN	28,067	246,813	-	274,880	197,453	77,427
FARA (DONATA)	351,381	1,013,139	-	1,364,520	696,571	667,949
Information & comm. unit	7,013	208,208	-	215,221	135,939	79,282
Up-scaling & Knowledge mgmt	344,368	804,931	-	1,149,299	560,632	588,667
FARA (UniBrain)		81,705	-	81,705	-	81,705
Partnerships & capacity dev.		81,705	-	81,705	-	81,705

Appendix-I

CC/Programmes and donors	2012	Funds	Funds	2012	2012	Balance
	B/B/F	received	receivable	Total grant	Actual	carry over
	US\$	in 2012	for 2012	funds	expenditure	to 2013
A	US\$	US\$	US\$	US\$	US\$	US\$
	A	B	C	D=A+B+C	E	F=D-E
IDRC	78,608	22,142	47,486	148,236	148,236	-
Policy analysis & advocacy	7,631	22,142	47,486	77,259	17,410	59,849
NRM and Biodiversity	70,977	-	-	70,977	130,826	(59,849)
IFPRI	4,761	(4,761)*	-	-	-	-
Policy analysis & advocacy	4,761	(4,761)	-	-	-	-
Ethiopia-EAAPP	28,322	80,000	-	108,322	102,917	5,405
Partnerships & capacity development	28,322	80,000	-	108,322	102,917	5,405
Kenya-EAAPP	34,313	80,000	48,927	163,240	163,240	-
Partnerships & capacity development	34,313	80,000	48,927	163,240	163,240	-
Tanzania-EAAPP	87,450	80,000	-	167,450	151,047	16,403
Partnerships & capacity development	87,450	80,000	-	167,450	151,047	16,403
Uganda-EAAPP	114,459	-	34,310	148,769	148,769	-
Partnerships & capacity development	114,459	-	34,310	148,769	148,769	-
CIMMYT-ACIAR	113,409	430,400	-	543,809	387,574	156,235
Monitoring & Evaluation	-	85,000	-	85,000	46,113	38,887
Knowledge Mgmt & up-scaling	5,971	84,029	-	90,000	45,448	44,552
Policy analysis & advocacy	107,438	261,371	-	368,809	296,013	72,796
Total funding/expenditure	5,201,822	12,424,525	130,723	17,757,070	13,366,932	4,390,138

*This amount was written off in 2012

Annex 2

Communication material

Electronic newsletters

The following electronic newsletters were published during the review period.

List of Electronic Newsletters

	Date (2013)	Issue	Title
1.	25 Jan	1	State of food and agriculture: why investment by farmers is key for the future
2.	8 Feb	2	Formulating nutrition policies in developing countries: the issues involved
3.	22 Feb	3	Factors influencing the adoption of soil erosion control technologies
4.	8 March	4	A change of guard: ASARECA gets its first woman executive director
5.	22 March	5	Policies on pastoralism and biodiversity in the east African drylands
6.	5 April	6	Water security and the global water agenda: an analytical brief
7.	19 April	7	Impact of off-farm income on technology adoption, intensity and productivity
8.	3 May	8	Opportunities for Africa in unlocking the vast potential of agribusiness
9.	17 May	9	Food price volatility in Africa: has it really increased or it is speculation?

Journal Articles

- Nakato, V., Beed F., Ramathani, I., Kubiriba, J., Rwomushana, I. and Opio F. (2013). Risk of banana Xanthomonas wilt spread through trade. *Journal of Crop Protection* 2 (2): 151-161.
- Kassa, Y., Asea, G., Demissew, A.K., Ligeyo, D., Demewoz, N., Saina, E., Serumaga, J., Twumasi-Afryie, S., Opio, F., Rwomushana, I., Gelase, N., Wondimu, F., Solomon, A., Habtamu, Z., Andualem, W., Bayisa, A., Habte J. and Mduruma Z (2012). Stability in Performance of Normal and Nutritionally enhanced Highland Maize Hybrids in Eastern Africa. *Asian Journal of Plant Sciences* 10: 1-10.
- Kinyau, M., Ley, G.J, Hella, J.P, Tenge, A.J., Opio, F. and Rwomushana, I. (2013). Economic analysis of rice legume rotation systems in Morogoro, Tanzania. *International Journal of Agricultural Policy and Research* 1 (2): 41-47
- Mulwa, R., Wafula, D., Karembu, M., and Waithaka, M. (2013). Estimating the Potential Economic Benefits of Adopting Bt Cotton in Selected COMESA Countries. *AgBioForum*, 16(1): 14-26. ©2013 AgBioForum
- Barungi, M., Ng'ong'ola, D.H, Edriss, A., Mugisha, J., Waithaka, M., and Tukahirwa, J. (2013). Factors Influencing the Adoption of Soil Erosion Control Technologies by Farmers along the Slopes of Mt. Elgon in Eastern Uganda. *Journal of Sustainable Development* 6(2) 2013. ISSN 1913-9063 E-ISSN 1913-9071.
- Kimani, P.M., Narla, R.D Ugen,, M.A. Musoni, A. and Onyango, C. (2013). Breeding snap bean for multiple disease resistance, pod quality and pod yield in eastern Africa. *African Crop Science Journal* (submitted).
- Orende, J. and Kimani, P.M. (2013). Screening for drought resistance in small seeded common beans. *East African Agricultural and Forestry Journal* (accepted: April 2013).
- Kimani, P.M. et al. (2013). Breeding drought tolerant bean varieties in eastern Africa. *East African Agricultural and Forestry Journal* (Accepted: April 2013).

Prepared manuscripts

1. Tenge, A.J., Ley, G. J., Hella, J.P., Kinyau, M., Opio, F. and Rwomushana, I. Strategies for Improving Adoption of Lowland Rice - Legume Technologies. *Journal of Sustainable Development*.
2. Mulungu, L.S., Mrosso, F.P., Mdangi, M.E., Sheyo, P.M., Ngowo, V., Mchomvu, M., Katakweba A., Tesha, P.P.H., Ley, G.J., Tenge, A.J., Opio, F. and Rwomushana, I. Rodent population dynamics in lowland rice fields: A case from Mvomero District, Tanzania. *Journal of Crop Protection*.
3. Kinyua, Z.M., Schulte-Geldermann, E., Namugga, P., Muriithi, W.M., Kinoti J., Ong'ele, J.A., Ochieng-Obura, B., Tindimubona, S., Bararyenya, A., Kashaija, I.N., Kimoone G., Oyena, D. Rwomushana I. and Opio. F. Adaptation and improvement of the seed-plot technique in smallholder potato production. *East African Agriculture and Forestry Journal*.
4. Karugia, J., Wanjiku, J., Waithaka, M. and Babu, S. Persistence of high food prices in Eastern Africa: What role for policy? *Food Policy Special issue on food prices*.
5. Yirga, C., Waithaka, M., Kyotalimye, M., Gorfu, B. Community participatory sustainable land management byelaw formulation in the highlands of central Ethiopia. *African Crop Science Journal*.
6. Karugia, J., Wanjiku, J., Wambua, J., Nzuma, J. and Kirui, O.. Coping with food price volatility in Kenya: Policy implications. <http://www.kippra.org/FAQs/congratulation-to-call-for-papers-winners.html>
7. Kimani, P.M *et al.* Validation of New Disease Snap bean candidate varieties and Integrated Crop Management technologies in Eastern Africa.
8. Kimani, P.M. *et al.* New disease snap bean candidate varieties for Eastern Africa.
9. Kimani, P.M. *et al.* Snap bean improvement research at UON.
10. Kimani, P.M *et al.* Breeding bush and climbing snap beans for multiple disease resistance, pod quality and pod yield for sub-Saharan Africa.
11. Warsame, A.O., Kimani P.M. and Mwangi J.W.. Variation and selection for cooking time in drought tolerant canning beans.
12. Warsame, A.O., Kimani P. M. and Mwangi J.W.. Selection for multiple disease resistance in canning beans.
13. Kimani P.M. *et al.* Advances in breeding bean for drought tolerance and canning quality in Kenya.
14. Kimani, P.M *et al.* Breeding bean for Nutritional quality, Drought tolerance and Productivity in Kenya.
15. Kimani, P.M. *et al.* Seed Delivery Systems in Eastern Africa: A synthesis.
16. Kimani, P.M *et al.* Breeding beans for drought tolerance, multiple disease resistance, nutritional and canning quality in Kenya.

Other publications (produced by ASARECA staff)

1. Wanjala, B.W., Obonyo, M., Wachira, F.N., Muchugi, A., Mulaa, M., Harvey, J., Skilton, R.A., Proud, J. and Hanson, J. (2013). Genetic diversity in Napier grass (*Pennisetum purpureum*) cultivars: Implications for breeding and conservation. *AoB Plants*, 5: plt022; doi:10. 1093/aobpla/plt022.
2. Koech K. R., Wachira F. N., Ngure R. M., Orina I. A., Wanyoko J. K., Bii C. and Karori S. M. (2013). Antifungal activity of crude tea extracts. *African Journal of Agricultural Research*, 8(19): 2086-2089.
3. Kerio, L.C., Wachira, F.N., Wanyoko, J.K. and Rotich, M.K. (2013). Total polyphenols, catechin profiles and antioxidant activity of tea products from purple leaf coloured purple tea cultivars. *Food Chemistry*, 136: 1405-1413.
4. Moseti, K.O., Wanyoko, J.K., Kinyanjui, T. and Wachira, F.N. (2013). Extractability of fluoride into black tea liquors, Kenya. *International Journal of Environmental Protection*, 3 (5): 14-19.

5. George, K.O., Kinyanjui, T., Wanyoko, J., Moseti, K.O. and Wachira, F.N. (2013). Extraction and analysis of tea (*Camellia sinensis*) seed oil from different clones. *African Journal of Biotechnology*, 12(8): 841-846.
6. Njuguna, D.G., Wanyoko, J.K., Kinyanjui, T. and Wachira, F.N. (2013). Mineral elements in Kenyan tea seed oil cake. *International Journal of Research in Chemistry and Environment*, 3: 253-261.
7. Wambulwa, M.C., Wachira, F.N., Karanja, L.S., Kiarie, S.M. and Muturi, S.M. (2013). The influence of host and pathogen genotypes on symptom severity in Banana Streak Disease. *African Journal of Biotechnology*, 12: 27-31.

Manuals and field guides

1. Training manuals on pasture establishment, management, storage and utilisation.
2. Training manual on heat detection in cattle.
3. A farmer guide manual titled *Improving livelihoods in smallholder crop-livestock farming systems in ECA: A catalogue of proven and practical climate smart agricultural technologies and innovations*.
4. EDRI 2013. Training manual on food price analysis, data management, and SPSS use.
5. IITA 2013a. Quality training manual for production of fresh sweet cassava, cassava flour, dried chips, crisps and determination of total cyanogens.
6. IITA 2013b. Quality training manual for production of fresh potato tubers (ware potato), potato crisps, potato chips and frozen potato.
7. IITA 2013 c. A standard manual on harmonised EA cassava products.
8. IITA 2013d. A standard manual for harmonised EA potato products.

Documentaries

The following documentaries were prepared during the review period.

List of Documentaries

Documentary	Theme	No.	Countries
DVD (+ CD)	A video documentary on climate-smart agricultural technologies and innovations in Ngora district	1	Uganda
Radio spot messages and television	TV programme on climate smart agricultural technologies and innovations in Ngora district	1	Uganda

Posters / leaflets / fliers

1. Brochure on heat detection in cattle.
2. The potential of calcium-bentonite as a mineral supplement in small holder dairy systems.
3. Harnessing crop-livestock integration to enhance food security and livelihood resilience in ECA: Key outputs and impacts.
4. Farmers' uptake and utilisation of vegetable processing technologies in ECA: A case of farmers in Ngora and Masaka districts of Uganda.

General reports (workshops, annual reports, conference papers, conference proceedings, etc)

1. Mitaru, B., Mgonja, M., Rwomushana, I. and Opio, F. Eds. (2012). Integrated sorghum and millet sector for increased economic growth and improved livelihoods in Eastern and Central Africa. Proceedings of the ECARSAM stakeholders conference, ASARECA. 184pp
2. Matiri, F.M., Kagunyu, A.W. and Kwena K. (2013). Critical analysis of strategic documents in the context of policies on Integrated Watershed Management in Kenya. Paper presented at 13th KARI Biennial Scientific Conference, 22-26 October 2012, KARI Headquarters Complex, Nairobi, Kenya.
3. Alusa, L., Kwena, K., Wafula, J., Ruto, R., Nyamwaro, S., Ariithi, C.C.K., Ogama, S.O., Nzombe, N., Mutuoki, T. and Rao. K.P.C. (2013). Factors influencing adoption of agricultural productivity enhancing technologies in semi-arid lower eastern Kenya. Paper presented at 13th KARI Biennial Scientific Conference, 22-26 October 2012, KARI Headquarters Complex, Nairobi, Kenya.
4. Wafula, J., Kwena, K., Nyamwaro, S.O., Ruto, R., Nzombe, N., Ariithi, C.C.K. and Alusa, L (2013). Opportunities for agricultural value chain research in integrated management of water for productivity and livelihood security under variable and changing climatic conditions in lower eastern Kenya. Paper presented at 13th KARI Biennial Scientific Conference, 22-26 October 2012, KARI Headquarters Complex, Nairobi, Kenya.
5. Nyamwaro, S.O., Kwena, K., Ruto, R., Wafula, J., Alusa, L., Nzombe, N., Mutuoki, T. and Ogama S. (2013). Status of livestock resources constraints and opportunities for productivity and livelihood security under variable and changing climatic conditions in Mwanja watershed of Machakos District, Kenya. Paper presented at 13th KARI Biennial Scientific Conference, 22-26 October 2012, KARI Headquarters Complex, Nairobi, Kenya.

Newspaper articles (including website articles)

1. New Vision Wednesday, 20 February 2013. "2,500 farmers to benefit from World Bank project. Inception workshop for standards project".
2. Monitor Wednesday, 20 February 2013. "Standards set for cassava and potato". <http://www.monitor.co.ug/Magazines/Farming/Standards-set-for-cassava-and-potato/-/689860/1698846/-/pdsg1n/-/index.html>

Acronyms and abbreviations

AfDB	African Development Bank
AGROBIO	Agro-biodiversity and Biotechnology Programme
ARC	Agricultural Research Corporation (Sudan)
CGIAR	Consultative Group for International Agricultural Research
CGS	Competitive Grant Scheme/System
CIAT	International Centre for Tropical Agriculture
CIDA	Canadian International Development Agency
CIMMYT	International Maize and Wheat Improvement Centre
DFID	Department of International Development of the United Kingdom
DONATA	Dissemination of New Agricultural Technologies in Africa
DRD	Department of Research and Development of Ministry of Agriculture (Tanzania)
EAAPP	East African Agricultural Productivity Programme
EAPGREN	Eastern Africa Plant Genetic Resources Network
EIAR	Ethiopian Institute of Agricultural Research (Ethiopia)
EU	European Union
FARA	Forum for Agricultural Research in Africa
FOFIFA	Centre Nationale de Recherche Agronomique pour le Developement Rurale (Madagascar)
IARCs	International Agricultural Research Centres
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
INERA	Institut Nationale pour L'Etude et la Recherche Agronomiques (Congo, D R)
ISABU	Institut des Sciences Agronomiques du Burundi (Burundi)
ISAR	Institut des Sciences Agronomiques du Rwanda (Rwanda)
KARI	Kenya Agricultural Research Institute (Kenya)
M&E	Monitoring & Evaluation
MDTF	Multi-Donor Trust Fund
NARI	National Agricultural Research Institute (Eritrea)
NARO	National Agricultural Research Organization (Uganda)
NPPs	Networks, Programmes and Projects
NRI	Natural Resources Institute
NRM	Natural Resources Management
NGOs	Non-Governmental Organizations
OFSP	Orange-Flesh Sweet Potato
PAAP	Policy Analysis and Advocacy Programme
RAB	Rwanda Agricultural Board
SCARDA	Strengthening Capacity for Agricultural Research and Development in Africa
SIDA	Swedish International Development Cooperation Agency (Sweden)
UoG	University of Greenwich
USAID-EA	United States Agency for International Development, East Africa Regional Office



About ASARECA

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

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

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



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