



**Consortium for the
improvement of agriculture-
based livelihoods in Central
Africa**

***Musa* Sub-Sector Strategic Plan for the Great Lakes Region, Burundi, DR-Congo and Rwanda: 2006–2011**

*“Addressing the challenges of integrating
bananas into the market economy”*

April 2007



IPGRI and INIBAP now operate under
the name "Bioversity International"



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FOREWORD

This strategic plan for the *Musa* sub-sector was developed for the Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa. CIALCA brings together national, regional and international partners to focus their resources on improving the livelihoods of people recovering from decades of civil conflicts. CIALCA is implemented by the National Agricultural Research Systems (NARS) of Rwanda, Burundi and the Democratic Republic of Congo, in collaboration with three Consultative Group for International Agricultural Research (CGIAR) centres (Bioversity International, the International Institute of Tropical Agriculture-IITA and the *Centro Internacional de Agricultura Tropical*-CIAT).

CIALCA also draws in the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) in the framework of the Banana Research for Eastern and Southern Africa (BARNESA) and mirrors the Institut de Recherche Agronomique et Zootechnique (IRAZ), which brings together the NARS of the three Central Africa countries. With the recent revival of the Economic Community of the Great Lakes Countries, IRAZ's role in coordinating sub-regional efforts to address agricultural productivity will be enhanced. Moreover a number of NGOs and private sector organization are operating across the borders of the countries of the sub-region. Such a large number of partners working within the agriculture sector of the sub-region would benefit from a regional strategic plan to facilitate their collaboration, share information and technologies and exploit synergies and institutional comparative advantages within and between them.

It is against this background that the sub-regional players were brought together to analyse and prioritize the constraints on banana productivity at the sub-region level, before identifying and prioritizing them at the country level. The approach also reflects the understanding that the majority, and sometimes the most important constraints, such as banana *Xanthomonas* wilt (BXW), Banana Bunchy Top Virus (BBTV), fusarium wilt, weevils and nematodes, as well as a host of socioeconomic problems, cut across borders. In addition it was also realized that there was a lot of similarity in terms of demographics, farming systems and socio economic fabric with potential for cross-border synergies that need to be exploited to address any agreed research for development priorities effectively. It was also perceived that identifying, prioritizing and addressing sub-regional constraints in a coordinated way would add value to the national level efforts to address the same.

As the sub-regional level, a number of challenges need to be addressed by research and development:

- Improving transfer of appropriate banana technologies;
- Adding value and improving post-harvest handling;
- Broadening the genetic base of bananas;
- Addressing the major pests and diseases;

Furthermore, another set of very important constraints were rated as medium priority because of the perceived probability of success in the face of the limited resources. These include:

- Improving soil fertility and water management.

- Enhancing the nutritional quality of bananas for income and food security.
- Intensification of the existing production systems.
- Promoting transboundary banana/plantain trade between Uganda, Rwanda, Burundi and DR Congo.

The country priorities mirror the sub-regional priorities, further supporting the need for looking at the larger picture at the sub-regional level, where resources can be aggregated to create greater impact at national levels.

The sub-regional priorities will serve as a guide for resource allocation and sharing of responsibilities between countries and will form a basis for the development other associated policies aimed at improving the livelihoods of the people of the sub region. The document will facilitate discussions at national, sub-regional and international levels where partners may need guidance on resource investment and potential impacts. It will also guide the development of cooperation and collaborations mechanisms with respect to comparative advantages and roles in the collaboration. The priorities however must be construed as dynamic and requiring constant analysis to ensure synergies are exploited, lessons are learnt and critical and timely changes are made to maximize investment by all the interest groups from grassroot organizations to policy makers. To this end CIALCA (along with IRAZ and other sub-regional platforms) will play important roles in strengthening the sub-regional cooperation on agricultural research for development, while enhancing the linkages for information and technology access/exchange between the sub-region and the wider global fora with interests in the region.

MUSA SUB-SECTOR STRATEGIC PLAN FOR THE GREAT LAKES REGION

INTRODUCTION

In the central African countries of the Democratic Republic of Congo (DRC), Rwanda and Burundi, banana and plantain (*Musa*) play a key role in the livelihoods of many people, providing a staple food for both rural and urban populations. 'Matooke' bananas, also known as East African highland bananas (EAHBs), are the major staple food in the mountainous, high rainfall areas of Rwanda, Burundi and eastern Congo, whereas plantains are the major food source in the Congo basin and in other lowland areas of Central Africa. Throughout the region, cities such as Kigali, Bujumbura, Goma, Bukavu and, above all, Kinshasa, draw in *Musa* from a large catchment area, providing income for producers, traders and vendors. Fruit sold into smaller village and town markets similarly provide a source of income and employment on a more local scale. In these countries the banana cropping system is typically small-scale and largely managed by women.

Plantings of *Musa* are also ecologically important as a stable element in the agricultural landscape, grown in association with many other crops and helping to prevent soil erosion in fragile ecosystems, especially in the densely populated highlands of Central Africa. In the East African highlands, where soils are often of volcanic origin and relatively fertile, plantings of EAHBs have traditionally been a perennial element in the agricultural landscape, with individual stands lasting for many decades before they needed to be replanted. Intensive husbandry traditionally included recycling of organic nutrients while local consumption of the greater part of the crop ensured that nutrients remained largely within the system; nutrients lost from the system from the sale of small quantities of fruit could be replenished with residues of other crops or by normal soil nutrient cycles. Lowland plantings of plantain were also expected to last for many years, but when factors such as pest build-up forced the abandonment of a particular plot, long periods of natural 'bush fallow' served to replenish soil nutrients and the biological health of soils.

In recent years, however, yields have stagnated around 4-9 tonnes/ha, much below the 30 or so tonnes/ha achieved on research stations and in commercial plantations. To the extent that the number of tonnes has increased, by 56% between 1970 and 2004, it is mainly due to a 40% augmentation in the area under cultivation (FAOSTAT 2004). Meanwhile, the widespread erosion of the natural resource base is exposing the crop to abiotic stresses, especially water deficit. This accentuates the seasonality of production, contributing to periods of glut and of scarcity.

The research and development experiences in Africa have created a substantial knowledge base for overcoming these constraints. Technical solutions are available at the research level and, if deployed concertedly on a large scale, should be capable of reversing the trends in declining productivity and eroding natural resources.

Banana research in Africa dates back to the beginning of the 20th century but efforts were isolated and scattered. During the colonial days, agricultural research in DRC, Rwanda and Burundi, which were under Belgian administration, was coordinated by one institution. At the time, bananas and plantains were considered as native crops that did not require research attention.

After independence, the focus was initially on maintaining food security at household levels because of the crop's all-year-round fruiting habit. Later research efforts were extended to

addressing household incomes through research and development on value addition. The three countries maintain ex-situ collections of local and introduced germplasm that farmers can access. Genetic resources are not only collected, they are also characterized and evaluated under varying growing conditions.

The three countries have also directed research efforts to agronomic practices, including planting dates, densities and plant nutrition as well as on pests and diseases in an effort to improve the productivity of the crop. Additionally, the region has made great strides in the delivery of cleaning planting materials for dissemination to farmers, with the collaboration of the private sector, NGOs and other development partners.

Although DRC, Rwanda and Burundi developed their own institutions, they continued coordinating their activities through crop networks. The creation in 1979 of the *Institut de recherche agronomique et zootechnique* (IRAZ) to coordinate region-level priorities reflected a desire for cooperation between the three countries.

The strategy presented in this document will require substantial change in the way banana research in the Great Lakes Region is conducted. The various programmes are committing themselves to become more responsive, participatory, accountable and performance oriented. To implement the strategy, a medium-term plan will be developed with specific outputs, activities and indicators.

PRIORITY SETTING FOR THE *MUSA* SUB-SECTOR

The process of developing a strategic plan started by identifying the constraints and priority research interventions in order to make decisions on the allocation of investments.

The Project Strategic Planning Workshop followed the seven-step priority setting process recommended by the International Service for National Agricultural Research (ISNAR) and the International Food Policy Research Institute (IFPRI) and adopted by the Association for Strengthening Agricultural research in East and Central Africa (ASARECA). A Network Committee comprising the Bioversity-ESA Regional Coordinator, the Director of the Monitoring and Evaluation and Planning Unit of NARO, and an Associate Scientist at Bioversity-ESA was established (Step 1) to review the banana sub-sector or research domain (Step 2), evaluate existing results (Step 3). For the fourth step, a second committee, a Workshop Process Management Committee (Annex 1), comprising the head of the National Banana Research Programme, eminent scientists and the Network Committee was established to develop/analyse the individual constraints (Step 4) into a set of research alternatives and consolidated into research for development sub-themes (Step 5). Subsequently, a priority setting workshop (Step 6) involving stakeholders was held during the first three days of the Workshop.

Steps 1 to 5 were conveyed to participants by way of presentations and discussions during the workshops. Work in groups and plenary discussions were also used. Presentations were delivered in both French and English, when necessary. Templates and background material were presented in French and English.

Step 6 involved the priority setting workshop itself. The process can be summarized into four key stages:

1. Presentation of the results obtained by the Network Coordination Committee and the Workshop Process Committee were delivered to participants through presentations. The regional sub-thematic areas for the Great Lakes Region were delivered by the Head of the National Banana Programme to the stakeholder representatives.
2. Group work exercises (and plenary discussions) were utilized to:

- a. verify the key constraints and research areas proposed by the Process Management Committee,
 - b. agree on the criteria at country level and determine their relative weight,
 - c. score the research areas.
3. The Workshop Process Management Committee synthesized and classified the results into high, medium or low priority research areas.
 4. Stakeholder approval of the final results.

IDENTIFICATION OF CRITERIA

The priority-setting process used the weighted scoring method. The method ensures that adjustments can be made as priorities and circumstances change. Application of the weighted scoring method included identifying relevant criteria representative of national goals and research for development thematic areas. The team modified the BARNESA criteria (Annex 2) as indicated in Table 1. The total had to add up to 100.

Table 1. Weight given by the stakeholders to the criteria used to identify the priorities.

Criteria	Weight
<i>Increasing household income</i>	
Creating employment	4
Adding value to banana products	8
Increasing banana products on the market	8
Introducing new and profitable technologies along the chain	8
Improving product quality	7
<i>Increasing household food security</i>	
Increasing banana yields and products	8
Reducing losses at all levels along the chain	5
Introducing demand-driven technologies	7
Improving nutritional value of banana and banana products	5
<i>Maintaining the sustainability of the natural resource base</i>	
Reducing use of chemical additives	4
Reducing soil fertility loss	6
Improving air and water quality	4
Conserving banana-based biodiversity	6
<i>Strengthening institutional capacity</i>	
Improving linkages and partnerships	2
Improving the skills of stakeholders	2
Strengthening financial resource base	2
Improving infra-structure	2

Criteria	Weight
<i>Improving the policy environment</i>	
Strengthening advocacy at the grassroots	2
Generating policy data/information	2
Improving linkages between policy organizations	2
<i>Facilitating information exchange and utilization</i>	
Increasing information generation	2
Increasing information dissemination	2
Increasing information utilization	2

IDENTIFICATION OF CONSTRAINTS

Individual countries have specific constraints related to the conditions in the country, even though some constraints in one country have the potential of affecting the economies of the other two and beyond. In general, however, the productivity of the banana system at the regional level is inherently a low-input and low-output system with its associated productivity problems, including declining soil fertility and increasing incidence of pests and diseases. At the institutional level, the banana sector in the region suffers from weak policies, weak linkages and low analytical and technological skills, in addition to being under-resourced. This probably accounts for the limited research in value-addition technologies, product quality, markets and policy interventions. The constraints identified for the Great Lakes Region are presented in Table 2.

Table 2. Constraints on the *Musa* sub-sector in the Great Lakes region.

Constraints
<p><i>Production constraints</i></p> <p>Low and/or declining fertility</p> <p>Diseases and pests: Fusarium wilt, BBW, bunchy top; nematodes, weevils;</p> <p>Poor accessibility to production inputs: fertilizers, improved varieties, clean planting material; improved agronomic practices</p> <p>Poor client-oriented research</p>
<p><i>Market and Post-harvest constraints</i></p> <p>Subsistence oriented production systems</p> <p>Poor marketing of bananas: lack of information on bananas prices, market intelligence and skills, poor handling</p> <p>Limited to international market</p> <p>Poor diversification of banana products on the market</p> <p>Limited access to improved processing technologies</p>
<p><i>Institutional constraints</i></p> <p>Policies not favourable for the banana sub-sector</p> <p>Low involvement of the private sector</p> <p>Low human resource capacity</p> <p>Poor infrastructure: roads, telecommunication</p> <p>Insufficiency of financial resource base</p>

IDENTIFICATION OF RESEARCH AREAS

The following research areas were identified:

- Formulating and promoting enabling banana policies (natural resource, land tenure system, trans-boundary issues and germplasm exchange),
- Evaluating and promoting trans-boundary banana trade between Uganda, Rwanda, Burundi and DRC,
- Developing integrated pest management strategies (set up early warning system, quarantine system, clean planting material facilities),
- Improving soil fertility and water management: (using GIS, establishing regional lab for analysis),
- Enhancing transfer of appropriate technologies: (exchange of package of technologies, information sharing, GIS-based database, germplasm etc),
- Enhancing value addition and post-harvest handling of banana,
- Improving banana germplasm,
- Building capacity (researchers, farmers, private sector, NGOs, infrastructure),
- Studying ways to intensify existing production systems,
- Understanding the major socio-economic issues (land tenure systems, crop-livestock competition, input systems, trans-boundary trade),
- Enhancing the nutritional quality of bananas (broadening germplasm base to increase provitamine A levels).

PRIORITY RESEARCH AREAS

The participants discussed the contribution of the research areas to meeting the identified criteria. Each research area was scored according to its estimated impact on a given criterion, from -5 for a very significant negative effect (if, for example, it had a negative impact on the environment, gender equity or employment) to +5 for an extremely positive effect. A score of 0 implied that the research area would contribute nothing to that criterion. The scores given by the participants were averaged and multiplied by the weight given to each criterion. The standard deviation was used to separate the research areas into three groups: high, medium and low priority.

This exercise is to help managers decide to which projects allocate resources. All high being equal, the high priority projects will be allocated more resources than the ones ranked medium and low. The results of the priority exercise are presented in Table 3. Participants were given the opportunity to review the results of their scoring so as to identify outlier scores.

Table 3. Priority given to each research area for the Great Lakes Region.

Research areas	Priority
Enhancing transfer of appropriate technologies Enhancing value addition and post-harvest handling Improving banana germplasm Developing integrated pest management strategies	High
Improving soil fertility and water management Enhancing the nutritional quality of bananas Studying ways to intensify existing production systems Evaluating and promoting transboundary banana trade between Uganda, Rwanda, Burundi and DRC	Medium
Building capacity Understanding the major socio-economic issues Formulating and promoting enabling banana policies	Low

STRATEGIC PLAN FOR THE *MUSA* SUB-SECTOR

Stakeholders recognise the fact that bananas are a very important for the livelihoods of people in the Great lakes region. They also appreciate that the production-to-consumption chain does not effectively meet expectations. The need to improve production and productivity has become so apparent that the way to conduct research has to change. The overriding goal is to contribute to poverty eradication. To this effect, emphasis has to shift to increasing household income and food security, maintaining the sustainability of the natural resource base, strengthening institutional capacity, improving the policy environment and facilitating information exchange and use.

VISION AND MISSION

The vision is for the banana sub-sector to satisfy the livelihood needs of the Central African rural communities. Banana producers should improve their livelihoods by being able to pay for school fees, medical services, livestock, housing, agricultural inputs and other requirements (e.g. pocket money and social obligations such as weddings)

The mission is to strengthen knowledge and service-support systems for a more effective *Musa*-based economy geared to improving the well-being of the poor in the Great Lakes Region.

CHALLENGES

As a region emerging from a decade of civil strife, there is a number of challenges to be faced. The conflict in the 1990s destroyed infrastructure and social economic networks, increasing unemployment and poverty, especially in banana-based farming systems. Population growth and the declining productivity of agricultural systems would have also contributed to increasing the number of people going hungry. Re-building the social fabric in the rural communities to recreate the pre-conflict dynamic rural economies remains a daunting challenge that will require all partners at the local, national, regional and international levels to join hands and pull in the same direction. As the dominant cropping system in this region, bananas will have a major role to contribute to the recovery process and should form the basis for rebuilding the institutional frameworks needed for collaboration and coordination.

The obstacles include poverty, rapid population growth and land scarcity as a result of a high population pressure, declining health and nutritional status of population, low employment level and subsistence production systems. The strategic challenges are:

- Improving transfer of appropriate banana technologies;
- Adding value and improving post-harvest handling;
- Broadening genetic base;
- Addressing the major pests and diseases;
- Improving soil fertility and water management;
- Enhancing nutritional quality of bananas;
- Promoting trans-boundary banana trade between Uganda, Rwanda, Burundi and DR Congo;
- Improving human resources and infrastructure.
- Formulating and advocating for enabling policies.

STRATEGIC OBJECTIVES AND OPPORTUNITIES

The overall strategic objective that will be pursued is strengthening national and regional mechanisms to plan and orient investments and exploit synergies for increasing the contribution of the *Musa* sector to the improvement of livelihoods in the Great Lakes Region. The specific objectives are to contribute to the food security and incomes of small-scale farmers and sustain the natural resource base through research and development on improved banana production and processing technologies.

In the operationalization of this strategic plan, participatory inclusive approaches targeting farmers, farmer organizations, extension workers, development agencies, researchers, traders, consumers, entrepreneurs, credit institutions, local and national governments, and sub-regional organizations will be used. Moreover, there is a growing awareness of the need to view banana farming as a business rather than a culture. This coupled with the pro free market government policies and donors' interest in regions recovering from conflicts, will greatly enhance the role of the banana sector to contribute to the region's recovery.

In order to achieve the above strategic objectives, research interventions were identified and these will make up the projects for which full blown proposals with indicators and targets will be developed. The projects to be implemented are divided into high, medium and low priority. By implication, if resources are very limiting, then the high priority projects will be considered first.

SUCCESS FACTORS

In order to effectively implement the different strategies for achieving the strategic objectives, the critical factors that will define success are:

- Timely funding: the proposed research interventions will require a timely flow and release of funds if the action plan is to be implemented accordingly.
- Adherence to work plans: this is necessary to achieve the outputs of the agenda and a means of accountability to the partners.
- Community participation and ownership: the communities must be involved and own the process.

- Effective partnerships: the production to consumption chain requires the participation of different players each contributing at critical points. The processors, marketing, transport to mention but a few will need to work together with a common vision.
- Security: this affects all the spheres of the economy and research can be very vulnerable to the extent that no funds will flow into the system and researchers won't be able to work.
- Political will: Great Lakes Region governments and other policy makers should be committed to the cause of improving the banana sub-sector.

CORE VALUES

The following core values are recommended in the implementation of the strategic plan:

- Team spirit: valuing team spirit, creativity and respect for one another and recognising diversity in the workplace (gender, cultural and professional), building on them as strengths.
- Integrity: respecting and responding to the needs of our partners and the people we serve with a high degree of integrity.
- Transparency: believing in and supporting transparency in our activities, resource allocation and decision-making.
- Result oriented: valuing time management and a result-oriented work ethics.
- Non-bureaucratic: maintaining an informal working environment, valuing effective vertical and horizontal communication more than hierarchy (non- bureaucratic).

IMPACT AND PERFORMANCE ASSESSMENTS

Periodic assessment of performance and impact is a key element to measure the contribution of banana research to rural development, as well as to identify its strengths and weaknesses. In future, the Great Lakes Region Banana Research Programme will ensure that performance indicators are identified. Such indicators will be simple and clearly defined to allow appropriate participatory methodologies to be used in performance and impact assessments.

The Great Lakes Region Banana Research Programme will also assess the processes and methods. Accuracy and dependability of results not only depend on clearly defined monitorable indicators and the availability of reliable data and information, but also on the wider participation of stakeholders in the assessment process. A management information system is a useful tool for capturing, updating and creating data, and monitoring provides a feedback mechanism. Integrating the two greatly facilitates performance assessment. The programme will seek to develop and implement such a system and to monitor and evaluate processes and methods by:

- Establishing a set of key quantitative and qualitative monitorable indicators to assess the project outputs and results;
- Documenting results to evaluate their effectiveness and impact on increasing production, incomes as well as their environmental impacts;
- Creating a database to ensure the timely and reliable assessment results.

The assessment process will involve partners and clients in operational areas. In order to integrate monitoring and evaluation processes with the performance assessment process, the focus will be on developing milestones and outputs for performance evaluation. Comprehensive baseline surveys will be conducted to set benchmarks against which future improvements will be gauged.

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ANNEX 2: ORIGINAL CRITERIA AND SUB-CRITERIA

<p>INCREASING HOUSEHOLD INCOME</p> <p>Creates employment</p> <p>Adds value to banana products</p> <p>Increases banana products on the market</p> <p>Introduces new technologies along the chain</p> <p>Improves product quality</p>
<p>IMPROVING HOUSEHOLD FOOD SECURITY</p> <p>Increases yields of banana and products</p> <p>Reduces losses at all levels along the chain</p> <p>Introduces demand-driven technologies</p>
<p>MAINTAINING THE SUSTAINABILITY OF THE NATURAL RESOURCE BASE</p> <p>Reduces use of chemical additives</p> <p>Reduces loss of soil fertility</p> <p>Improves the quality of air and water</p> <p>Conserves banana-based biodiversity</p>
<p>STRENGTHENING INSTITUTIONAL CAPACITY</p> <p>Improves linkages and partnerships</p> <p>Improves the skills of stakeholders</p> <p>Strengthens Financial Resource Base</p> <p>Improves infra-structure</p>
<p>IMPROVING THE POLICY ENVIRONMENT</p> <p>Strengthens advocacy at the grass-roots</p> <p>Generates policy data/information</p> <p>Improves linkages between policy organisations</p>
<p>FACILITATING INFORMATION EXCHANGE AND UTILISATION</p> <p>Increases information generation</p> <p>Increases information dissemination</p> <p>Increases information utilization</p>

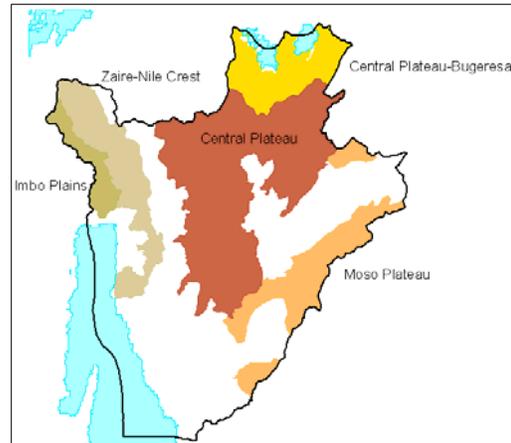
ANNEX 3: ACRONYMS

ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
BAIR	Bureau d'Appui Aux Initiatives Rurales
BARNESA	Banana Research Network for East and Southern Africa
BBW	Banana Bacterial Wilt
BIOVERSITY	Bioversity International
BXW	Banana <i>Xanthomonas</i> Wilt (or Banana Bacterial Wilt)
CIALCA	Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa
CIAT	Centro Internacional de Agricultura Tropical
DGDC	Directorate General for Development Cooperation, Belgium
DIOBASS	Demarche pour une Interaction entre Organisation de Base et Autre Sources de Savoirs
DRC	Democratic Republic of Congo
ESA	Eastern and southern Africa Office
FACAGRO	Agricultural Faculty of the University of Burundi
GIS	Geographic Information System
IITA	International Institute of Tropical Agriculture
IFPRI	International Food Policy Research Institute
INERA	Institute National des Etudes et de la Recherches Agricole
IRAZ	Institut de Recherche Agronomique et Zootechnique
ISABU	Institut des Sciences Agonomiques du Burundi
ISAR	Institut des Sciences Agonomiques du Rwanda
ISNAR	International Service for National Agricultural Research
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
NGO	Non Governmental Organisation

MUSA SUB-SECTOR STRATEGIC PLAN FOR BURUNDI

INTRODUCTION

In Burundi, bananas, especially the cooking types) are a very important staple food. With the beer and dessert bananas and some plantains, they represent 40% of the total agriculture production and provide an important source of income. The main banana-growing regions are the Nile crest, the Imbo plains, the Central plateau and the Moso plateau. A few plantains can be found in the Imbo plains. Banana program research is handled by IRAZ, which closely collaborates with the other research institutes (ISABU, FACAGRO), the extension services, NGO's and other farmers organisations.



Over the years, the main achievements registered in Burundi are:

- The constitution of the first and significant reference collection of high altitude bananas. By the breath of its diversity, this collection is one of most significant in Africa and has germplasm not found anywhere else in the world. The collection currently has 300 accessions;
- Identification and diffusion of 16 cultivars of banana with good agronomic characteristics;
- Identification and diffusion of clones resistant and or tolerant to the various diseases in the area, in particular fusarium wilt and black leaf streak disease;
- Trials conducted by IRAZ at Mashitsi research centre has led to the determination of the densities of plantation, the periods of planting the banana trees, the optimal amounts of the manure, etc;
- The establishment of a tissue culture laboratory able to carry out micropropagation of planting material. It is an essential facility for research and access to clean and improved planting material for the farmers.

PRIORITY SETTING FOR THE *MUSA* SUB-SECTOR

The process of developing a strategic plan started by identifying the constraints and priority research interventions in order to make decisions on the allocation of investments.

The Project Strategic Planning Workshop followed the seven-step priority setting process recommended by the International Service for National Agricultural Research (ISNAR) and the International Food Policy Research Institute (IFPRI) and adopted by the Association for Strengthening Agricultural research in East and Central Africa (ASARECA). A Network Committee comprising the Bioversity-ESA Regional Coordinator, the Director of the Monitoring and Evaluation and Planning Unit of NARO, and an Associate Scientist at Bioversity-ESA was established (Step 1) to review the banana sub-sector or research domain (Step 2), evaluate existing results (Step 3). For the fourth step, a second committee, a Workshop Process

Management Committee (Annex 1), comprising the head of the National Banana Research Programme, eminent scientists and the Network Committee was established to develop/analyse the individual constraints (Step 4) into a set of research alternatives and consolidated into research for development sub-themes (Step 5). Subsequently, a priority setting workshop (Step 6) involving stakeholders was held during the first three days of the Workshop.

Steps 1 to 5 were conveyed to participants by way of presentations and discussions during the workshops. Work in groups and plenary discussions were also used. Presentations were delivered in both French and English, when necessary. Templates and background material were presented in French and English.

Step 6 involved the priority setting workshop itself. The process can be summarized into four key stages:

5. Presentation of the results obtained by the Network Coordination Committee and the Workshop Process Committee were delivered to participants through presentations. The regional sub-thematic areas for the Great Lakes Region were delivered by the Head of the National Banana Programme to the stakeholder representatives.
6. Group work exercises (and plenary discussions) were utilized to:
 - a. verify the key constraints and research areas proposed by the Process Management Committee,
 - b. agree on the criteria at country level and determine their relative weight,
 - c. score the research areas.
7. The Workshop Process Management Committee synthesized and classified the results into high, medium or low priority research areas.
8. Stakeholder approval of the final results.

IDENTIFICATION OF CRITERIA

The priority-setting process used the weighted scoring method. The method ensures that adjustments can be made as priorities and circumstances change. Application of the weighted scoring method included identifying relevant criteria representative of national goals and research for development thematic areas. The team modified the BARNESA criteria (Annex 2) as indicated in Table 1. The total had to add up to 100.

Table 1. Weight given by the stakeholders to the criteria used to identify the priorities.

Criteria	Weight
<i>Increasing household income</i>	
Creating employment	9
Adding value to banana products	7
Increasing banana products on the market	7
Introducing new and profitable technologies along the chain	7
Improving product quality	5

Criteria	Weight
<i>Increasing household food security</i>	
Increasing banana yields and products	10
Reducing losses at all levels along the chain	4
Introducing demand-driven technologies	7
Improving nutritional value of banana and banana products	4
<i>Maintaining the sustainability of the natural resource base</i>	
Reducing use of chemical additives	3
Reducing soil fertility loss	9
Improving air and water quality	3
Conserving banana-based biodiversity	5
<i>Strengthening institutional capacity</i>	
Improving linkages and partnerships	1
Improving the skills of stakeholders	3
Strengthening financial resource base	2
Improving infra-structure	2
<i>Improving the policy environment</i>	
Strengthening advocacy at the grassroots	2
Generating policy data/information	2
Improving linkages between policy organizations	2
<i>Facilitating information exchange and utilization</i>	
Increasing information generation	2
Increasing information dissemination	2
Increasing information utilization	2

IDENTIFICATION OF CONSTRAINTS

The banana cropping system and the marketing of banana are much constrained by many factors such as biotic and abiotic factors leading to low productivity and institutional weaknesses (Table 2).

Table 2. Constraints on the *Musa* sub-sector.

Constraints
<i>Production constraints</i>
Low and/or declining fertility
Diseases and pests: Fusarium wilt, BBW, bunchy top; nematodes, weevils;
Poor accessibility to production inputs: fertilizers, improved varieties, clean planting material; improved agronomic practices
Genetic diversity poorly exploited because of lack of characterization and evaluation

Constraints
<p><i>Market and Post-harvest constraints</i></p> <p>Lack of marketing information</p> <p>Lack of marketing skills</p> <p>Poor marketing</p> <p>Lack of knowledge about technologies that can add value;</p> <p>Traditional technologies not adapted to preserving and improving products</p> <p>High packaging costs</p>
<p><i>Institutional constraints</i></p> <p>Insufficient funding for research</p> <p>Low involvement of the private sector</p> <p>Limited access to credit</p> <p>Low human resource capacity</p> <p>Poor coordination at extension level</p>

IDENTIFICATION OF RESEARCH AREAS

The following research areas were identified:

- Improving soil fertility, water management and soil conservation in banana cropping systems;
- Strengthening the application of integrated pest management strategies, establishing the distribution of diseases and pests, identifying banana cultivars resistant to current disease, establishing a quarantine system;
- Facilitating access to improved varieties and planting material (complete collecting, characterize and evaluate germplasm, enhance capacity in multiplication of clean planting material);
- Facilitating transfer of appropriate post-harvest technologies;
- Improving marketing and market information (diversification of banana products, development of competitive banana products, collect and dissemination of information);
- Developing human resources (researchers, farmers, private sector) and infrastructure;
- Developing partnerships (scientists, public sector, extension services, NGOs, private sector)

PRIORITY RESEARCH AREAS

The participants discussed the contribution of the research areas to meeting the identified criteria. Each research area was scored according to its estimated impact on a given criterion, from -5 for a very significant negative effect (if, for example, it had a negative impact on the environment, gender equity or employment) to +5 for an extremely positive effect. A score of 0 implied that the research area would contribute nothing to that criterion. The scores given by the participants were averaged and multiplied by the weight given to each criterion. The standard deviation was used to separate the research areas into three groups: high, medium and low priority.

This exercise is to help managers decide to which projects allocate resources. All high being equal, the high priority projects will be allocated more resources than the ones ranked medium and low. The results of the priority exercise are presented in Table 3. Participants were given the opportunity to review the results of their scoring so as to identify outlier scores.

Table 3. Priority given to each research area in Burundi.

Research areas	Priority
Facilitating access to improved varieties and planting material Strengthening the application of integrated pest management strategies	High
Improving soil fertility, water management and soil conservation in banana cropping systems Improving marketing and market information Developing human resources Facilitating transfer of appropriate post-harvest technologies	Medium
Developing partnerships Infrastructure /Physical Development	Low

THE STRATEGIC PLAN FOR THE *MUSA* SUB-SECTOR

Agricultural researchers in Burundi recognise the fact that bananas are a very important commodity in the livelihoods of the people and that the production-to-consumption chain does not effectively meet the stakeholders' expectations. The need to improve production and productivity of bananas has become so apparent that research has to be conducted in a different way. The overriding goal here is to contribute to poverty eradication. To this effect the paradigm shift in banana research will be geared towards increasing household income, improving household food security, maintaining the sustainability of the natural resource base, strengthening institutional capacity, improving the policy environment and facilitating information exchange and utilisation.

VISION AND MISSION

The vision is to enhance rural livelihood by increasing banana products on the market whereas the mission is to generate and disseminate appropriate technologies that will result in improving the banana cropping system for increased contribution to the well-being of the population of Burundi.

CHALLENGES

The main challenges that the banana research programme needs to address are:

- Facilitating access to improved germplasm and planting material;
- Enhancing skills in integrated pest management;
- Improving soil fertility and availability of water resources;
- Improving marketing and market information for bananas;
- Improving transfer of appropriate post-harvest technologies;
- Improving human, financial resources and infrastructures;

- Enhancing linkages and partnership between stakeholders.

STRATEGIC OBJECTIVES AND OPPORTUNITIES

The strategic objectives that will be pursued are:

- Promoting access to improved banana germplasm and planting material;
- Strengthening the application of integrated pest management strategies;
- Improving management and conservation of soil fertility and water;
- Improving marketing and market information of bananas;
- Developing human resource and physical infrastructure;
- Facilitating the transfer of appropriate post-harvest technologies;
- Developing and implementing effective partnerships.

In addressing the strategic objectives, the main opportunities to take advantage of are:

Commitment to peace and return of donors: There is a great thirst for development by the people of Burundi. The willingness of donors to provide funds will accelerate development by investing in the different sectors of the economy. A good banana research proposal stands very high chances of being supported.

Presence of institutions that can address the strategic challenges: At the research level, there are NARIs IRAZ, and RCMRD. Extension services, NGOs, farmers organisation and the private sector are involved in seed production.

Efficient tools exist at different institutional level: Especially for molecular biology and tissue culture laboratories.

Natural resources for the restoration of fertility: Utilisation of animal manure, compost, mulch, cold ash and plants such as *Tithonia*.

Technologies to control pest and diseases available in the country and at regional level: Improved hybrids, clean tissue-culture planting materials, botanicals such as neem, traditional biological control techniques.

Potential markets: Bananas can be exported to COMESA countries and non-African countries. Flour, chips and wine can be produced.

Telecommunication facilities: The Eastern Africa Submarine Cable System will improve communications, reduce the on satellite communications and reduce costs. Some countries like Burundi, Rwanda, Tanzania and Uganda are linked by KBO telecommunications, which are cheap.

For each project the outputs and specific activities to be undertaken are shown in Annex 3.

SUCCESS FACTORS

In order to effectively implement the different strategies for achieving the strategic objectives, the critical factors that will define success are:

- **Timely funding:** the proposed research interventions will require a timely flow and release of funds if the action plan is to be implemented accordingly.
- **Adherence to work plans:** this is necessary to achieve the outputs of the agenda and a means of accountability to the partners.

- Community participation and ownership: the communities must be involved and own the process.
- Effective partnerships: the production to consumption chain requires the participation of different players each contributing at critical points. The processors, marketing, transport to mention but a few will need to work together with a common vision.
- Security: this affects all the spheres of the economy and research can be very vulnerable to the extent that no funds will flow into the system and researchers won't be able to work.
- Political will: the government and other policy makers should be committed to the cause of improving the banana sub-sector.

CORE VALUES

The following core values are recommended in the implementation of the strategic plan:

- Team spirit: valuing team spirit, creativity and respect for one another and recognising diversity in the workplace (gender, cultural and professional), building on them as strengths.
- Integrity: respecting and responding to the needs of our partners and the people we serve with a high degree of integrity.
- Transparency: believing in and supporting transparency in our activities, resource allocation and decision-making.
- Result oriented: valuing time management and a result-oriented work ethics.
- Non-bureaucratic: maintaining an informal working environment, valuing effective vertical and horizontal communication more than hierarchy (non- bureaucratic).

IMPACT AND PERFORMANCE ASSESSMENTS

Periodic assessment of performance and impact is a key element to measure the contribution of banana research to rural development, as well as to identify its strengths and weaknesses. In future, the Banana Research Programme will ensure that performance indicators are identified. Such indicators will be simple and clearly defined to allow appropriate participatory methodologies to be used in performance and impact assessments.

The Banana Research Programme will also assess the processes and methods. Accuracy and dependability of results not only depend on clearly defined monitorable indicators and the availability of reliable data and information, but also on the wider participation of stakeholders in the assessment process. A management information system is a useful tool for capturing, updating and creating data, and monitoring provides a feedback mechanism. Integrating the two greatly facilitates performance assessment. The programme will seek to develop and implement such a system and to monitor and evaluate processes and methods by:

- Establishing a set of key quantitative and qualitative monitorable indicators to assess the project outputs and results;
- Documenting results to evaluate their effectiveness and impact on increasing production, incomes as well as their environmental impacts;
- Creating a database to ensure the timely and reliable assessment results.

The assessment process will involve partners and clients in operational areas. In order to integrate monitoring and evaluation processes with the performance assessment process, the

focus will be on developing milestones and outputs for performance evaluation. Comprehensive baseline surveys will be conducted to set benchmarks against which future improvements will be gauged.

ANNEX 1: THE WORKSHOP PROCESS MANAGEMENT COMMITTEE

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<p>MAINTAINING THE SUSTAINABILITY OF THE NATURAL RESOURCE BASE</p> <p>Reduces use of chemical additives</p> <p>Reduces loss of soil fertility</p> <p>Improves the quality of air and water</p> <p>Conserves banana-based biodiversity</p>
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<p>FACILITATING INFORMATION EXCHANGE AND UTILISATION</p> <p>Increases information generation</p> <p>Increases information dissemination</p> <p>Increases information utilization</p>

ANNEX 3: RESEARCH OUTPUTS AND ACTIVITIES

Outputs	Activities	On-going and expected activities	Partners
Output 1: Enrichment of existing IRAZ collection	1.1. Complete collect of banana germplasm 1.2. Introduce exotic germplasm 1.3. Install new accessions collected and introduced ex situ	1.1.IRAZ/ISABU (EAPGREN) 1.2.IRAZ (KUL) 1.3. DGDC/CIALCA	1.1. ISABU 1.2. IRAZ
Output 2: Knowledge of the accessions in the collection is increased	2.1. Complete characterization of the accessions in the IRAZ collection 2.2. Evaluate the accessions	2.1.IRAZ/ISABU (EAPGREN) 2.2.IRAZ/ISABU (EAPGREN)	2.1. IRAZ DGDC/CIALC 2.2. IRAZ, ISABU and FACAGRO
Output 3: Availability of improved, clean and demand-driven material	3.1. Reinforce tissue culture facilities 3.2. Reinforce human resources 3.3. Clean and conserve the collected and introduced material in vitro 3.4. Multiply rapidly the promising varieties 3.5. Disseminate the cleaned promising varieties	3.1.DGDC/CIALCA 3.2.DGDC/CIALCA 3.3.DGDC/CIALCA 3.4. DGDC/CIALCA 3.5.DGDC/CIALCA	3.1.IRAZ, FACAGRO, AGROBIOTEC 3.2. FACAGRO, ISABU, IRAZ 3.3. IRAZ, FACAGRO, 3.4. Private labs, IRAZ 3.5. ISABU, NGOs, Extension services and private sector and farmers
Output 4: Existing technologies evaluated and new ones generated (IPM/Soil fertility)	4.1.Establish a pest and disease distribution map 4.2. Evaluate disease/pests impact 4.3. Develop and implement IPM techniques / components 4.4. Develop and implement soil fertility and water management techniques/ components 4.5. Train extension agents	4.1. DGDC/CIALCA 4.2. DGDC/CIALCA 4.3. DGDC/CIALCA 4.4.DGDC/CIALCA 4.5.DGDC/CIALCA	4.1.IRAZ, FACAGRO, ISABU 4.2.RAZ, FACAGRO, ISABU 4.3.RAZ, FACAGRO, ISABU 4.4.IRAZ, FACAGRO, ISABU 4.5.IRAZ,FACAGRO, ISABU

Outputs	Activities	On-going and expected activities	Partners
Output 5: Post harvest technologies transfer enhanced	5.1. Collect existing information on available technologies (diversification) 5.2. Identify market-oriented technologies 5.3. Training on the identified technologies 5.4. Dissemination of approved technologies	5.1. DGDC/CIALCA 5.2. DGDC/CIALCA 5.3. DGDC/CIALCA 5.4. DGDC/CIALCA	5.1. CNTA, ISABU, FACAGRO 5.2. CNTA, ISABU, FACAGRO 5.3. CNTA, ISABU, FACAGRO 5.4. NGOs, extension services, private sector, farmers and farmer associations, Young and women organisations
Output 6: Availability of marketable banana products ensured	6.1. Collect information and carry out socio-economic studies on banana market opportunities 6.2. Promote the available banana products	6.1. DGDC/CIALCA 6.2. Processors, marketers	6.1. ISABU, FACAGRO, processors, marketers, consumers 6.2. Processors, marketers

ANNEX 4: ACRONYMS

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BXW	Banana <i>Xanthomonas</i> Wilt (or Banana Bacterial Wilt)
CIALCA	Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa
CIAT	Centro Internacional de Agricultura Tropical
CNTA	Centre National de Technologie Alimentaire
DGDC	Directorate General for Development Cooperation, Belgium
EAPGREN	Eastern African Plant Genetic Resources Network
IITA	International Institute of Tropical Agriculture
IFPRI	International Food Policy Research Institute
INERA	Institute National des Etudes et de la Recherches Agricole
IPM	Integrated Pest Management
IRAZ	Institut de Recherche Agronomique et Zootechnique
ISABU	Institut des Sciences Agonomiques du Burundi
ISNAR	International Service for National Agricultural Research
MEPU	Monitoring, Evaluation and Planning Unit, NARO
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
NGO	Non-Governmental Organisation
TSBF	CIAT's Tropical Soil and Biology Fertility Institute

MUSA SUB-SECTOR STRATEGIC PLAN FOR THE DEMOCRATIC REPUBLIC OF CONGO

INTRODUCTION

Banana is an important staple and cash crop in the Democratic Republic of Congo (DR Congo). In Eastern Congo, bananas account for about 40% of total household income. The largest portion of the production is sold in local markets. An unknown volume is exported to Uganda and Rwanda. Only plantain is exported to Uganda from North Kivu, while beer bananas are the main export to Rwanda.

Bananas are ranked first among staple crop in South and North Kivu as far as acreage and production are concerned. They cover 1.35 million hectares and the annual production is 3.7 million tons (Ministry of Agriculture, 2002). Bananas are usually intercropped with bean, arrow root, yam and cassava, but are also grown as a monocrop. Banana yields are generally low, and vary from 3 tons/ha to 6 tons/ha/year. Bananas are cultivated up to approximately 2300 m.

The cultivars grown vary with the altitude. At the lower altitudes, (below 1200 m in the western part of the country) plantains constitute the main types, followed by Kisubi and dessert bananas. At mid and high altitude (1200 to 2000 m in Eastern Congo, South Kivu, North Kivu and Ituri), the East African highland banana types predominate. Dessert bananas, Kalole and Kisubi are also present. However, above 2000 m, in the eastern part of the country, bananas do not perform well due to the low temperature.

Research and development on bananas is conducted at the universities and INERA. INERA has a germplasm collection at Mulungu Station in South Kivu. Some socio-economic studies are being done by local NGOs such as DIOBASS.

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The process of developing a strategic plan started by identifying the constraints and priority research interventions in order to make decisions on the allocation of investments.

The Project Strategic Planning Workshop followed the seven-step priority setting process recommended by the International Service for National Agricultural Research (ISNAR) and the International Food Policy Research Institute (IFPRI) and adopted by the Association for Strengthening Agricultural research in East and Central Africa (ASARECA). A Network Committee comprising the Bioversity-ESA Regional Coordinator, the Director of the Monitoring and Evaluation and Planning Unit of NARO, and an Associate Scientist at Bioversity-ESA was established (Step 1) to review the banana sub-sector or research domain (Step 2), evaluate existing results (Step 3). For the fourth step, a second committee, a Workshop Process Management Committee (Annex 1), comprising the head of the National Banana Research Programme, eminent scientists and the Network Committee was established to develop/analyse the individual constraints (Step 4) into a set of research alternatives and consolidated into research for development sub-themes (Step 5). Subsequently, a priority setting workshop (Step 6) involving stakeholders was held during the first three days of the Workshop.

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 - a. verify the key constraints and research areas proposed by the Process Management Committee,
 - b. agree on the criteria at country level and determine their relative weight,
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11. The Workshop Process Management Committee synthesized and classified the results into high, medium or low priority research areas.
12. Stakeholder approval of the final results.

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Criteria	Weight
<i>Increasing household income</i>	
Creating employment	8
Adding value to banana products	7
Increasing banana products on the market	6
Introducing new and profitable technologies along the chain	8
Improving product quality	6
<i>Increasing household food security</i>	
Increasing banana yields and products	9
Reducing losses at all levels along the chain	6
Introducing demand-driven technologies	5
Improving nutritional value of banana and banana products	5
<i>Maintaining the sustainability of the natural resource base</i>	
Reducing use of chemical additives	3
Reducing soil fertility loss	7
Improving air and water quality	4
Conserving banana-based biodiversity	6

Criteria	Weight
<i>Strengthening institutional capacity</i>	
Improving linkages and partnerships	2
Improving the skills of stakeholders	2
Strengthening financial resource base	2
Improving infra-structure	2
<i>Improving the policy environment</i>	
Strengthening advocacy at the grassroots	2
Generating policy data/information	2
Improving linkages between policy organizations	2
<i>Facilitating information exchange and utilization</i>	
Increasing information generation	2
Increasing information dissemination	2
Increasing information utilization	2

IDENTIFICATION OF CONSTRAINTS

The situation was analysed to identify the main constraints that need addressing and how they interact. Opportunities were also highlighted. The potential impact of resolving a constraint or addressing an opportunity was borne in mind while establishing priorities.

The process began with the strategic management committee consulting with a wide range of stakeholders. The committee synthesised the results of the consultation in a list of key constraints and opportunities. A causal structure among the constraints was used to establish the problems rather than the symptoms.

From the analysis of the constraints, it was established that the banana cropping system and the marketing of banana are much constrained by biotic and abiotic factors leading to low productivity and institutional weaknesses. The following constraints were identified.

Production constraints

Productivity has declined in recent times thereby failing to benefit from increased market opportunities and further threatening food security. The decline in output is due to several factors which include; low genetic base, poor access to improved planting materials, low external inputs, declining soil fertility, pests and diseases, and non adoption of improved technologies by the farmers.

Low genetic base: In view of the fact that bananas are constrained by a lot of biotic factors, there is a need for a diverse genetic base from which to draw genes to breed for resistance or tolerance against such factors. Unfortunately, the genetic base of bananas in DR Congo is low. This puts a big challenge to the scientists in developing germplasm that can stand the pressure of pests and diseases and that can meet the demand of stakeholders.

Poor access to improved planting materials: To compound the problem of a low genetic base, the few improved planting materials in the country and region cannot be easily accessed. For some places are very distant and the roads are very bad. The regionally available materials require some complex mechanisms to access. In this strategic plan measures for improving access are presented and will have to be explored to improve the situation.

Low external inputs: Like many other African countries, DR Congo is not an exception in using few external inputs, especially fertilisers. In most cases, inorganic fertilisers are not applied. The use of manure too is negligible. Nutrients are mined from the gardens by harvesting the bananas and taking them to markets without replenishing soil nutrients. Mulch is occasionally applied but in insufficient quantities to cause any significant replenishment.

Low and declining soil fertility: Low soil fertility in the main banana production areas limits its extension. Soils in the eastern highlands are acidic and low in bases. Magnesium deficiency is also common. Bananas are grown around homesteads and fail to grow and produce where soils are not improved by house refuses. Poor soil conservation measures have also contributed to loss of fertility through erosion. The use of organic fertilizers is very limited given the small number of livestock. Cooking bananas is more sensitive to soil fertility levels and it is one of the reasons it is not the dominant type of banana grown in the country. The soil without any major productivity problem are those of volcanic origin and the alluvial soils, extensive in north Kivu.

Pests and diseases: The main banana diseases are present: fusarium, black and yellow Sigatoka, bacterial wilt and bunchy top. The common pests, which cause considerable damage, are weevils and nematodes.

The emerging threat is bacterial wilt spreading in North Kivu where banana production is highest thanks to fertile soils. All varieties are infected, and 5% of banana field is estimated to be infected in Rutshuru and Masisi territories. This disease require mobilisation of all and urgent action, if not there is risk that all banana be wiped out. There are some evidences of the diseases spreading to South Kivu.

Improved production technologies not used by farmers: Generally, the standards of farm management are low, which leads to low productivity. There is limited use of manure or mulches due to lack of resources. Traditionally, banana is intercropped with annual crops (predominantly beans).

Marketing constraints

Markets and marketing can play a big role in improving livelihoods but the major constraints are poor infrastructures, price fluctuations and inadequate market information.

Poor road infrastructure: The road infrastructure in DR Congo is very poor. The roads are almost impassable during the rainy seasons. Lorries get stuck in the mud for days during which time bananas ripen. The bulky nature of bananas makes their transportation difficult.

Low banana farm gate prices: Banana farm gate price is very low in most remote zones because of bad road conditions. As a consequence, in these zones, farmers take less care of bananas. Only the middlemen benefit from the crop, although the price on the market in large cities is quite high, particularly for the cooking (i.e. plantain) and dessert types.

Subsistence-oriented banana production: Integrating bananas into the market economy will require a shift in agricultural methods. It has been a characteristic of the banana growers to do it for subsistence. This has to change so that they can do for income generation and preferably on a commercial scale. During the next five years, programmes for commercial-oriented banana production will be developed and implemented.

Lack of market information for business planning: There is no formal mechanism for scanning the environment to establish market opportunities for the farmers to sell their produce. This is worsened by the fact that the skills for market intelligence are lacking in the communities. Without appropriate market information farmers cannot decide quickly where and when to sell.

Post-harvest constraints

Many losses are incurred after harvest. The situation is worse with bananas because of being highly perishable. There is a need to invest in post-harvest technologies to improve the value of the crop right from harvest up to consumption. The major factors are poor handling, low value addition, high production costs for some products and poor planned harvests.

Narrow range of banana products: Cooking bananas are mainly sold as bunches or hands. Deserts are sold when ripe. The most common banana products are juice and beer. There are many more products that can be developed from bananas and yet this knowledge is lacking. A wide range of products will act as catalyst in improving productivity.

Poor product quality: It has been observed that the quality of the products on the market is poor. The shelf life of some products is low. There is need to improve the quality, especially critical if the plan is to supply regional markets.

Insufficient post harvest technologies: Improving the quality of banana products and widening the range of the products, it requires application of appropriate post-harvest technologies. Unfortunately, such technologies are insufficient. This can be attributed to insufficient human resources and financial resources for technology generation and development. There will be deliberate efforts to invest in increasing the availability of appropriate post-harvest technologies.

Institutional constraints

The major institutional constraints are; low human resource capacity in terms of numbers and skills, absence of policy to promote banana sector, poor integration of research system, no access to credit, inefficient extension systems leading to low technology use, and low priority given to the banana sector. There is need for government and development partners to address the above institutional constraints. This will create an enabling environment for all the other constraints to be easily addressed as they greatly hinge on prevailing institutional environment.

IDENTIFICATION OF RESEARCH AREAS

Based on the overview of the banana sector, the following list of research areas was generated:

- Collecting and/or introducing, characterizing and conserving germplasm in Eastern DRC.
- Improving marketing and marketing information opportunities.
- Developing integrated pest management strategies.
- Developing sustainable and profitable soil fertility management options (such as cover crop, legume integration, farm yard manure, compost).
- Identifying, adapting and promoting appropriate post-harvest technologies.
- Developing efficient seed systems for clean planting material.
- Developing and promoting market-led banana varieties.
- Developing strategies for conflict prevention.
- Human resource development (such as marketing, value addition, M&E, policy analysis).

PRIORITY RESEARCH AREAS

The participants discussed the contribution of the research areas to meeting the identified criteria. Each research area was scored according to its estimated impact on a given criterion, from -5 for a very significant negative effect (if, for example, it had a negative impact on the environment, gender equity or employment) to +5 for an extremely positive effect. A score of 0

implied that the research area would contribute nothing to that criterion. The scores given by the participants were averaged and multiplied by the weight given to each criterion. The standard deviation was used to separate the research areas into three groups: high, medium and low priority.

This exercise is to help managers decide to which projects allocate resources. All high being equal, the high priority projects will be allocated more resources than the ones ranked medium and low. The results of the priority exercise are presented in Table 2. Participants were given the opportunity to review the results of their scoring so as to identify outlier scores. If resources are very limiting, the high priority areas will be considered first.

Table 2. Priority given to each research area for DR Congo.

Research areas	Priority
Identifying, adapting and promoting appropriate post-harvest technologies. Human resource development (such as marketing, value addition, M&E, policy analysis). Developing and promoting market-led banana varieties. Developing sustainable and profitable soil fertility management options.	High
Developing efficient seed systems for clean planting material. Developing integrated pest management strategies. Improving marketing and marketing information opportunities. Developing strategies for conflict prevention.	Medium
Collecting and/or introducing, characterizing and conserving germplasm in Eastern DR Congo.	Low

STRATEGIC PLAN FOR THE *MUSA* SUB-SECTOR

Stakeholders recognise the fact that bananas are a very important commodity in the livelihoods of the people and that the production-to-consumption chain does not effectively meet the stakeholders' expectations. The need to improve production and productivity of bananas has become so apparent that research has to be conducted in a different way from what it has been. The overriding goal here is to contribute to poverty eradication. To this effect the paradigm shift in banana research will be geared towards increasing household income, improving household food security, maintaining the sustainability of the natural resource base, strengthening institutional capacity, improving the policy environment and facilitating information exchange and utilisation.

VISION AND MISSION

The vision is for research to create a profitable and sustainable *Musa* sub-sector, whereas the mission is to generate and disseminate appropriate technologies that will result in improving the banana cropping system for increased contribution to the well-being of the population of DR Congo.

CHALLENGES

The ultimate goal of this strategic plan is to have bananas fully integrated into the market economy but appropriate strategies and approaches need to be implemented in order to address the following challenges:

- *Improving marketing and marketing information opportunities.* Characterizing domestic and regional markets and market chains should reveal opportunities and potentially marketable banana products. Establishing effective and sustainable partnerships between the private sector, farmer organizations and policy makers should also help address this challenge. Other activities include; promoting banana in the media and at trade fairs, and training stakeholders on quality standards. Farmers groups should be strengthened to increase their bargaining power and market information should be more accessible.
- *Identifying and promoting appropriate post-harvest technologies.* Possible activities include identifying and documenting existing value added technologies and assessing their profitability, evaluating with farmers and other end-users techniques for reducing losses due to handling and transportation, developing promotional materials (posters, brochures) and medias briefs, evaluating processing technologies and assessing their profitability, and training partners in these technologies.
- *Developing sustainable and profitable soil fertility management options.* Soil erosion control strategies adapted to banana production systems should be identified, evaluated and disseminated. Integrating livestock to the system would provide manure.
- *Developing integrated pest management strategies.* Research should help develop and promote environmentally-friendly pest and disease management strategies. The spread of pests and diseases should be monitored, especially the one of BXW.
- *Developing efficient seed system for clean planting materials.* Appropriate policies and facilities producing clean planting materials should be developed.
- *Developing and promoting market-led banana varieties.* Banana varieties can be evaluated in participatory trials to see if they meet market requirements, consumer preferences and local agro-ecological conditions.
- *Improving the adoption of new banana varieties.* Limited access to improved technologies, an inadequate supply of planting materials, and few opportunities to observe the performance of the new varieties are said to be responsible for the low adoption rate of the latter in Africa. Multiplication facilities, demonstration trials in farmer field schools and promotional activities should improve the adoption of improved banana varieties.
- *Building human and physical capacity.* Gaps were identified in the areas of marketing, value addition, monitoring and evaluation and policy analysis. Training programmed based on the identified needs should be developed and the physical infrastructure improved.

STRATEGIC OBJECTIVES AND OPPORTUNITIES

The strategic objectives that will be pursued in the coming years are:

- Improving the current banana yield from 5-8 tones/ha to 30 to 40 tones/ha by the sustainable appropriate technologies use;
- Adding value to banana products;
- Strengthening physical and human capacity of the stakeholders;
- Generating information to enable policy formulation;

In addressing the strategic objectives, the main opportunities to take advantage of are:

Presence of NARIs, universities and NGOs. These are important partners in the implementation of the research agenda. The NARIs and Universities are potential sources of technologies, knowledge and skills needed to address the identified strategic challenges. The NGOs will be very useful as technology uptake pathways and delivery agencies.

Human and physical resources. Despite being scarce, there are resources available in the critical disciplines, human as well as physical, especially laboratories, computers, vehicles and infrastructure.

Proximity of markets in neighbouring countries. The neighbouring countries already offer a big market for the bananas produced in DR. Congo.

Partnership with international research organizations: Partners are a potential source of ideas and finances. For example INIBAP (renamed Bioversity International), ASERECA and BARNESA can help in seeking funds. Bioversity and IITA can be sources of germplasm.

The logical framework for the implementation of the strategic plan is presented in Annex 3 and details on the activities in Annex 4.

SUCCESS FACTORS

In order to effectively implement the different strategies for achieving the strategic objectives, the critical factors that will define success are:

- *Timely funding:* the proposed research interventions will require a timely flow and release of funds if the action plan is to be implemented accordingly.
- *Adherence to work plans:* this is necessary to achieve the outputs of the agenda and a means of accountability to the partners.
- *Community participation and ownership:* the communities must be involved and own the process.
- *Effective partnerships:* the production to consumption chain requires the participation of different players each contributing at critical points. The processors, marketing, transport to mention but a few will need to work together with a common vision.
- *Security:* this affects all the spheres of the economy and research can be very vulnerable to the extent that no funds will flow into the system and researchers won't be able to work.
- *Political will:* the government and other policy makers should be committed to the cause of improving the banana sub-sector.

CORE VALUES

The following core values are recommended in the implementation of the strategic plan:

- *Team spirit:* valuing team spirit, creativity and respect for one another and recognising diversity in the workplace (gender, cultural and professional), building on them as strengths.
- *Integrity:* respecting and responding to the needs of our partners and the people we serve with a high degree of integrity.
- *Transparency:* believing in and supporting transparency in our activities, resource allocation and decision-making.
- *Result oriented:* valuing time management and a result-oriented work ethics.

- *Non-bureaucratic*: maintaining an informal working environment, valuing effective vertical and horizontal communication more than hierarchy (non- bureaucratic).

IMPACT AND PERFORMANCE ASSESSMENT

Periodic assessment of performance and impact is a key element to measure the contribution of banana research to rural development, as well as to identify its strengths and weaknesses. In future, the DR Congo Banana Research Programme will ensure that performance indicators are identified. Such indicators will be simple and clearly defined to allow appropriate participatory methodologies to be used in performance and impact assessments.

The DR Congo Banana Research Programme will also assess the processes and methods. Accuracy and dependability of results not only depend on clearly defined monitorable indicators and the availability of reliable data and information, but also on the wider participation of stakeholders in the assessment process. A management information system is a useful tool for capturing, updating and creating data, and monitoring provides a feedback mechanism. Integrating the two greatly facilitates performance assessment. The programme will seek to develop and implement such a system and to monitor and evaluate processes and methods by:

- Establishing a set of key quantitative and qualitative monitorable indicators to assess the project outputs and results;
- Documenting results to evaluate their effectiveness and impact on increasing production, incomes as well as their environmental impacts;
- Creating a database to ensure the timely and reliable assessment results.

The assessment process will involve partners and clients in operational areas. In order to integrate monitoring and evaluation processes with the performance assessment process, the focus will be on developing milestones and outputs for performance evaluation. Comprehensive baseline surveys will be conducted to set benchmarks against which future improvements will be gauged.

ANNEX 1: THE WORKSHOP PROCESS MANAGEMENT COMMITTEE

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ANNEX 2: ORIGINAL CRITERIA AND SUB-CRITERIA

<p>INCREASING HOUSEHOLD INCOME</p> <p>Creates employment</p> <p>Adds value to banana products</p> <p>Increases banana products on the market</p> <p>Introduces new technologies along the chain</p> <p>Improves product quality</p>
<p>IMPROVING HOUSEHOLD FOOD SECURITY</p> <p>Increases yields of banana and products</p> <p>Reduces losses at all levels along the chain</p> <p>Introduces demand-driven technologies</p>
<p>MAINTAINING THE SUSTAINABILITY OF THE NATURAL RESOURCE BASE</p> <p>Reduces use of chemical additives</p> <p>Reduces loss of soil fertility</p> <p>Improves the quality of air and water</p> <p>Conserves banana-based biodiversity</p>
<p>STRENGTHENING INSTITUTIONAL CAPACITY</p> <p>Improves linkages and partnerships</p> <p>Improves the skills of stakeholders</p> <p>Strengthens Financial Resource Base</p> <p>Improves infra-structure</p>
<p>IMPROVING THE POLICY ENVIRONMENT</p> <p>Strengthens advocacy at the grass-roots</p> <p>Generates policy data/information</p> <p>Improves linkages between policy organisations</p>
<p>FACILITATING INFORMATION EXCHANGE AND UTILISATION</p> <p>Increases information generation</p> <p>Increases information dissemination</p> <p>Increases information utilization</p>

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ANNEX 3: LOGICAL FRAMEWORK OF THE STRATEGIC PLAN.

	Objectives	Indicators	Evidence (means of verification)	Assumptions
Goal	Bananas fully integrated into the market economy of DR Congo	<ul style="list-style-type: none"> - Percentage increase in contribution of banana to GDP - Number of organised marketing channels - Number of value added products on the market 	<ul style="list-style-type: none"> - National budget speeches - National statistics -Market survey reports 	
Purpose/ Outcome	Increased banana productivity in DR Congo	<ul style="list-style-type: none"> - Level of commercialization of fresh and value added products - Decrease in loss due to pests and diseases - Increased soil fertility and watershed management - Increased banana yields - Number of functional linkages among producers, processors and researchers 	<ul style="list-style-type: none"> Rapid rural appraisal reports Annual reports Survey reports 	
Outputs	1. Market opportunities for banana and banana products identified	<ul style="list-style-type: none"> - Number of trans-boundary banana products' markets and market chains - Number of identified potentially marketable banana product 	Survey reports	
	2. Effective and sustainable partnerships among private sector, farmer organizations and policy makers linking banana sector to markets established	<ul style="list-style-type: none"> - Number of participating partners in production, processing and trading of bananas. - Number of functional partnerships - Number of products promoted through media, advertisement, and trade fair. 	Variety release committee reports	

	Objectives	Indicators	Evidence (means of verification)	Assumptions
	3. Bargaining capacity of local communities strengthened	-Number of functional farmers groups - An operational mechanism of capturing and disseminating market information on banana products - Number of supportive policies passed by government	Producers satisfaction survey reports Extension delivery reports	
	4. Value added products identified, adapted and promoted at all levels of the stakeholders	- Number of value added products promoted	Survey reports Annual reports	Conducive environment for applying the skills exists
	5. Handling losses reduced	- Number of post-harvest handling options adopted - Reduction in handling losses	Survey reports	
	6 Development Agro-enterprises for banana processing facilitated	- Number of banana agro-enterprises	Survey reports	Farmers adopt the pests and disease management technologies
	7. Appropriate soil fertility management technologies/innovations for sustained smallholder banana production developed and promoted	- Number of soil fertility management technologies adopted	Adoption study reports	Favourable policy environment
	8. Environmentally-friendly pests and diseases management technologies for intensifying smallholder banana production developed and promoted	- Number of pest and disease management technologies promoted.	Survey reports	
	9. Strategy to stop BXW expansion implemented in North Kivu	- Number of functional partnerships - Number of activities jointly implemented	Partnership documents Annual and quarterly reports	Conducive environment for networking exists
	10. Livestock Integrated in the banana agro-system	- Number of farmers with livestock in the banana agro-system	Survey reports Annual reports	

	Objectives	Indicators	Evidence (means of verification)	Assumptions
	11. Planting material exchange policy reinforced.	<ul style="list-style-type: none"> - Number of policies that support the exchange of planting materials - Number of people happy with material exchange policies 	Policy documents Customer satisfaction reports	
	12. Knowledge and skills of key stakeholders to manage clean planting materials enhanced	<ul style="list-style-type: none"> - Number of key partners in seed systems. - Number of community based nurseries and clean planting materials - Number of trained key stakeholders in handling clean planting materials 	Survey reports	
	13. Clean planting materials accessed by farmers	<ul style="list-style-type: none"> - Number of producers accessing new varieties - Number of mechanisms for accessing varieties 	Survey reports Annual reports	
	14. Market-led banana varieties developed	<ul style="list-style-type: none"> - Number of market-led banana varieties 	Survey reports Annual reports	
	15. New varieties adopted	<ul style="list-style-type: none"> - Number of new varieties adopted 	Adoption rate study report	
	16. Capacity for <i>Musa</i> sub-sector research built	<ul style="list-style-type: none"> - Number of researchers trained - Number of extension workers trained - Number of stakeholders trained - Adequacy of research infrastructure 	Training reports	

ANNEX 4: RESEARCH OUTPUTS AND ACTIVITIES

Activities	Stakeholders	R&D work done by partners	Sites
1. Improving marketing and marketing information opportunities on banana			
Output 1.1. Market opportunities for banana and banana products identified			
1.1.1. Characterize domestic and trans-boundary banana and banana products markets and market chains	DIOBASS, UCG, UCB, INERA	DIOBASS, has started market studies in, UCB, UCG	South and North Kivu, Rwanda, Burundi and Uganda border
1.1.2. Identify potentially marketable banana product		South and North Kivu	
Output 1.2. Effective and sustainable partnerships among private sector, farmer organizations and policy makers linking banana sector to markets established			
1.2.1. Identify participating partners in production, trading including exporting and processing	INERA, IPAPEL, DIOBASS, AATN	-	South and North Kivu
1.2.2. Establish and strengthen linkages among partners along the product to marketing chain (MoUs, ...)	INERA, SNV DIOBASS		“
1.2.3. Promote banana marketing through media, advertisement, fair	IPAPEL, RADIO Kahuzi, Radio Maendeleo,		“
1.2.4. Train stakeholders on banana quality standards	INERA, UCG, OCC.		“

Activities	Stakeholders	R&D work done by partners	Sites
<p>Output 1.3. Bargaining Capacity of local communities strengthened</p> <p>1.3.1 Facilitate and strengthen farmers groups</p> <p>1.3.2 Generate and disseminate market information on banana products</p> <p>1.3.3 Facilitate enabling policy to enhance banana and products</p>	<p>INERA, IPAPEL</p> <p>INERA, SNV, IPAPEL, ISDR.</p> <p>IPAPEL</p>		<p>South and North Kivu</p> <p>“</p>
2. Post-harvest technologies			
Output 2.1. Value added products identified, adapted and promoted			
<p>2.1.1. Identify and document existing value added technologies</p> <p>2.1.2. Evaluate with farmers and other end-users the existing options and techniques for reducing losses due to handling and transportation</p> <p>2.1.3. Assess profitability of use of selected value adding technologies</p> <p>2.1.4. Develop and produce promotional materials (posters, brochures) and medias briefs, ...</p> <p>2.1.5. Train potential processors</p>	<p>INERA, FAO/Goma.</p> <p>“</p> <p>UCG, UCB</p> <p>UCG, UCB, DIOBASS, FAO, ISDR.</p> <p>IITA-FOODNET</p>		<p>South and North Kivu</p>

Activities	Stakeholders	R&D work done by partners	Sites
<p>2.1.1. Collate and evaluate with farmers banana post-harvest handling options</p> <p>2.1.2. Disseminate appropriate improved banana handling and post harvest technologies through demonstration, promotion materials (leaflets, brochures, posters)</p> <p>2.1.3. Train stakeholders on banana quality standards</p> <p>2.1.4. Train potential transporters</p>	<p>INERA, SOPAT / Goma</p> <p>DIOBASS, AEPAS, MEDIAS, ISDR.</p> <p>Bioversity, IITA, OCC</p> <p>DIOBASS, AEPAS.</p>		<p>South and North Kivu</p> <p>“</p> <p>“</p> <p>“</p>
<p>Output 2.3. Development Agro-enterprises for banana processing facilitated</p> <p>2.3.1. Evaluate existing banana processing technologies</p> <p>2.3.2. Assess the profitability of use of selected value adding technologies</p> <p>2.3.3. Demonstrate relevant banana processing technologies</p> <p>2.3.4. Train participating partners on production, processing and marketing technologies</p>	<p>INERA, Bioversity, IITA.</p> <p>UCG, UCB, INERA.</p> <p>DIOBASS, OLAME, UMAMABU, SOJUF, KIVU WINE</p> <p>Bioversity, IITA.</p> <p>DIOBASS, OLAME, UMAMABU, SOJUF, KIVU WINE</p> <p>Bioversity, IITA.</p>		<p>South and North Kivu</p> <p>Bukavu, Goma</p> <p>South Kivu</p> <p>North and South Kivu</p>

Activities	Stakeholders	R&D work done by partners	Sites
Soil fertility and IDPM technologies			
<p>Output 3.1. Appropriate soil fertility management technologies/innovations for sustained smallholder banana production developed and promoted</p> <p>3.1.1. Identify and evaluate soil erosion control strategies adapted to banana system</p> <p>3.1.2. Evaluate and disseminate soil fertility management technologies</p> <p>3.1.3. Advocacy for land tenure and conflict resolution</p>	<p>INERA, UCG, IITA, CIAT / TSBF.</p> <p>“</p> <p>UCB/CEGEC, UCG/CEJA</p>		<p>South Kivu (all) and Kichanga</p> <p>South Kivu (all)</p> <p>North and South Kivu</p>
<p>Output 3.2 Environmentally friendly pests (weevils and nematodes) and diseases (fusarium) management technologies for intensifying smallholder banana production developed and promoted</p> <p>3.2.1. Evaluate with female and male farmers pests and disease management options including cultural practices (companion and intercropping)</p> <p>3.2.2. Demonstrate appropriate IPM technologies through Farmer Field school</p> <p>3.2.3. Monitoring pests and diseases</p>	<p>UCG, UCB, INERA, IITA, Bioversity, TSBF</p> <p>INERA, FRAMERS GROUPS, DIOBASS</p> <p>UCB, UCG, Bioversity, IITA</p>		<p>Kishanga, Kashenyi, Bugobe Centre, Kabumba, Cijingri, Rubumba</p> <p>North and South Kivu</p>

Activities	Stakeholders	R&D work done by partners	Sites
<p>Output 3.3. Strategy to stop BXW expansion implemented in North Kivu</p> <p>3.3.1. Monitor BXW expansion in Eastern Congo</p> <p>3.3.2. Disseminate alert system in unaffected zones</p> <p>3.3.3. Reinforce BXW control measure</p>	<p>UCG, UCB, INERA, IITA, Bioversity, TSBF</p>		<p>Masisi, Rutshuru</p>
<p>Output 3.4 Integration of livestock in the banana agro-system</p> <p>3.4.1. Train farmers of manure technologies</p> <p>3.4.2. To choose multipurpose fodder crops in the banana agro-systems</p>	<p>INERA, IITA, Bioversity, TSBF</p> <p>INERA, IITA, Bioversity, TSBF</p>		<p>North and South Kivu</p> <p>“</p>
<p>4. Efficient seed system for clean planting materials</p>			
<p>Output 4.1. Planting material exchange policy reinforced</p>			
<p>3.1.4. Develop policy briefs and promote for seed exchange</p> <p>3.1.5. Develop micro- and macro-propagation facilities on station and in farmers communities</p> <p>3.1.6. Facilitate farmers' organization for clean planting materials</p>	<p>IPAPEL, INERA</p> <p>INERA, DIOBASS, IPAPEL IITA, Bioversity</p> <p>“</p>		<p>North and South Kivu</p> <p>Mulungu, Bweremana</p> <p>Mulungu, Bweremana</p>

Activities	Stakeholders	R&D work done by partners	Sites
Output 4.2. Knowledge and skills of key stakeholders to manage clean planting materials enhanced			
4.2.1. Identify key partners in seed systems.	SENASEM, INERA		North and South Kivu
4.2.2. Organize community based nurseries and clean planting materials	SNV		
4.2.3. Train key stakeholders	UCG, INERA		Mulungu, Goma
Output 4.3. Clean planting materials accessed by farmers			
4.3.1. Establish efficient CPM system	UCG, UCB, INERA		North and South Kivu
4.3.2. Establish community based CPM production	INERA, IPAPEL, ISDR		North and South Kivu
4.3.3. Monitor seed quality	UCB, UCG, SENASEM, INERA		North and South Kivu
5. Market-led banana varieties			
14.1 Banana varieties that meet market requirements/preferences identified			North and South Kivu
5.1.1. Introduce/ collect banana varieties that meet domestic and export market demands	UCB, UCB, INERA,		“
5.1.2. Evaluate in participatory trials and select potentially marketable varieties in different agro ecological zones for adaptation	UCB, UCB, INERA, IPAPEL		“
5.1.3. Conduct acceptability test	INERA, DIOBASS, UMAMABU		“
5.2. New varieties adopted			

Activities	Stakeholders	R&D work done by partners	Sites
5.2.1. Multiply identified varieties 5.2.2. Disseminate selected varieties through demonstration trials in Farmer Field schools 5.2.3. Promote selected varieties through various promotional materials, medias, field days	UCG, INERA INERA, AEPAS, IPAPEL, DIOBASS INERA, IPAPEL, ISDR, RADIOS		Mulungu, Bweremana South and North Kivu
6. Capacity building			
Assess training need	INERA, UCB, UCG		North and South Kivu
Training	UCL, KUL, UCG, UCB, South Africa, Sokoine, Makerere		North and South Kivu

ANNEX 5: ACRONYMS

ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
BARNESA	Banana Research Network for East and Southern Africa
BIOVERSITY	Bioversity International
BXW	Banana <i>Xanthomonas</i> Wilt (or Banana Bacterial Wilt)
CIALCA	Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa
CIAT	Centro Internacional de Agricultura Tropical
DGDC	Directorate General for Development Cooperation, Belgium
DIOBASS	Demarche pour une Interaction entre Organisation de Base et Autre Sources de Savoirs
DR Congo	Democratic Republic of Congo
ESA	Eastern and southern Africa Office
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
INERA	National des Etudes et de la Researches Agricole
IPM	Integrated Disease Management
ISNAR	International Service for National Agricultural Research
MEPU	Monitoring, Evaluation and Planning Unit, NARO
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
R&D	Research and Development

MUSA SUB-SECTOR STRATEGIC PLAN FOR RWANDA

INTRODUCTION

Banana is one of the major commodity crops in Rwanda. It occupies 23% of the country's arable land. Banana is both a food and a cash crop for most producers and, as such, is a key component in Rwanda's food security. Most production is on small plots. Banana is grown by more than 65% of households in eleven provinces. Banana beer is generally processed on-farm and marketed locally. Cooking and dessert banana are generally marketed in urban centres. Some semi-industrial groups produce banana beverages (juice, wine, beer, liqueurs). Significant quantities of cooking bananas are also imported from neighbouring Uganda and the Democratic Republic of Congo. However, farmers are still not fully benefiting from the growing market opportunities, mainly due to poor quality, high transaction costs and lack of marketing infrastructures. A small quantity of dessert Apple bananas is exported to Europe; however, this market niche is experiencing problems as Apple banana are highly susceptible to fusarium wilt. The handicraft industry produces a range of products made out of banana fibre for tourists. Since its introduction, banana production has expanded to almost all marginal areas and is the principal source of rural trade providing easy income on regular basis, and it is integrated in the culture.

The mild Rwandan climate is favourable for banana production and bananas are grown at altitudes ranging from 800 to 2000 m, with the main production zones concentrated between 1300 and 1800 m: the Kivu Lake border, Kibungo, in Umutara province, and the Kigali–Butare area, where bananas contribute 60 to 80% of household income. The central area gets between 1100 and 1200 mm/year and the eastern countryside 800–1000 mm/year.

The Northern Kivu Lake border (Kibuye and Gisenyi provinces) is a narrow band of lakeside highland. This area produces mainly beer types of East African highland bananas beer bananas (*Musa* AAA-EAHB). As the cultivated area is limited to the highlands, its contribution to the country's banana production is low (12% for both provinces). Soils vary from relatively fertile in the south (Kibuye) to very rich volcanic in the North (Bugoyi).

Beer bananas predominate in the Northern Kivu Lake border province of Cyangugu, but cooking bananas play an important role for food as well as a source of income. The contribution to the country's is however low, about 6%, as this region is remote, isolated by Nyungwe National Park and poor road conditions. Soils are fertile but often acid and showing signs of decline.

Kibungo is a leading banana production area with predominantly cooking types. The area contributes more than 20% of the country's banana production. The Kigali Ngali Province also contributes more than 20% of country's banana production. A traditional beer-banana growing area, the demand from Kigali city is stimulating a shift to producing cooking bananas and especially dessert bananas. Soil fertility varies from poor to relatively good.

In the Kigali–Butare zone, there were significant shifts in banana production although it had been uniform in the past. It is mostly concentrated in the plateau around the Kigali city, while at Butare and Gitarama production has substantially declined, probably due to poor soil fertility.

The remaining areas (Byumba, Ruhengeri and Gikongoro) are marginal for banana production. Since highland cultivars are less tolerant to poor soils, farmers in this zone tend to cultivate introduced beer bananas (Kayinja, *Musa* ABB).

Principal in-country partners in banana research and development include research and educational institutions (ISAR, NUR, ISAE), policy and extension body (MINAGRI), local and

international NGOs (World Vision, Care International, LWF, RWARRI, BAIR), processing enterprises (such as COVIBAR, Gorilla Mountain Banana Industries, Frulex, ASSOABI etc.), community based organizations, local community development committees and farmers associations. There are also linkages and partnerships with international organizations such as IITA, IRAZ, Bioversity, BARNESA as well as ASARECA and various ASARECA networks.

Banana research at ISAR (formerly the Institut National pour Etudes Agronomiques du Congo-Belge) started in the colonial period, but it has focused mainly on introducing and evaluating different dessert bananas. During the first years of independence (1963–1981), banana research received little attention. In 1982, the National Banana Research Program was created at ISAR to improve banana productivity. Major achievements of banana research and development included introduction of exotic (ABB) brewing clones and dessert (AAA) cultivars in the 1950s and 1960s; creation of National Banana Research Program at ISAR in 1982; collection of 85 highland banana cultivars in 1982-1984, which were later established in the national collection; diagnostic survey on production constraints in Kibungo in 1988; screening trials for resistance or tolerance to banana bunchy top virus, black sigatoka and fusarium in 1992-1994; introduction of a number of ABB beer and dessert cultivars; establishing in 1993a tissue culture laboratory for supplying clean planting material; nematode survey in 1996; rehabilitation of National germplasm collection in 1999 with 98 banana and plantain varieties; country surveys in 2000-2001 on production constraints; survey in 2002 on marketing constraints and opportunities; dissemination of clean planting material of local cooking varieties; introduction and evaluation of new FHIA and IITA hybrids; development and dissemination of extension material (farmers' guides and extension leaflets and brochures) and radio programmes on banana management, fusarium wilt and bunchy top diseases, new varieties and banana bacterial wilt; and development of processed products based on green banana flour.

PRIORITY SETTING FOR THE *MUSA* SUB-SECTOR

The process of developing a strategic plan started by identifying the constraints and priority research interventions in order to make decisions on the allocation of investments.

The Project Strategic Planning Workshop followed the seven-step priority setting process recommended by the International Service for National Agricultural Research (ISNAR) and the International Food Policy Research Institute (IFPRI) and adopted by the Association for Strengthening Agricultural research in East and Central Africa (ASARECA). A Network Committee comprising the Bioversity-ESA Regional Coordinator, the Director of the Monitoring and Evaluation and Planning Unit of NARO, and an Associate Scientist at Bioversity-ESA was established (Step 1) to review the banana sub-sector or research domain (Step 2), evaluate existing results (Step 3). For the fourth step, a second committee, a Workshop Process Management Committee (Annex 1), comprising the head of the National Banana Research Programme, eminent scientists and the Network Committee was established to develop/analyse the individual constraints (Step 4) into a set of research alternatives and consolidated into research for development sub-themes (Step 5). Subsequently, a priority setting workshop (Step 6) involving stakeholders was held during the first three days of the Workshop.

Steps 1 to 5 were conveyed to participants by way of presentations and discussions during the workshops. Work in groups and plenary discussions were also used. Presentations were delivered in both French and English, when necessary. Templates and background material were presented in French and English.

Step 6 involved the priority setting workshop itself. The process can be summarized into four key stages:

13. Presentation of the results obtained by the Network Coordination Committee and the Workshop Process Committee were delivered to participants through presentations. The regional sub-thematic areas for the Great Lakes Region were delivered by the Head of the National Banana Programme to the stakeholder representatives.
14. Group work exercises (and plenary discussions) were utilized to:
 - a. verify the key constraints and research areas proposed by the Process Management Committee,
 - b. agree on the criteria at country level and determine their relative weight,
 - c. score the research areas.
15. The Workshop Process Management Committee synthesized and classified the results into high, medium or low priority research areas.
16. Stakeholder approval of the final results.

IDENTIFICATION OF CRITERIA

The priority-setting process used the weighted scoring method. The method ensures that adjustments can be made as priorities and circumstances change. Application of the weighted scoring method included identifying relevant criteria representative of national goals and research for development thematic areas. The team modified the BARNESA criteria (Annex 2) as indicated in Table 1. The total had to add up to 100.

Table 1. Weight given by the stakeholders to the criteria used to identify the priorities.

Criteria	Weight
<i>Increasing household income</i>	
Creating employment	10
Adding value to banana products	5
Increasing banana products on the market	9
Introducing new and profitable technologies along the chain	5
Improving product quality	6
<i>Increasing household food security</i>	
Increasing banana yields and products	8
Reducing losses at all levels along the chain	5
Introducing demand-driven technologies	6
Improving nutritional value of banana and banana products	7
<i>Maintaining the sustainability of the natural resource base</i>	
Reducing use of chemical additives	3
Reducing soil fertility loss	8
Improving air and water quality	4
Conserving banana-based biodiversity	5

Criteria	Weight
<i>Strengthening institutional capacity</i>	
Improving linkages and partnerships	2
Improving the skills of stakeholders	3
Strengthening financial resource base	2
Improving infra-structure	2
<i>Improving the policy environment</i>	
Strengthening advocacy at the grassroots	2
Generating policy data/information	2
Improving linkages between policy organizations	2
<i>Facilitating information exchange and utilization</i>	
Increasing information generation	2
Increasing information dissemination	2
Increasing information utilization	2

IDENTIFICATION OF CONSTRAINTS

The situation was analysed to identify the main constraints that need addressing and how they interact. Opportunities were also highlighted. The potential impact of resolving a constraint or addressing an opportunity was borne in mind while establishing priorities.

The process began with the strategic management committee consulting with a wide range of stakeholders. The committee synthesised the results of the consultation in a list of key constraints and opportunities. A causal structure among the constraints was used to establish the problems rather than the symptoms.

From the analysis of the constraints, it was established that the banana cropping system and the marketing of banana are much constrained by biotic and abiotic factors leading to low productivity and institutional weaknesses. The following constraints were identified.

Production constraints

Despite a growth in acreage, productivity has declined in recent times. Production increased from 1995 up to 2000 when it drastically fell, leading to an increase in prices. The decline in output in 2000 is estimated at about 29% compared to the 1990 figures. This decline in productivity is due to several factors, which include poor farm management, declining soil fertility, pests and diseases, drought, wind and changes in the socio-economic environment.

Poor farm management: Generally, the standards of farm management are low leading to low productivity. There is limited use of manure or mulches due to lack of resources. Traditionally, banana is intercropped with annual crops (predominantly beans).

Low and declining soil fertility: Soil fertility levels have declined due to continuous cultivation, without the use of fallow, fertilizers, or crop rotation. Continuous cultivation has over time resulted in exportation through harvested crops while land pressure has greatly reduced or eliminated the use of fallow and crop rotation. Poor soil conservation measures have also contributed to loss of fertility through erosion. The use of organic fertilizers is very limited given the small number of livestock. Cooking bananas is more sensitive to soil fertility levels and it is one of the reasons it is not the dominant type of banana grown in the country.

Pests and diseases: Cooking bananas are more susceptible to pests. The leading pest on cooking banana is banana weevil while beer bananas (ABB) are most affected by fusarium wilt. Given the dominance of beer banana, fusarium wilt is the most damaging and rapidly spreading disease across Rwanda. Other diseases are limited to certain areas. Banana streak virus in Kibungo, banana bunchy top and bacterial wilt in Cyangugu, cigar end rot in Gisenyi and banana weevil in Kibungo and Kigali rurale. Nematodes are widespread. Pesticides are not used at all as well as mineral fertilisers.

Planting material: Use of high yielding cooking banana varieties is not widespread. Cyangugu area is an exception, as the best cooking variety (Injagi) dominates supply. There is no planting material supply system for cooking bananas at the moment. Banana planting material is obtained primarily from own old banana plantations. Sometimes farmers also get planting material from neighbours. Suckers are usually given out for free. Selling of suckers is negligible.

Poor access to improved production technologies: The country has been characterised with internal strifes to the extent that the research system could no longer generate improved production technologies. In effect the farmers continue recycling their old technologies which can no longer match the emerging constraints. Consequently, the productivity is reduced resulting into low incomes and food insecurity.

Shortage of labour: Production largely depends on family labour (>60%) except in commercialized areas like Kayonza in Kibungo region where more than 50% of the labour is hired.

Marketing constraints

Markets and marketing can play a big role in improving livelihoods but the major constraints are poor infrastructures, price fluctuations and inadequate market information.

Poor market infrastructure: Bananas are a bulk commodity and can perish quickly. This requires good access to organised markets. The road infrastructure, especially the feeder roads into Rwanda, are poor.

Price fluctuations: Unpredictable price fluctuations make planning difficult. Sometimes the prices are so low that it becomes uneconomical for a farmer to trek to the markets, discouraging investment in the farm.

Poor market intelligence and skills: There is no formal mechanism for scanning the environment to establish market opportunities for the farmers to sell their produce. This is worsened by the fact that the skills for market intelligence are lacking in banana communities. Without appropriate market information farmers cannot decide quickly where and when to sell.

Post-harvest constraints

Many losses are incurred after harvest. The situation is worse with bananas because of being highly perishable. There is a need to invest in post-harvest technologies to improve the value of the crop right from harvest up to consumption. The major factors are poor handling, low value addition, high production costs for some products and poor planned harvests.

Poor handling: Poor handling of bananas from harvest to the market is one of the major causes of poor quality. This can be discouraging to the buyers especially when the fingers are bruised. Most farmers do not know how to handle bananas to attract the attention of buyers.

Narrow range of value added products: Cooking bananas are mainly sold as bunches or hands. Deserts are sold when ripe. In some cases juice and beer are extracted from bananas. There are many more products that can be developed from bananas and yet this knowledge is lacking.

The shelf life of some products is low. Also some products are expensive to develop for example juice as compared to liqueur. At times the supply cannot be sustained due to poor planning of the harvests.

Institutional constraints

There is need to have processes and procedures in place for the *Musa* sub-sector to play a leading role in transforming the livelihoods of the people of Rwanda. For example the private sector is poorly informed and organized. The private sector can act as a catalyst in the marketing of bananas and value addition. Similarly, there is limited human resource capacity for research and extension in Rwanda. This makes it rather difficult to generate and disseminate appropriate banana production technologies.

IDENTIFICATION OF RESEARCH AREAS

Based on the overview of the banana sector, evaluation of existing results in Rwanda, and the constraints derived from constraint analysis, a list of research areas was generated in groups and discussed, modified and agreed upon in plenary. The research areas agreed on are:

- Developing appropriate banana varieties (high yielding adapted to specific eco-zones and resistant varieties within each banana type and fitting to consumer preferences);
- Developing national policies;
- Developing a national seed supply system;
- Improving and promoting conservation and management of soil fertility and water;
- Integrated management of major pests and diseases;
- Enhancing value addition and post harvest handling of bananas (diversification, quality improvement, processing);
- Developing and implementing effective participatory approach;
- Promoting a systems approach (optimization of various technologies within the system and interaction studies)
- Developing and implementing effective partnerships (forums for exchange between stakeholders along the production to consumption chain)
- Developing and strengthening human capacity (farmers, private sector, extension, researchers, NGOs)

PRIORITY RESEARCH AREAS

The participants discussed the contribution of the research areas to meeting the identified criteria. Each research area was scored according to its estimated impact on a given criterion, from -5 for a very significant negative effect (if, for example, it had a negative impact on the environment, gender equity or employment) to +5 for an extremely positive effect. A score of 0 implied that the research area would contribute nothing to that criterion. The scores given by the participants were averaged and multiplied by the weight given to each criterion. The standard deviation was used to separate the research areas into three groups: high, medium and low priority.

This exercise is to help managers decide to which projects allocate resources. All high being equal, the high priority projects will be allocated more resources than the ones ranked medium and low. The results of the priority exercise are presented in Table 2. Participants were given

the opportunity to review the results of their scoring so as to identify outlier scores. If resources are very limiting, the high priority areas will be considered first.

Table 2. Priority given to each research area for Rwanda.

Research areas	Priority
Enhancing value addition and post harvest handling of bananas Improving and promoting conservation and management of soil fertility and water	High
Developing appropriate banana varieties Developing a national seed supply system Developing and strengthening human capacity Promoting a systems approach Developing and implementing effective partnerships	Medium
Integrated management of major pests and diseases Developing and implementing effective participatory approach Developing national policies	Low

STRATEGIC PLAN FOR THE *MUSA* SUB-SECTOR

Stakeholders recognise the fact that bananas are a very important commodity in the livelihoods of the people and that the production-to-consumption chain does not effectively meet the stakeholders' expectations. The need to improve production and productivity of bananas has become so apparent that research has to be conducted in a different way from what it has been. The overriding goal here is to contribute to poverty eradication. To this effect the paradigm shift in banana research will be geared towards increasing household income, improving household food security, maintaining the sustainability of the natural resource base, strengthening institutional capacity, improving the policy environment and facilitating information exchange and utilisation.

VISION AND MISSION

The vision is for the banana sector to contribute significantly to the Rwandan economy, reduce poverty, increase food security and contribute to environmental protection, whereas the mission is to generate and disseminate appropriate technologies that will result in improving the banana cropping system for increased contribution to the well-being of the population of Rwanda.

CHALLENGES

The ultimate goal of this strategic plan is to have bananas fully integrated into the market economy but appropriate strategies and approaches need to be implemented in order to address the following challenges:

- *Increasing commercialization of fresh and value added products.* The result of addressing this strategic challenge will be more banana products and better quality of bananas in the market. To this effect, ISAR has developed technologies and products that should be disseminated. This challenge will be addressed by identifying existing post-harvest technologies and products and introducing post-harvest technologies. Research efforts will also be geared towards evaluation of new technologies, including palatability tests, market trials and quality control studies. Resistant material will be introduced, evaluated under local conditions and multiplied for distribution.

- *Reducing pressure by pests and diseases.* Addressing this strategic challenge will result in reduced losses from pests and diseases. Generally the approaches for achieving this will be through integrated management and the development and implementation of effective participatory approaches in research. Specifically, the activities to be implemented will include; participatory and multidisciplinary evaluation of improved technologies to optimize system productivity, interaction studies of various technologies and/or system components and Information sharing with the stakeholders.
- *Reversing the deterioration of the natural resource base.* The need for improving and promoting conservation and management of soil fertility and water was found a critical challenge. The output of addressing the challenge is improved sustainable agricultural production systems. The government of Rwanda is strongly committed to the environment protection and conservation of soil and water. To this effect, ISAR is developing an integrated watershed management approach. In the next 5 years, more efforts will be expended in developing soil fertility and water management technologies, evaluating the technologies on a wider scale, promoting soil fertility and water management technologies, developing skills of stakeholders and sharing information.
- *Improving banana productivity.* Developing and implementing a systems approach will be the focus for improving banana productivity. This will result in increased production and productivity and higher income on farm and/or agro-ecosystem level. Specific activities that will be conducted include; participatory and multidisciplinary evaluation of improved technologies to optimize system productivity, interaction studies of various technologies and/or system components and information sharing with the stakeholders.
- *Strengthening linkages among producers, processors and researchers.* Effective networking of banana sub-sector stakeholders will be established at national level and this will need development of national policies to support the banana sub-sector. The government of Rwanda is encouraging farmers to work in associations and cooperatives and is promoting private sector initiatives. Also MINAGRI is committed to improving the banana sub-sector. Enhancing effective networking will require identifying the stakeholders, evaluating their needs, facilitating their organization, facilitating information exchange/flow and strengthening technical and organizational skills.
- *Capacity building (human resources and infrastructure).* Generally, this challenge will be addressed by developing national banana seed supply systems. will be specifically achieved by implementing activities such as quantifying the needs for planting materials and identifying partners and initiating partnership with NGOs, CBOs and farmers associations interested in seed production and seed dissemination. Human resource capacity will be built through degree training (MSc and PhD) for scientists from the national research organizations and NGOs. Short term training sessions for farmers, extension agents and technicians will be conducted. In addition farmer field days, study tours, radio programmes will be organized and extension materials produced and disseminated.

STRATEGIC OBJECTIVES AND OPPORTUNITIES

In addressing the strategic objectives there are opportunities to take advantage of. Major opportunities include the commitment from the Rwandan government to develop the banana sub-sector, presence of processing facilities, local initiative for the export of Apple bananas, post-harvest programme at ISAR, willingness of various NGOs to intervene in banana sub-sector. The strategic objectives that will be pursued in the coming years are:

- Developing and disseminating high yielding resistant varieties that meet consumer preferences;
- Improving crop, soil and water management;
- Assessing, monitoring and managing pests and diseases;
- Developing and promoting handling and processing technologies;
- Disseminating and promoting developed technologies;
- Promoting marketing and value-added products and strengthening linkages between researchers, producers, processors and private sector;
- Building capacities of researchers, extension agents and other stakeholders and putting in place an effective seed distribution system.

The logical framework for the implementation of the strategic plan is presented in Annex 3.

SUCCESS FACTORS

In order to effectively implement the different strategies for achieving the strategic objectives, the critical factors that will define success are:

- **Timely funding:** the proposed research interventions will require a timely flow and release of funds if the action plan is to be implemented accordingly.
- **Adherence to work plans:** this is necessary to achieve the outputs of the agenda and a means of accountability to the partners.
- **Community participation and ownership:** the communities must be involved and own the process.
- **Effective partnerships:** the production to consumption chain requires the participation of different players each contributing at critical points. The processors, marketing, transport to mention but a few will need to work together with a common vision.
- **Security:** this affects all the spheres of the economy and research can be very vulnerable to the extent that no funds will flow into the system and researchers won't be able to work.
- **Political will:** The government and other policy makers should be committed to the cause of improving the banana sub-sector.

CORE VALUES

The following core values are recommended in the implementation of the strategic plan:

- **Team spirit:** valuing team spirit, creativity and respect for one another and recognising diversity in the workplace (gender, cultural and professional), building on them as strengths.
- **Integrity:** respecting and responding to the needs of our partners and the people we serve with a high degree of integrity.
- **Transparency:** believing in and supporting transparency in our activities, resource allocation and decision-making.
- **Result oriented:** valuing time management and a result-oriented work ethics.

- Non-bureaucratic: maintaining an informal working environment, valuing effective vertical and horizontal communication more than hierarchy (non- bureaucratic).

IMPACT AND PERFORMANCE ASSESSMENTS

Periodic assessment of performance and impact is a key element to measure the contribution of banana research to rural development, as well as to identify its strengths and weaknesses. In future, the Banana Research Programme will ensure that performance indicators are identified. Such indicators will be simple and clearly defined to allow appropriate participatory methodologies to be used in performance and impact assessments.

The Banana Research Programme will also assess the processes and methods. Accuracy and dependability of results not only depend on clearly defined monitorable indicators and the availability of reliable data and information, but also on the wider participation of stakeholders in the assessment process. A management information system is a useful tool for capturing, updating and creating data, and monitoring provides a feedback mechanism. Integrating the two greatly facilitates performance assessment. The programme will seek to develop and implement such a system and to monitor and evaluate processes and methods by:

- Establishing a set of key quantitative and qualitative monitorable indicators to assess the project outputs and results;
- Documenting results to evaluate their effectiveness and impact on increasing production, incomes as well as their environmental impacts;
- Creating a database to ensure the timely and reliable assessment results.

The assessment process will involve partners and clients in operational areas. In order to integrate monitoring and evaluation processes with the performance assessment process, the focus will be on developing milestones and outputs for performance evaluation. Comprehensive baseline surveys will be conducted to set benchmarks against which future improvements will be gauged.

ANNEX 1: THE WORKSHOP PROCESS MANAGEMENT COMMITTEE

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ANNEX 2: ORIGINAL CRITERIA AND SUB-CRITERIA

<p>INCREASING HOUSEHOLD INCOME</p> <p>Creates employment</p> <p>Adds value to banana products</p> <p>Increases banana products on the market</p> <p>Introduces new technologies along the chain</p> <p>Improves product quality</p>
<p>IMPROVING HOUSEHOLD FOOD SECURITY</p> <p>Increases yields of banana and products</p> <p>Reduces losses at all levels along the chain</p> <p>Introduces demand-driven technologies</p>
<p>MAINTAINING THE SUSTAINABILITY OF THE NATURAL RESOURCE BASE</p> <p>Reduces use of chemical additives</p> <p>Reduces loss of soil fertility</p> <p>Improves the quality of air and water</p> <p>Conserves banana-based biodiversity</p>
<p>STRENGTHENING INSTITUTIONAL CAPACITY</p> <p>Improves linkages and partnerships</p> <p>Improves the skills of stakeholders</p> <p>Strengthens Financial Resource Base</p> <p>Improves infra-structure</p>
<p>IMPROVING THE POLICY ENVIRONMENT</p> <p>Strengthens advocacy at the grass-roots</p> <p>Generates policy data/information</p> <p>Improves linkages between policy organisations</p>
<p>FACILITATING INFORMATION EXCHANGE AND UTILISATION</p> <p>Increases information generation</p> <p>Increases information dissemination</p> <p>Increases information utilization</p>

ANNEX 3: LOGICAL FRAMEWORK OF THE STRATEGIC PLAN

	Objectives/Narrative	Indicators (Verifiable indicators)	Evidence (Means of verification)	Assumptions
Goal	Bananas fully integrated into the market economy of Rwanda	<ul style="list-style-type: none"> - Percentage increase in contribution of banana to GDP - Number of organised marketing channels - Number of value added products on the market 	<ul style="list-style-type: none"> - National budget speeches - National statistics -Market survey reports 	
Purpose/ Outcome	Increased banana productivity in Rwanda	<ul style="list-style-type: none"> - Level of commercialization of fresh and value added products, - Decrease in loss due to pests and diseases, - Increased soil fertility and watershed management - Increased banana yields - Number of functional linkages among producers, processors and researchers 	<ul style="list-style-type: none"> Rapid rural appraisal reports Annual reports Survey reports 	
Outputs	1. More banana products of better quality in the market t	<ul style="list-style-type: none"> - Number of banana products on the market - Quality of bananas on the market 	Market survey reports	
	2. Appropriate varieties developed	<ul style="list-style-type: none"> - Number of demand specific varieties 	Variety release committee reports	
	3. More producers accessed new varieties	<ul style="list-style-type: none"> - Number of producers accessing new varieties - Number of mechanisms for accessing varieties 	<ul style="list-style-type: none"> Producers satisfaction survey reports Extension delivery reports 	

	Objectives/Narrative	Indicators (Verifiable indicators)	Evidence (Means of verification)	Assumptions
	4. Professional skills and capacity improved at all levels of the stakeholders	<ul style="list-style-type: none"> - Number of professionals applying the skills imparted into them - Number of people trained 	<ul style="list-style-type: none"> Follow-up study reports Training reports 	Conducive environment for applying the skills exists
	5. Better production / Productivity and higher income on farm and /or agro-eco-system level (eg. Watershed)	<ul style="list-style-type: none"> - Yield increase - Amount of money accruing from bananas 	<ul style="list-style-type: none"> Survey reports 	
	6 & 7. Economic losses from pests and diseases minimized	<ul style="list-style-type: none"> - Reduced loss due to pests - Reduced loss due to diseases 	<ul style="list-style-type: none"> Yield loss assessment studies 	Farmers adopt the pests and disease management technologies
	8. National policies to support the banana sub-sector developed	<ul style="list-style-type: none"> - Number of policies that support the banana sub-sector - Number of people happy with production policies 	<ul style="list-style-type: none"> - Policy documents - Customer satisfaction reports 	Favourable policy environment
	9. Sustainable agricultural production systems improved	<ul style="list-style-type: none"> Productivity of production systems 	<ul style="list-style-type: none"> Survey reports 	
	10. Effective networking of banana sub-sector stakeholders established at national level	<ul style="list-style-type: none"> - Number of functional partnerships - Number of activities jointly implemented 	<ul style="list-style-type: none"> Partnership documents Annual and quarterly reports 	Conducive environment for networking exists

ANNEX 4: STRATEGIC RESEARCH OUTPUTS AND ACTIVITIES

Project	Output	Activities	Work by other partners
1. Enhancing value addition and post harvest handling of bananas	More banana products of better quality in the market	<ol style="list-style-type: none"> 1. Identification of existing post-harvest technologies and products 2. Introduction of new p-h technologies 3. Evaluation of new technologies including palatability tests, market trials, quality control studies 4. Awareness creation for further dissemination 	ISAR has developed some technologies and products
2. Developing appropriate banana varieties	Appropriate varieties developed	<ol style="list-style-type: none"> 1. Introduction of new resistant material 2. Evaluation of new material in Rwandan conditions 3. Multiplication of elite stock for massive multiplication 	IITA has developed resistant material, BIOVERSITY conserves and shares world germplasm collection
3. Developing national banana seed supply systems	More producers accessed new varieties	<ol style="list-style-type: none"> 1. Quantify the needs in planting material 2. Identify partners and initiate partnership with NGOs, CBOs, farmers associations interested in seed production and seed dissemination 3. Reinforce capacity of potential seed producers 4. Involve stakeholders in massive production of best existing and new released varieties 5. Ensure quality control of seeds produced 6. Awareness creation on availability of seed supply system 	<p>Private in vitro labs exist in the sub-region (Agrobiotec – Burundi)</p> <p>NGOs available at grass root level (WV, BAIR, RWARRI)</p>

Project	Output	Activities	Work by other partners
4. Developing and reinforcement of human capacity	Professional skills and capacity improved at all levels of the stakeholders	<ol style="list-style-type: none"> 1. Degree training (MSc and PhD) for scientists from the national research organizations (ISAR, NUR) and other stakeholders (NGOs) 2. Short term training sessions for farmers, extensionists and technicians 3. Organize farmer field days, study tours, radio programs, produce and disseminate extension materials 	<p>DGDC, USAID, World Bank have provided some scholarships for degree training</p> <p>ATDT project has organized radio programs, study tours, short term training for farmers, technicians and scientists, produced various extension material</p>
5. Developing and implementing system approach	Better production/ Productivity and higher income on farm and/or agro-eco-system level (eg. Watershed)	<ol style="list-style-type: none"> 1. Participatory and multidisciplinary evaluation of improved technologies to optimize system productivity 2. Interaction studies of various technologies and/or system components 3. Information sharing with the stakeholders 	Limited interaction studies from various research institutions
6. Integrated management of major pests and diseases	Economic losses from P&D minimized	<ol style="list-style-type: none"> 1. Collect/update information on P&D incidence and severity 2. Establish the status of major P&D 3. Evaluate available IPM options for major P&D 4. Promote the effective IPM options 5. Develop capacity for IPM implementation 6. Sharing information with different stakeholders 	IITA/BIOVERSITY/CABI have developed many IPM options
7. Developing and implementing effective participatory approach	- see project 5 above	- see project 5 above	- see project 5 above

Project	Output	Activities	Work by other partners
8. Developing national banana sub-sector policies	National policies to support the banana sub-sector developed	<ol style="list-style-type: none"> 1. Generate appropriate information for policy makers 2. Share information with policy makers to convince them about the needs of the policy 3. Develop the policy 	MINAGRI has commitment to improve the banana sub-sector
9. Improving and promoting conservation and management of soil fertility and water	Sustainable agricultural production systems improved	<ol style="list-style-type: none"> 1. Develop soil fertility and water management technologies 2. Evaluate the technologies on a wider scale 3. Promote soil fertility and water management technologies 4. Develop skills of stakeholders in NRM 5. Sharing information and linkages with different stakeholders 	<p>ISAR is developing integrated watershed management approach</p> <p>Government is strongly committed to the environment protection and conservation of soil and water</p>
10. Developing and implementing effective partnerships	Effective networking of banana sub-sector stakeholders established at national level	<ol style="list-style-type: none"> 1. Identification of stakeholders 2. Evaluate of the needs of stakeholders 3. Facilitate organization of the stakeholders 4. Facilitate information exchange/flow among the stakeholders 5. Strengthening of their technical and organizational skills 6. Organize the stakeholders 	Government is promoting farmers to work in associations and cooperatives and promotes private sector initiatives

ANNEX 5: ACRONYMS

ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
BARNESA	Banana Research Network for East and Southern Africa
BIOVERSITY	Bioversity International
BSV	Banana Streak Virus
CABI	Commonwealth Abstract International
CIALCA	Consortium for the Improvement of Agriculture-based Livelihoods in Central Africa
CIAT	Centro International de Agricultura Tropical
DGDC	Directorate General for Development Cooperation, Belgium
DR Congo	Democratic Republic of Congo
IITA	International Institute of Tropical Agriculture
IFPRI	International Food Policy Research Institute
ISAR	Institut des Sciences Agronomiques du Rwanda
ISNAR	International Service for National Agricultural Research
MEPU	Monitoring, Evaluation and Planning Unit, NARO
MIS	Management Information System
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
NGOs	Non-Governmental Organisation
NPP	Network Project and Programmes of ASARECA
NUR	National University of Rwanda
PRA	Participatory Rural Appraisal
RWARRI	Rwanda Rural Rehabilitation Initiative



Consortium for the improvement of agriculture-based livelihoods in Central Africa

Following a call for proposals of the Directorate General for Development Cooperation (DGDC – Belgium) in April 2004, three proposals were approved:

- ‘Sustainable and Profitable Banana-based Systems for the African Great Lakes Region’, led by the International Institute of Tropical Agriculture (IITA), Kampala, Uganda.
- ‘Enhancing the resilience of agro-ecosystems in Central Africa: a strategy to revitalize agriculture through the integration of natural resource management coupled to resilient germplasm and marketing approaches’, led by the Tropical Soil Biology and Fertility Institute of the International Center for Tropical Agriculture (TSBF-CIAT), Nairobi, Kenya.
- ‘Building Impact Pathways for Improving Livelihoods in *Musa*-based Systems in Central Africa’, led by Bioversity International, Kampala, Uganda.

As the above projects proposed to operate largely in the same parts of Rwanda, Burundi, and the Democratic Republic of Congo (DR Congo), with similar national partner institutes, and due to the complimentary nature of the activities proposed, above institutes agreed to operate as a Consortium to ensure cooperation and complementarity and avoid technical and financial duplication at the national level. The Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA) is a Consortium of the International Agricultural Research Centers (IARCs) and their national research and development partners that aims at close technical and administrative collaboration and planning in areas of common interest, thereby enhancing returns to the investments made by DGDC and accelerating impact at the farm level.



Institut de Recherche Agronomique et Zootechnique (IRAZ), Burundi



Institut des Sciences Agronomiques du Burundi (ISABU), Burundi



Université du Burundi (UNB), Burundi



Institut des Sciences Agronomiques du Rwanda (ISAR), Rwanda



Université National de Rwanda (NUR), Rwanda



Institut National des Etudes et de la Recherche Agricole (INERA), DR-Congo



Plateforme DIOBASS, DR-Congo



Université de Kinshasa (UNIKIN), DR Congo



Université Catholique de Bukavu (UCB), DR Congo



Université Catholique du Graben (UCG), DR Congo



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