

**DEPARTMENT OF CROP SCIENCE, FACULTY OF
AGRICULTURE MAKERERE UNIVERSITY**



IN COLLABORATION WITH

**THE REGIONAL UNIVERSITY FORUM FOR
CAPACITY BUILDING IN AGRICULTURE RU
FORUM**



**PROJECT DOCUMENT FOR REGIONAL MASTERS
AND PHD PROGRAMMES IN PLANT BREEDING
AND BIOTECHNOLOGY**

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ABBREVIATIONS AND ACRONYMS

AR4D	Agricultural Research for Development
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BECA	Bio-Sciences East and Central Africa
BIO-EARN	Regional Programme and Research Network for Biotechnology and Bio-safety and Bio-policy Development
CGIAR	Consultative Group on International Agricultural Research
CAADP	Comprehensive Africa Agricultural Development programme
FAO	Food and Agriculture Organisation of the United Nations
FARA	Forum for Agricultural Research for Africa
FAAP	Framework for African Agricultural Productivity
IAR4D	Integrated Agricultural Research for Development
ICTs	Information and Communication Technologies
ILRI	International Livestock Research Institute
NARI	National Agricultural Research Organisation
NACRRI	National Crops Resources Research Institute
NARS	National Agricultural Research Systems
NARLI	National Agricultural Research Laboratories Institute (NARLI),
NEPAD	New Partnership for Africa's Development
NGO	Non-Government Organisation
MAK	Makerere University, Kampala
MUIENR	Makerere University Institute of Environment and Natural Resources
PRSP	Poverty Reduction Strategy Papers
RAAB	Regional Academic Advisory Board
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
RUPBBS	RUFORUM plant breeding, biotechnology and seed systems strategy
SCARDA	Strengthening Capacity for Agricultural Research and Development in Africa
SROs	Sub-Regional Organisations
SSP-CP	Sub-Saharan Africa-Challenge Programme

EXECUTIVE SUMMARY

Background

The RUFORUM Plant Breeding, Biotechnology and Seed Systems Strategy (RUPBBS) is an implementation framework for building regional capacity in Plant breeding, biotechnology and Seed systems. RUPBBS has been developed by RUFORUM in conjunction with its member universities and National Forums. RUPBBS is one of the regional strategies developed to implement regional training programmes by RUFORUM and network universities. All RUFORUM regional programmes have been developed following a review process among the member universities. (For details see www.ruforum.org).

The review process identified key competence and capacity gap areas that needed strengthening. It also identified member universities that could be used as leaders to train for the wider region. Together with the leaders, RUFORUM has now developed regional capacity building programmes. The regional programmes so far being developed include the following.

- Natural Resource Economics;
- Dryland Resources Management;
- Plant Breeding and Biotechnology and Seed systems;
- Biometrics and Research Methodology;
- Fisheries and Aquaculture.

Thus the proposed undertaking of implementing MSc and PhD in Plant breeding, biotechnology and seed systems is one of the initiatives being piloted in east and southern Africa.

Niche Description

These programmes are being proposed against a background that there is a real need in the region that needs to be filled. The proposed action will complement other efforts in the region to train plant breeders such as at the African Center for Crop Improvement (ACCI) at the University of KwaZulu Natal and the East African Regional Programme and Research Network for Biotechnology and Bio-safety and Bio-policy Development (BIO-EARN). The proposed training have the following niche features

- It aims at integrating plant breeding seed systems and biotechnology at PhD and MSc level using local crops and facilities in the region.
- The focus is on identified regional constraints such as those identified by the Sub-Saharan Africa regional research organisations (ASARECA, SADC and CORAF), and national programmes.
- The programmes aim at rationalizing existing resources in the region by sharing existing human resources and infrastructure for training and research for development. Accordingly, the programmes have been developed by a regional consortium of universities who will own and implement it. They may, when own capacity is built, adopt them to their own universities. There is also an element of credit transfer among universities is in built to strengthen regionality.
- It is built on a model that aims at strengthening national institutions (universities and NARS) to respond to challenges.
- The goal is to produce “well-grounded” plant breeders, knowledgeable and with skills to work in private and public sectors as researchers, trainers and policy advisors.

Results/outputs of RUPBBS

RUPBBS primarily draws its agenda from the RUFORUM Strategic Plan which lays out the scope and scale of RUFORUM's mandate in training, research and possible roles in analysis and advocacy as laid out in FAAP and other continental documents.

Goal: “ *To develop and strengthen the human resources and research capacity for Crop improvement and related development areas in sub-Saharan Africa but with particular emphasis on East, Central and Southern African countries.*”

Results/Outputs. RUPBBS will have the following outputs:

1. Regional programmes (Curricula and implementation modalities for plant breeding, Biotechnology and Seed Systems) at MSc and PhD levels developed.
2. A Regional network of RUFORUM human resources mobilized and activated to run high quality MSc and PhD graduate programmes at Makerere.
3. A pool of Scientists with capacity and competences to engage with stakeholders trained.
4. The capacity of Makerere University to undertake quality Plant breeding and biotechnology research for development while engaging with other stakeholders strengthened.
5. Makerere University agricultural education and training empowered to match the capacity building offered to changing market demand through National Forum activities.
6. The RUPBBS approach for capacity strengthening is documented, validated with and owned by key stakeholders.

Conceptual framework of RUPBBS

It is envisaged that all these interventions shall be implemented in a learning framework that permits the capture, up- and out-scaling of lessons from national to regional level. The model is built on a key goal of assuring achievement of results. It is also based on consultation undertaken during the programme development phase. The key attributes of the models include:

1. Selection of student research areas that are anchored in the NARO and or other NARS research programmes.
2. Strong theoretical and practical aspects involving both public and private sector institutions.
3. Regional quality assurance by the RAAB but local management by the host
4. Involvement of regional actors in training and supervision.

Activity schedules

The RUPBBS is designed to deliver interventions that will build capacity for the region initially over a six year period. The RUPBBS is based on the principle of building capacity for capacity building. This means two types of capacities will be developed, i) MSc level training for the NARS and as pipeline to PHD programmes and ii) the PhD programmes for mainly university staff. To achieve such a this requires well-designed delivery of unique suite of training programmes that ensure learning, as well as up and out-scaling of lessons.

Scope within RUFORUM results

All the RUPBBS outputs are built upon the RUFORUM results that provide the over-arching guidance of any project intervention in the sub-region. RUPBBS outputs 1, 2 and 3 are built into the RUFORUM results 1, 2, 3 and 4 respectively. The RUFORUM results within which the RUPBBS results are anchored are (1) Responsive training, (2) Rationalized facilities, (2) Innovative structures, and (4) Impact-oriented research.

Management and governance

Governance and organisational structure. The programme will be governed at three levels

- a) Host institutions level. A management committee comprised of the Dean or his representative, Hosting department Head, project coordinator and two people (one from partner institute (NARI) or private sector person. The programmes shall also report directly to the senate of Makerere University.
- b) RAAB. The Regional Academic advisory Board (RAAB) shall oversee quality of the programme. The RAAB is composed of one member from each RUFORUM member country and two from outside of the region. These will meet one a year physically and at least twice a year electronically.
- c) RUFORUM Technical committee and committee of Deans. These will meet one a year to review progress and provide overall guidance on the programmes.

Management. In terms of operations, the programme shall be managed within at Makerere by the Management body put in place. It shall receive support from the RAAB and the RUFORUM technical committee.

Implementing agencies. There are two major implementing agencies i.e. RUFORUM the Makerere University.

- **RUFORUM.** RUFORUM shall manage the programmes using a coordinating office. The focus of this coordinating office shall be to manage funds disbursement and provide financial stewardship. RUFORUM shall also assist Makerere University in Resource mobilisation and advocacy and marketing of the programmes internationally.
- **Makerere University.** Makerere University, Department of Crop Science is the hosting department. Makerere University shall perform a number of functions detailed in the document that range from managing operations, executing and accounting for resources received. The proposed programmes have been approved by Makerere University senate and are now ready to be mounted. The masters degree programme starts on October 4th 2008, whereas the PhD programmes commences on November 1st 2008. The programmes will deploy both local and regional staff drawn from RUFORUM member countries as well as international staff. Given the primary goal of producing practical oriented scientists, part of the training will take place at the National Agricultural Crops Resources Research Institute (NACRRI) Namulonge.

Project duration and Financing

The RUPBBS will be implemented over a 6 year period. Makerere University will co-fund the programmes by deploying its staff, and facilities, as well as cover utility and space costs. Other costs will be co-shared with RUFORUM. This proposal seeks support from RUFORUM to fund student upkeep and staff costs and operational support for the programmes in the Faculty of Agriculture. The It is estimated that RUFORUM will directly support 8 MSc students and 15 PhD students drawn from the region. The other students needed to meet the minimum standards for the programmes will be supported through other funding. The total budget for the first three years is **1,681, 036 USD** for both programmes (MSc = **314,740 USD** and PhD = **756,950 USD**). All procurement shall be done following procedures in Makerere University.

1 BACKGROUND

1.1 Context of the proposed programmes

Investing in plant breeding is a matter of urgency because of the diverse needs of the Africa's farming community and persistent poverty and food insecurity. A recent survey by the Forum for Agricultural Research in Africa (FARA) and the New Partnership for Africa's Development (NEPAD) as well National Poverty Reduction Strategy Papers (PRSPs) all advocate for increased development and use of science and technology to address the continent's persistent hunger and poverty. At global level, the Food and Agricultural Organisation of the United Nations (FAO) has conducted similar studies which all point to the very limited capacity in terms high level trained plant breeders especially in sub-Saharan Africa¹. This has lead to limited variety releases and general weakened innovations systems which are critical for enhancing productivity to address food insecurity and livelihood issues.

In many countries application of biotechnology to agricultural research and production has hailed a new era. In most of sub-Saharan Africa, studies by FAO (FAO, 2005) and the Action Plans of NEPAD², all point to the fact that the region must harness science and technology particularly biotechnology if it is to attain the needed 6% annual growth of the agricultural sector to eradicate poverty and hunger in Africa. Furtherance of the need for strategic capital development has been highlighted as a key factor to increase progress towards attainment of the Millennium Development Goals (MDGS).

1.2 Rationale for a regional approach

The UNDP's Millennium Development Goals lay out a challenging but achievable vision for dramatically reducing poverty in all its forms world over. At continental level, the economies of sub-Saharan African countries must achieve a 7% annual GDP growth for the next 20 years, with 6% annual growth in agricultural output, anchored on a 3% annual increase in total factor productivity and an equivalent fixed investment in agriculture over the same period. Achieving these highly ambitious targets require revitalising plant breeding capacity to redress the declining capacity of many national plant breeding programmes. These challenges are common in east, central and southern Africa. Addressing them will require using approaches that assure regional spill-over to member countries. Thus a regional programme is justified because of the following reasons:

- The gap in plant breeding and seed systems has been identified as a core strategic investment area in Sub-Saharan Africa, by FARA, RUFORUM member countries, and by several National Agricultural Research Systems (NARS), including NARO. Common regional approaches assure economies of scale and scope are thus justified. Such an approach will also support the development of regional public goods. Public good in this case are goods and services characterised by non-exclusion and shared benefits to all.
- A recent study among RUFORUM member universities shows that training can be done at regional level by marshalling existing resources among partner universities. There are few universities with the needed capacities to develop high calibre MSc level graduates in Plant breeding and biotechnology³.
- Training at regional level provides for shared vision, networking, and production of regional public goods at lower transaction costs.

¹ FAO, 2005. The Way Forward to Strengthen National Plant Breeding and Biotechnology Capacity. Proceedings of a meeting to discuss results of a survey on the Status of Plant Breeding in Africa. Rome 9th -11 February 2005.

² NEPAD, 2005. The New Partnership for Africa's Development. A Summary of NEPAD Action Plans.

³ Eicher, C. 2003. Rebuilding Africa's Scientific Capacity in Food and Agriculture. A paper presented at an International Policy Conference "Successes in African Agriculture: Building for the Future", sponsored by InWent, IFPRI, NEPAD and CTA, Pretoria, South Africa, December 1-3, 2003.

- Biotechnology training at the moment can be best done at regional level taking advantage of the facilities and knowledge available in certain institutions or countries. Because of the comparative capacity in biotechnology at Makerere University, the RUFORUM Network would like Makerere to train for the region in biotechnology approaches related to plant breeding.
- The seed sector of the region is still weak, Makerere University, Moi University and University of Zambia have some experience in this area. It is proposed to build these capacities for the region by coupling it to plant breeding- the source of improved seed as a pilot programme from the region. Accordingly, the three partner universities will take lead in this joint venture under the leadership of Makerere.

1.3 Justification of the MSc and PhD programmes in plant breeding and biotechnology

Why the focus on plant breeding and biotechnology

- **Enhancing productivity:** Plant breeding has been instrumental in boosting crop production world over in the past century. High yielding varieties were at the heart of the green revolution, which produced a spectacular increase in food production in Asia in the 1970s. In the US, more than half the gains in yields of all major field crops over the past 70 years are attributed to genetic improvement. In contrast, many farmers in Sub-Saharan Africa still largely grow unimproved land races attaining up to only 20% of yield potential. Most of the deficit is due to abiotic stresses (low soil fertility and drought) and biotic stresses (pests, weeds and diseases). Plant breeding alone will not bridge the gap, but plant breeders can contribute to higher yields by developing improved varieties that are suited to specific agro-ecologies. Clearly, enhancing crop productivity requires human capital and working national plant breeding systems. This is the object of this programme.
- **Human resources:** Africa's human resources suffer from severe attrition due to socio-economic reasons and diseases such as HIV/AIDS (NEPAD, 2005⁴, Eicher, 2003⁵, Eicher, 2004⁶). Indeed, rebuilding the continents' human resources may require investment levels similar to what China, South-east Asia and the emerging economies of Brazil and Argentina undertook to strengthen innovations systems for agricultural sector expansion and science-led growth of their economies. Given that the agriculture sector remains the main stay of most economies in Sub-Saharan Africa, strengthening crop improvement will enhance achievement of NEPAD's Comprehensive Africa Agricultural Development programme (CAADP) and the National Poverty Reduction Strategy Papers. The commonality of agricultural development challenges suggests that rationalised intervention at regional level is worthwhile.
- **Multi disciplinarity:** Ultimately, breeding efforts will have impact only if improved varieties reach producers. Currently, one of the major causes of low productivity is the limited access to improved seed due to weak seed systems in the region. The proposed action aims at combining plant breeding with biotechnology, seed systems and other cross-cutting issues required for work as innovators, and development agents.
- **Targeted crops research.** The vast majority of sub-Saharan Africa's people are highly dependent on so-called "*orphan crops*", such as sorghum, yam, cassava and plantain. These crops are not targeted by CGAIR research. This calls for strategic investment in their improvement by African countries.

⁴ NEPAD, 2005. The New partnership for Africa's Development. A Summary of NEPAD Action Plans.

⁵ Eicher, C. 2004. Flashback: Fifty years of donor aid to African Agriculture.

⁶ Eicher, C. 2003. Rebuilding Africa's Scientific Capacity in Food and Agriculture.

2 THE RUFORUM PLANT BREEDING, BIOTECHNOLOGY AND SEED SYSTEMS STRATEGY (RUPBBS)

2.1 Framing of RUPBBS agenda in East and Southern Africa

2.1.1 Introduction

The RUFORUM Plant Breeding, Biotechnology and Seed Systems Strategy (RUPBBS) is an implementation framework for building regional capacity in Plant breeding, biotechnology and Seed systems. RUPBBS has been developed by RUFORUM in conjunction with its member universities and National Forums. RUPBBS is one of the regional strategies developed to implement regional training programmes by RUFORUM and network universities. All RUFORUM regional programmes have been developed following a review process among the member universities. (For details see www.ruforumm.org). The review process identified key competence and capacity gap areas that needed strengthening. It also identified member universities that could be used as leaders to train for the wider region. Together with the leaders, RUFORUM has now developed regional capacity building programmes. The regional programmes so far being developed include the following:

- Natural Resource Economics;
- Dryland Resources Management;
- Plant Breeding and Biotechnology;
- Biometrics and Research Methodology;
- Fisheries and Aquaculture.

At Makerere University, two programmes in Plant Breeding and Biotechnology (MSc and PhD) have been developed. They are hosted in the Department of Crop Science, faculty of Agriculture.

2.1.2 Critical success and failure factors for Programmes

Success factors for the programmes

The programmes addresses multi issues (related to enhancing agricultural productivity) this will improve their attractiveness;

1. The programmes build on networking and thus requires good and responsive co- ordination for success.
2. Currently the proposed programmes are donors supported. This seed funding is critical for initiating the programmes. This has been obtained.
3. Compliance requires setting guidelines to assure timely delivery of outputs and ultimately outcomes. An implementation plan has been developed to guide the project implementation.
4. Currently all partners are highly committed to the programmes and there is need to maintain this for success.
5. Success of these programmes will depend on maintaining transparency in all transactions. Communication strategy for the programmes is being developed.
6. It is important to assure equity and gender balance in the programmes.
7. Success of the programmes will depend on maintenance of high quality MScs and PhDs training process.
8. The success of the programmes will also depend on availability of candidates as well as goodwill

from participating candidates.

9. Success of the programmes will depend on maintaining flexibility to emergent or evolving development issues. The Regional Academic Advisory Board will provide the over arching guidance.
10. Success of the programmes will depend on Makerere Universities' institutional support of the programmes.
11. Success of the programmes will depend on capacity existing (infrastructural and administrative).

Failure factors for the programme

1. Political stability in Uganda and in deed the region;
2. Rejection of research outputs by end-users will reduce impact and ultimately level of partnerships;
3. Prolonged drought may interfere with field experiments complicating and increasing R4D costs;
4. Students falling out of the programmes due to various socio-economic reasons;
5. Social-economic issues that negatively impact on well being and R4D environment of students.

2.1.3 Niche of the programmes

These programmes are being proposed against a background that there is a real need in the region that needs to be filled. The proposed action will complement other efforts in the region to train plant breeders such as at the African Center for Crop Improvement (ACCI) at the University of KwaZulu Natal and the East African Regional Programme and Research Network for Biotechnology and Bio-safety and Bio-policy Development (BIO-EARN). The proposed training have the following niche features

- It aims at integrating plant breeding seed systems and biotechnology at PhD and MSc level using local crops and facilities in the region. They will permit development of local capacity within the region to train and undertake research
- The focus is on identified regional constraints such as those identified by the Sub-Saharan Africa regional research organisations (ASARECA, SADC and CORAF), and national programmes thus ensuring relevancy and settling-in of graduates as well as stabilizing universities and the National Agricultural Research Systems (NARS). This will reduce attrition rates significantly.
- The programmes aim at rationalizing existing resources in the region by sharing existing human resources and infrastructure for training and research for development.
- The programmes have been developed by a regional consortium of universities who will own and implement it. They may, when own capacity is built, adopt them to their own universities.
- An element of credit transfer among universities is in built to strengthen regionality.
- It is built on a model that aims at strengthening national institutions (universities and NARS) to respond to challenges
- It permits regional member universities to develop collaborative research and training models and perfect them.
- The goal is to produce “well-grounded” plant breeders, knowledgeable and with skills to work in private and public sectors as researchers, trainers and policy advisors.

2.1.5 The hosting institution- Makerere University

Makerere University is among the prominent academic institutions in sub-Saharan Africa. Its Faculty of agriculture, located in the main campus and the research arm, the Makerere University Agricultural Research Institute (MUARIK) have been engaged in research and training over the last 40 years. Makerere University and the Faculty of Agriculture in particular, have fronted biotechnology as a new frontier for upgrading academic excellence in bio-sciences to address national and regional developmental constraints. The Department of Crop Science, the implementing institution, was identified through an independent RUFORUM assessment to serve as a focal node for training in Plant Breeding and Biotechnology for the region. The Department of Crop Science has modern biotechnology laboratories, with tissue culture capacity, genomics (RNA and DNA), proteomics capacities, quarantine labs, and greenhouses. In addition the Department has been implementing MSc and PhD programmes. Currently the Department is providing training at MSc and PhD level for scientists from several countries. The Department is also involved in several regional and international research and training programmes involving both North-South and south-south linkages.

The introduction and implementation of the MSc and PhD programmes will be facilitated by several institutional collaborations that have been established between the Departments of Crop Science and institutions at national level such as the Uganda Biotechnology unit at National Agricultural Research Laboratories Institute (NARLI), the Makerere University Institute of Environment and Natural Resources (MUIENR), the Faculty of Veterinary Medicine Biotechnology Unit and at regional level by Bio-Sciences East and Central Africa (BECA) located at the International Livestock Research Institute (ILRI), Nairobi. Makerere has also established south-north partnership such as with the Swedish University of Agricultural Sciences, Ohio State University, Iowa State University and in the South with University of KwaZulu Natal, University of Pretoria, University of Cape Town, etc.

2.1.6 Programme activity thrusts

Outputs from both programmes

RUPBBS primarily draws its agenda from the RUFORUM Strategic Plan which lays out the scope and scale of RUFORUM's mandate in training, research and possible roles in analysis and advocacy as laid out in FAAP and other continental documents. The RUPBBS is also framed by Programme whose goal of “ *to develop and strengthen the human resources and research capacity for Crop improvement and related development areas in sub-Saharan Africa but with particular emphasis on East, Central and Southern African countries.*” RUPBBS has two components of strengthening (a) an MSc programme in Plant breeding and Seed Systems (b) a PhD programme in Plant breeding and Biotechnology. These goal will also based on lessons learnt for roll-out to RUFORUM consortium (**Kenya**- Egerton University, Jomo Kenyatta University of Agriculture and Technology, Kenyatta University, Moi University, University of Nairobi; **Malawi**- University of Malawi; **Mozambique**- Eduardo Mondlane University; **Tanzania**- Sokoine University of Agriculture; **Uganda**- Makerere University; **Zambia**- University of Zambia; and **Zimbabwe**- Africa University and University of Zimbabwe to produce relevant and skilled expertise and research capabilities in plant breeding and seed systems among the member universities. RUPBBS will have the following outputs:

1. Regional programmes (Curricula and implementation modalities for plant breeding, Biotechnology and Seed Systems) at MSc and PhD levels developed.
2. A Regional network of RUFORUM human resources mobilized and activated to run high quality MSc and PhD graduate programmes at Makerere.
3. A pool of Scientists with capacity and competences to engage with stakeholders trained. These graduates will among others have competencies in:
 - Use different scientific disciplines related to plant breeding, biotechnology and seed systems to produce new varieties and address value-chain needs,
 - Discuss and provide policy guidance such as on seed industry and applications of molecular biology and biotechnological methods used by agricultural researchers,

- Design and run breeding programmes,
- Manage seed enterprises and,
- Work in multi-actor platforms (from production to marketing).
- The capacity of Makerere University to undertake quality Plant breeding and biotechnology research for development while engaging with other stakeholders strengthened.
- Makerere University agricultural education and training empowered to match the capacity building offered to changing market demand through National Forum activities.
- The RUPBBS approach for capacity strengthening is documented, validated with and owned by key stakeholders.

2.1.1.1 Context of RUPBBS outputs within RUFORUM

All the RUPBBS outputs are built upon the RUFORUM results that provide the over-arching guidance of any project intervention in the sub-region. RUPBBS outputs 1, 2 and 3 are built into the RUFORUM results 1, 2, 3 and 4 respectively. The RUFORUM results within which the RUPBBS results are anchored are (1) Responsive training, (2) Rationalized facilities, (2) Innovative structures, and (4) Impact-oriented research.

Conceptual framework of RUPBBS programme

It is envisaged that all these interventions shall be implemented in a learning framework that permits the capture, up- and out-scaling of lessons from national to regional level. The model is built on a key goal of assuring achievement of results. It is also based on consultation undertaken during the programme development phase. The key attributes of the models include:

1. Selection of student research areas that are anchored in the NARO and or other NARS research programmes.
2. Strong theoretical and practical aspects involving both public and private sector institutions.
3. Regional quality assurance by the RAAB but local management by the host
4. Involvement of regional actors in training and supervision.

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2 THE RUPBSS RESULT AND LOGICAL FRAMEWORKS

2.1 RUPBBS results framework

The RUPBBS results framework presented below links outputs to outcomes and impact as shown in Figure 1. The results framework has three main outputs that contribute to the realisation of the project outcome, that in turn contributes to the RUFORUM strategic goal 1.

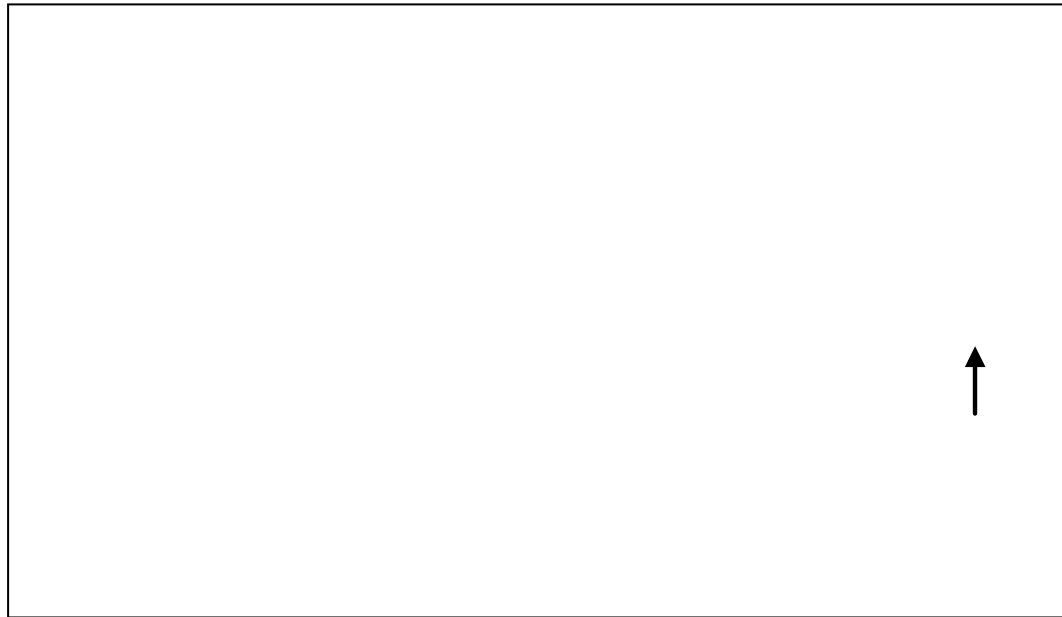


Figure1. Results framework for the RUPBBS.

2.2 RUPBBS logical framework

The logical framework for RUPBSS is presented in Table 1 below. The framework depicts a hierarchy of objectives that inter-relates programme objective, purpose, results and outputs. The framework shows the objectively verifiable indicators (OVIs) for each result, purpose and overall objective. It also highlights the means through which these indicators will be verified and associated assumptions and/or risks. A 24 month- budget summary by activity is also presented. The six programme results include:

1. New curriculum for PhD and MSc developed and operationalised
2. Regional human resources mobilized, rationalized & deployed
3. Scientists trained at MSc and PhD
4. Research capacity-human resource and infrastructure developed
5. Stakeholders mobilized via National Forum for research and training
6. Regional approach to training documented and validated.

Table 1. Logical framework for RUPBBS implementation

Logical framework: 24 months of implementation starting August 2008- August 2010			
Prepared: August 2008			
Intervention Logic	Objectively Verifiable Indicators	Sources of Verification	Assumptions
<p>Overall Objective Masters and doctoral programs responsive to stakeholder needs and national / regional development goals</p>	<p>A Master of Science Crop Science in plant breeding and seed systems developed in partnerships with stakeholders developed and approved for implementation by August 2008.</p> <p>A PhD in plant breeding and biotechnology developed in partnerships with stakeholders developed and approved for implementation by August 2008</p> <p>30% of NARS is the region take up the graduates from this programme by 2015.</p>	<p>Reports from Makerere University</p> <p>Reports form RUFORUM</p> <p>Government statistics</p> <p>NARS reports</p>	

Intervention Logic	Objectively Verifiable Indicators	Sources of Verification	Assumptions
<p>PURPOSE: Strengthened institutional and human capacity of Regional universities to train Scientists who meet the human resource needs of the public and private sector through crop improvement and related disciplines</p>	<ol style="list-style-type: none"> 1. 20% increase crop in improvement research undertakings of Makerere University by year 2010; and 10% increase by 2012. 2. 10% Increase in the stakeholders involved in partnerships with Makerere University to engage in training research and outreach activities by 2010 and 10% increase by 2012. 	<p>University Research and development statistics</p> <p>RUFORUM commissioned studies</p> <p>NARS project reports</p>	<p>Relevant regional and national policies are implemented effectively.</p> <p>Governments continue to support agriculture and poverty reduction as priorities.</p> <p>Government, non-government, regional and national organisations operate effectively at appropriate levels.</p> <p>Makerere University and its critical partners in research and training operate effectively at appropriate level</p>

Intervention Logic	Objectively Verifiable Indicators	Sources of Verification	Assumptions
<p>Results</p> <p>1. New curriculum for PhD and MSc developed.</p> <p>2. Regional human resources mobilized, rationalized & deployed in the new programmes</p> <ul style="list-style-type: none"> • Human resources and scientific capacities developed and deployed in training, research and innovation processes 	<p>1.1 A new MSc programme in plant breeding and seed systems developed by 2008.</p> <p>1.2 A new PhD programme in plant breeding and biotechnology developed by 2008</p> <p>2.1 At least 10 national researchers mobilized to engage training and research by 2008.</p> <p>2.2 At least 6 regional researchers mobilized to engage training and research by 2008.</p> <p>2.3 A regional academic and advisory board developed and operationalized for quality assurance purposes by 2008.</p> <p>2.4 At least 2, RUFORUM universities supported to initiate MSc programmes in Plant breeding and seed systems by 2011.</p>	<p>University annual reports</p> <p>RUFORUM annual reports</p> <p>Project partners reports and their annual reports</p>	<ul style="list-style-type: none"> • Lecturers and researchers, able to adopt new knowledge. • Efficient and effective international and national agricultural support services exist. • Effective mechanisms for widespread technology, innovation and knowledge uptake exist and are accessible. • Government, non-government, regional and national organisations operate effectively at appropriate levels. • Capabilities of Makerere University and partners radically enhanced for training and research. • Makerere University and partners use new capacities to improve effectiveness of training and research • Socio-cultural environment in target areas conducive for training, research

Intervention Logic	Objectively Verifiable Indicators	Sources of Verification	Assumptions
<p>Results [continued]</p> <p>3. Scientists trained at MSc and PhD</p> <p>4. Research capacity-human resource and infrastructure developed</p> <p>5. Stakeholders mobilized via National Forum for research and training</p> <p>6. Regional approach to training documented and validated</p>	<p>3.1 At least two cohorts (10 students per cohort) of students for MSc taken for the programmes over the 24 month period</p> <p>3.2 At least two cohorts (10 students per cohort) of students for PhD taken for the programmes over the 24 month period</p> <p>1.1 At least two technicians trained and recruited to support Plant breeding by 2009</p> <p>1.2 At least two plant breeding activities enhanced and or initiated at MUARIK by 2009</p> <p>5.1 At least 2 meeting of the National Forum in which management and implementation of the programmes are discussed are held by June 2009</p> <p>5.2 At least 50% of students attached to non-university stakeholders for field attachment</p> <p>At least 2 documentations (digital and hard) of the lessons learnt during the implementation of the programme at Makerere generated by 2010</p>	<p>As above</p>	<p>As above</p>

<p>Activity 1: Piloting the regional MSc in plant breeding and seed systems</p> <ol style="list-style-type: none"> 1. Design and implement a masters degree in plant breeding and seed systems at Makerere University as a RUFORUM regional programme 2. Formalize the MSc programme as a Makerere University Graduate degree programmes and recruit students into the programme. <p>Activity 2: Piloting the regional PhD in plant breeding and Biotechnology</p> <ol style="list-style-type: none"> 1. Design and implement a PhD degree in plant breeding and Biotechnology at Makerere University as a RUFORUM regional programme 2. Formalize the PhD programme as a Makerere University Graduate degree programmes and recruit students into the programme. <p>Activity 3: Creation of a management structures at Makerere for the programmes</p> <ol style="list-style-type: none"> 1. A faculty level programmes management team created to provide over arching guidance over the project 2. A project manager appointed by the Dean to over see day to day running of the project 3. A department staff mobilised to provide supervision for students 4. Programmes implementation documented for purposes of scaling up and out 5. Meetings/workshops organised with national Forum for student placement, M&E and quality assurance <p>Activity 4: Creation of a regional quality assurance mechanisms</p> <ol style="list-style-type: none"> 2. Six staff from among RUFORUM universities engaged into a Regional academic Board to process monitor and assure quality. <p>Activity 5: Funds mobilised to run the programmes</p> <ol style="list-style-type: none"> 1. Develop grant proposal to source seed money to fund. 2. Review how to tap internally raised funds from tuition for management of the programme. 	<p>Inputs</p> <p>Key inputs will include: research funds, funding for tuition and training costs, stipends, travel costs and honorarium for lecturers/ seconded to the project.</p> <p>Specialist technical support will be provided for management and initial start-up activities.</p> <p>Budget</p> <p>See below</p>	<ul style="list-style-type: none"> ● Potential for effective partnerships with adequate capacity for sharing of experiences in sound management in the region exist. ● Adequate human, physical and financial resources are maintained within University and other partners. ● Government, non-government, regional and national organisations operate effectively at appropriate levels. ● Socio-cultural environment in target areas conducive to uptake & adoption of knowledge and skills. ● Lecturers, researchers, managers, are able to adopt new knowledge and skills. ● Policies and environment of targeted institutions support project intervention.
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Inputs

Key inputs will include funds for studies including travel honoraria technical support by Lead Service Providers. All assumptions are the same as above

Budget summary

Activity	Aug08-Aug09 US\$	Aug09-Aug10 US\$	Total US\$
MSc Training			
^a Student costs			
Local	17,410	36,100	53,510
Foreign	73,220	136,010	209,230
Lecturers	31,100	20,900	52,000
Sub-total	104,320	193,010	314,740
PhD Training			
^a Student costs			
Local	182,500	378,500	561,000
Foreign	34,850	72,800	107,650
Lecturers	67,400	20,900	88,300
Sub-total	284,750	472,200	756,950
^bInfrastructure development			
Student accommodation	50,000		
Staff Housing	60,000		
Sub-total	110,000		110,000
Coordination			
^c Administration (10%)	38,907	62,911	101,818
Secretariat Operations			
RAAB and M%E	6,390	6,390	12,780
Communication Systems	21,220	21,220	42,440
Programme Coordination	171,154	171,154	342,308
Subtotal	237,671	261,675	499,346
Total	736,741	926,885	1,681,036

3 OPERATIONALISATION OF THE PROGRAMME

3.1 Governance and organisational structure

The programme will be governed at three levels

- a) Host institutions. A management committee comprised of the Dean or his representative, Hosting department Head, project coordinator and two people (one from partner institute (NARI) or private sector person. The programmes shall also report directly to the senate of Makerere University.
- b) RAAB. This shall oversee quality of the programme. The RAAB is composed of one member from each RUFORUM member country and two from outside of the region. These will meet once a year physically and at least twice a year electronically.
- c) RUFORUM Technical committee. Deans. These will meet one a year to review progress and provide overall guidance on the programmes.

3.2 Management

In terms of operations, the programme shall be managed within Makerere by the Management body put in place. It shall receive support from the RAAB and the RUFORUM technical committee.

3.2.1 Implementing agencies

RUFORUM. RUFORUM shall manage the programmes using a coordinating office. The focus of this coordinating office shall be to manage funds disbursement and provide financial stewardship. RUFORUM shall also assist Makerere University in Resource mobilisation and advocacy and marketing of the programmes internationally.

Makerere University. Makerere University Department of Crop Science is the hosting department. Makerere University shall perform the following functions:

- Insure the activities of RAABS are implemented cost-effectively and sustainably
- Supervise the work of lecturers and assure quality.
- Manage and facilitate monitoring, evaluation and learning at the institutional level regional level and recommend remedial actions when necessary, to maintain quality and timeliness of services provided.
- Accounts for funds received report on overall progress of the project to RUFORUM.

3.3 Knowledge Management and Communication

Communication shall be managed in conjunction with the unit responsible for this in the organisation at RUFORUM. The focus of the communication is to ensure flow of and exchange of messages and contacts (such as exchange of ideas, interactions, consultations and transmission) between and among stakeholders. Thus the RAPBSS coordination mechanism at Makerere University will link up with all the other critical actors all levels (RUFORUM, National FORUM and other stakeholders) to maintain a close link with actors involved in the Programmes. The objectives of communication plan shall be to:

- Foster commitment to and ownership of interventions among key partners during and beyond the project period by providing mechanisms through which they can contribute to decision-making.
- Build trust and a shared understanding among RUPBBS stakeholders, by enabling transparency in processes and decision-making.

- Facilitate efficient functioning of and widespread participation in RUPBBS activities by making relevant information accessible to all partners.
- Enable the widespread learning and sharing of project lessons among RUFORUM partners universities the policy community and relevant organisations.
- Raise awareness about RUPBBS's activities, key stakeholders and achievements among (a) policy-makers with a view to improved policy support that will achieve RUPBBS's aims; and (b) current and potential donors, with a view to raising additional resources.
- Foster a learning environment that enables diverse stakeholders to interact effectively to bring about innovations.

3.4 Monitoring Evaluation and Learning

RUFORUM has a strong monitoring and evaluation (M&E) unit that shall provide overarching guidance. Programme activities have been aligned to the RUFORUM purpose and goals. A participatory monitoring, evaluation and learning approach will be adopted as the main mechanism for generating information with which to monitor activities, milestones and the results indicators.

Stakeholders will be involved in implementation, advocacy and dissemination of important results to relevant information users in the region. Project implementers will continuously monitor progress as part of the social learning process. External evaluation of the strategy and the results will be carried out at the mid-term (2009) and end of project (2010). The project manager at the faculty level will liaise with RUFORUM desk officer in charge of programmes for implementation of M&E and Learning. Monitoring of the quality of the training will be done by the Regional Academic Advisory board and the RUFORUM technical committee.

4 PROJECT FINANCING

The summary budget for the first three years of training is provided below. Details of its derivation can be found in tables 2a, 2b and 3a and 3b.

Table 2. Summary budget for running the PhD and MSc budgets for the first cohort of students covering three years of training-2 years for MSc and 3 years for PhD

Activity	Aug08-Aug09 US\$	Aug09-Aug10 US\$	Total US\$
MSc Training			
^a Student costs			
Local	17,410	36,100	53,510
Foreign	73,220	136,010	209,230
Lecturers	31,100	20,900	52,000
Sub-total	104,320	193,010	314,740
PhD Training			
^a Student costs			
Local	182,500	378,500	561,000
Foreign	34,850	72,800	107,650
Lecturers	67,400	20,900	88,300
Sub-total	284,750	472,200	756,950
^bInfrastructure development			
Student accommodation	50,000		
Staff Housing	60,000		
Sub-total	110,000		110,000
Coordination			
^c Administration (10%)	38,907	62,911	101,818
Secretariat Operations			
RAAB and M%E	6,390	6,390	12,780
Communication Systems	21,220	21,220	42,440
Programme Coordination	171,154	171,154	342,308
Subtotal	237,671	261,675	499,346
Total	736,741	926,885	1,681,036

Table 2a Summary costs for MSc training for two years.

Activity	Aug08-Aug09 US\$	Aug09-Aug10 US\$	Total US\$
MSc Training			
^a Student costs			
Local	17,410	36,100	53,510
Foreign	73,220	136,010	209,230
Lecturers	31,100	20,900	52,000
Sub-total	104,320	193,010	314,740
^bInfrastructure development			
Student accommodation	50,000		
Staff Housing	60,000		
Sub-total	110,000		110,000
Coordination			
^c Administration (10%)	10,432	15,691	26,123
Secretariat Operations			
RAAB and M%E	4,390	4,390	10,976
Communication Systems	15,220	15,220	38,049
Programme Coordination	85,577	68,682	175,288
Subtotal	115,619	88,292	203,911
Total	329,939	281,302	628,651

Notes:

^a= This based on the programme supporting 2 local students and 7 foreign students during in the first cohort of the study. The programme will have about 22 students supported from other non RUFORUM projects. Such as AGRA, and Millennium Science Initiative World Bank supported projects and other sources.

^b= Infrastructure development covers the costs of rehabilitating the student accommodation at MUARIK as well as a guest house to accommodate visiting lecturers.

^c= Covers the cost of faculty administrative fees, and bank charges

Details of the student costs can be found in Table 2b below.

Table 2b. Detailed Budget for MSc training for each student

Cost Structure for Masters in Plant Breeding and Seed Systems at Makerere University				
ITEM		Year 1 US\$	Year 2 US\$	Total US\$
Administration fees				
	Administrative fee	145	145	290
	Application fee	25		25
	Registration fee	30	30	60
	Library fee	5	5	10
	Examination fee	200	200	400
	Subtotal	405	380	785
Teaching & course module development				
	Module development	25,500		
	Teaching	17000	17000	
	Travel	1800	1800	
	Accommodation and upkeep	2100	2100	
	Sub-total	46,400	20,900	67,300
Training				
	Tuition fees	1500	1500	3000
	Stationery and Text Books	300	300	600
	Research		9,000	9,000
	Thesis preparation		150	150
	Supervision	1,200	1,200	2,400
	Fields monitoring by supervisors	-	2000	2000
	Laptop	1500	-	1500
	Subtotal	4,905	14,530	19,435
Student Welfare				
	Stipend	3,600	3,600	7,200
	Health insurance	200	200	400
	Travel expenses (Foreign Student)	700	700	1,400
	Extra luggage (Foreign Student)	100	150	250
	Settling in (Foreign student)	300	-	300
	Settling in (National	200	-	200
	Airport taxes & work permits (Foreigners)	250	250	500
	Subtotal Foreign student	5,150	4,900	10,050
	Subtotal National	3,800	3,600	7,400
Total Foreign student	Foreign student	10,460	19,430	29,485
Total Local student	National	8,705	18,050	26,835
Training costs		31,100	20,900	52,000

Table 3a Summary costs for PhD training

Activity	Aug08-Aug09 US\$	Aug09-Aug10 US\$	Total US\$
PhD Training			
^a Student costs			
Local	182,500	378,500	561,000
Foreign	34,850	72,800	107,650
Lecturers	67,400	20,900	88,300
Sub-total	284,750	472,200	756,950
^b Coordination			
^c Administration (10%)	28,475	47,220	75,695
Secretariat Operations			
RAAB and M%E	2,000	2,000	4,000
Communication Systems	6,000	6,000	12,000
Programme Coordination	85,577	68,682	154,259
Subtotal	122,052	123,902	245,954
Total	406,802	596,102	1,002,904

Notes:

a= This based on the programme supporting 2 local students and 10 foreign students during in the first cohort of the study. The programme will have about 15 students supported from other non RUFORUM projects. Such as the Millennium Science Initiative world Bank supported projects and other sources.

b= Coordination costs shall be shared with the MSc training related costs

c= Covers the cost of faculty administrative fees, and bank charges

Details of the student costs can be found in Table 3b below.

**Table 3b: Budget for training student from a RUFORUM member country/university
Cost Structure for PhD (Plant Breeding and Biotechnology) at Makerere University**

ITEM		Year 1 US\$	Year 2 & 3 US\$	Total US\$
Administration fees				
	Administrative fee	120	240	460
	Application fee	12	-	12
	Registration fee	71	142	213
	Library fee	12	24	36
	ICT fee	20	40	60
	Examination fee	177	354	531
	Identity card fee	12	-	12
	Transcript fee	-	12	12
	Certificate fee	-	12	12
	Graduation fee	-	18	18
	Sub total	424	842	1366
Teaching & course module development				
	Module development	22,500		
	Teaching (regional staff)	17,000	17000	
	Teaching (II)	24,000		
	Travel	1800	1800	
	Accomodation and upkeep	2100	2100	
	Sub-total	67,400	20,900	88,300
Training**				
	Stationery and Text Books	250	500	750
	Tuition fees	3,000	6,000	9,000
	Research	3,000	9,000	12,000
	Thesis preparation	-	200	200
	Supervision	2,400	4,800	7,200
	Fields monitoring by supervisors	500	3000	3500
	Laptop	1500	-	1500
	Subtotal	10,650	23,500	34,150
Student Welfare				
	Stipend	6000	12,000	18,000
	Health insurance	200	200	400
	Travel Foreign Student	700	700	1,400
	Extra luggage (Foreign Student)	100	150	250
	Settling in Foreign student	300	-	300
	Settling in Nationals	200	-	200

	Airport taxes & work permits (Foreigners)	300	600	900
	Subtotal Foreign student	7,600	13,650	21,450
	Subtotal National	6,400	12,200	18,600
Total	Foreign student	18,625	37,850	56,475
Total	National	17,425	36,400	53,825
Total	Training and delivery	67,400	20,900	88,300