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منظمة الأغذية والزراعة للأمم المتحدة | 联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Agricultura y la Alimentación

COMMITTEE ON COMMODITY PROBLEMS

JOINT MEETING OF THE FOURTH SESSION OF THE SUB-GROUP ON BANANAS AND THE FIFTH SESSION OF THE SUB-GROUP ON TROPICAL FRUITS

Rome, 9 – 11 December 2009

PROJECT PROPOSAL FOR SUBMISSION TO THE COMMON FUND FOR COMMODITIES: RENOVATING SMALLHOLDER CAVENDISH PRODUCTION DESTROYED BY BBTD – CLEAN PLANTING MATERIAL, IMPROVED PRODUCTION METHODS AND GROUP MARKETING FOR NATIONAL AND REGIONAL PRODUCTION IN MALAWI, ZAMBIA AND THE DEMOCRATIC REPUBLIC OF CONGO

1. Title of Project:

Renovating small holder Cavendish production destroyed by BBTD: Clean planting material, improved production methods, and group marketing for national and regional production in Malawi, Zambia and DR Congo

2. **Potential Project Executing Agency:**

Bioversity International (formerly the International Network for the Improvement of Banana and Plantain (INIBAP)

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CAVENDISH BANANAS IN SOUTHERN AFRICA – A SMALLHOLDER MARKET CROP

Sub Saharan Africa has several centres of diversity of banana and plantain, but is also home to important areas of Cavendish banana production for national and regional markets. These areas are located both in the Sahelien region in countries such as Senegal, Mali, Guinea and Sudan, and the Horn of Africa (Somalia, Eritrea and Ethiopia) and also to the south in Zambia, Malawi, DR Congo (Lubumbashi), Angola, Zimbabwe, Mozambique and South Africa (Lescot, 2008).

This has been a growing sector in recent years with the expansion of mining in certain regions, the influx of labour and the growth of urban areas. Dessert bananas are inexpensive and available the year round. For growers, bananas offer a stable income, even from small land areas. However, this potential is being threatened by the spread of BBTD. It is present in a growing number of countries and continues to spread within the countries where it is already present.

Table - Cavendish production in countries of Southern Africa (Lescot, 2008)

Country	Cavendish production [tonnes]	Total Musa production [tonnes]	Presence of BBTD
Angola	162 000	306 000	Yes
DR Congo	290 000	1 518 000	Yes
Malawi	44 000	302 000	Yes
Mozambique	80 000	93 000	No
Zambia	20 000	20 140	Yes
Zimbabwe	86 000	87 000	No
South Africa	341 000	344 000	No

Presence of BBTD and its destructiveness

Malawi:

In Malawi BBTV was first spotted at Thiwi area in Nkhota-kota district, a lakeshore district in Salima Agricultural Development Division in December, 1994. The disease spread to Nkhata-bay South, another lakeshore district. Disease devastation prompted the formation of a multidisciplinary task force in 1998. This instituted mitigation measures and made recommendations which included: quarantine of the affected areas and containment of the disease through phytosanitary measures, chemical control of the vector aphids and total destruction of the banana crop in the affected areas. However, many farmers did not destroy their plants, as they were unsure about being provided with clean planting material, and although the government was aware of the disease programme, very little was done with regard to extension programs and bulletins. As a consequence, movement of planting material still occurred between districts, and the disease has spread from a recorded 104 hectares in 1994 to 650 hectares in 1998. Although BBTV started in the central region of Malawi, since that time it has spread both north and south unchecked by government programmes affecting several thousand hectares, primarily in the hands of small holders.

The two recent surveys which were conducted in 2008 have indicated that the disease has spread to all other parts of the country, with losses being estimated at over 40% of the crop area. Only a few areas in the most northerly and southern parts of the country remain ostensibly disease-free.. Banana holdings for food and income among thousands of smallholders in most of the country have suffered losses.

A visit to Nkhata-bay district, which is the main supplier for the city of Mzuzu, clearly shows that production has declined tremendously. Bananas are very scarce and the few which are available on the market are mostly of poor quality and too expensive for the average population. The survey also revealed that all banana cultivars are susceptible to the disease, although field observations show that a wild type, *Musa balbisiana* takes a bit longer to show symptoms as compared to the others.

Zambia:

In Zambia, banana growing is mainly in five provinces, namely: Southern, Copperbelt, Lusaka, Central and Eastern. The driver for banana growing in Zambia is mainly market availability . Both small-scale and large-scale farmers produce bananas. Large-scale producers are mostly commercial farmers growing mainly the dessert type. Such farmers grow from 5 ha to over 100 ha of bananas whereas small-scale farmers grow from ¼ ha to 2 ha. The total land under banana cultivation in Zambia is not known, but has been estimated at over 10000 ha. The Copperbelt province is the major producer of Cavendish bananas mostly for the mines and for sale in DR Congo. Popular varieties include Grand Nain, Williams and Dwarf Natal. Small-scale farmers also grow local varieties besides the above mentioned types. Although documented production information does not exist, notable increase in banana production is evident in Zambia in recent decades.

There are several factors that have contributed to this increase.

1. Opening of new mines and recapitalisation of the old ones both on the Copperbelt in Zambia and Congo DR;
2. Immigration of farmers from other countries;
3. Availability of planting materials from South Africa and other countries;
4. Establishment of outgrower schemes;

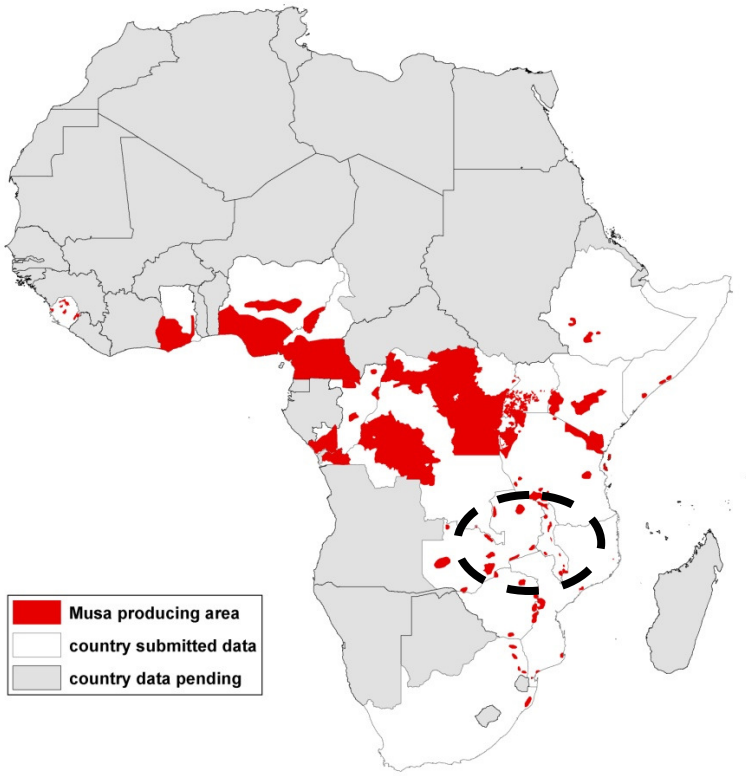
Although bananas are not a staple food in Zambia, farmers earn more money than they can get from growing maize. Bananas are sold at between US$0.30 and US$0.48/kg depending on demand, cultivar and distance from the market. With the promotion of diversification by the government, this crop can improve the food security of small-scale farmers. Banana production is, however, facing a huge challenge from Banana bunchy top disease (BBTD).

BBTV occurs in Zambia but there are no records indicating when it was first detected and the areas first attacked. It is thought that the disease may have entered with imported planting materials. Since the country does not produce banana planting materials, suckers were imported from other countries. This was intended to meet the demand for banana suckers from banana growers. Noticeably though, there were no institutions empowered with virus-indexing skills and facilities to help certify the freedom of imported materials from banana viruses including BBTV. This meant that symptomless, virus-infected plants were certified free from diseases by the Plant Quarantine and Phytosanitary Services.

Banana bunchy top disease is now found in all the banana growing areas in Zambia but mostly so on the Copperbelt province. This distribution is also a threat to neighboring countries like Zimbabwe. The spread of BBTD in Zambia can be attributed to a number of factors. These include lack of information about the disease, unwillingness by banana farmers to destroy diseased plants, establishment of outgrower schemes and unchecked in-country movement of planting materials. A survey targeting Central and Copperbelt provinces conducted in 2007 recorded 3% to 80% incidence levels of BBTD. Such high incidence levels have an adverse impact on production. This is evident in Eastern Zambia where many small-scale farmers who for their livelihoods depended on banana production have stopped growing bananas. This is because BBTD has wiped out all their banana fields.

A recent message to Bioversity from a medium-sized grower emphasizes the seriousness of the threat: "*We have a very grave situation in Zambia with very little support for the disease. This has spread like wild fire and having a plantation of some 30 hectares surrounded by indigenous farmers we are struggling to control the disease. We estimate a loss of around 40% of our crop per planting if not re-planted every year or after the first reaping (this is with active control of aphids)*"

Banana growing areas in Sub-Saharan Africa - Area to be targeted by the proposed project highlighted with the circle.



DR Congo – Katanga Province

At the national level, bananas constitute a basic food, occupying the second place among the food products cultivated in the country (SNSA, 1996).

In the Katanga province, banana production is a longstanding agricultural activity , but presents many new opportunities in response to the high prices for banana (0.4-0.5 $US/banana) in the booming mining city of Lubumbashi (population > 4 million inhabitants). Much of the production for Lubumbashi comes from Maniema, north Katanga and Zambia. Unfortunately farmers have introduced planting material from Zambia which has been a source of BBTD in new plantations (observation Mobambo and Roux 2008). Recently, BBTD has begun to cause more significant yield losses. A recent meeting on the potential for banana production drew a group of interested farmers and investors, but the challenge is to limit the spread of BBTD when new plantings are established, especially by small holders.

Current capacity to renovate devastated plantations and limit BBTD spread

BBTD is perhaps the most devastating pest problem of banana and plantain for smallholders. BBTD, caused by *Banana bunchy top virus* (BBTV *Babuvirus*), is transmitted by the black banana aphid (*Pentalonia nigronervosa*) and through infected planting material. The virus stunts the plant and results in more erect, narrow, small leaves with yellow borders which bunch together. Infected plants produce no fruits or a few twisted, deformed fingers. The plant may eventually die, but often remains as a source of inoculum.

BBTD is such a serious threat to smallholder production, because the disease infects local planting material before farmers or even local authorities become aware of the problem. Whilst laboratory techniques for virus detection and cleaning are well established, these services are not widely available in Sub-Saharan Africa. No farm-level techniques are known to eliminate the virus and once the virus is present, it is extremely difficult to eradicate. In each new planting cycle the disease spreads into new fields, primarily through infected suckers and within fields by aphids. Breeding virus-resistant cultivars has been used in crops such as cassava and sweet potato, but breeding new cultivars in bananas and plantains is more difficult. In addition, no sources of resistance for breeding have yet been identified.

Much is known about BBTD in Asia, Australia and the Pacific (Diekmann and Putter, 1996; Thomas and Caruana, 2000). Bioversity and national partners have developed strategies for rebuilding the production of Lacatan bananas for the national urban markets (Molina et al 2009). Bioversity is also working on cultivar screening (Niyongere *et al* 2009) and developing clean seed systems based on clean mother suckers and macropropagation techniques in Burundi. The following components are essential:

- a reliable source of virus-free planting material. This can be achieved with tissue culture plants which are produced from bud material tested free of BBTV. Suckers can also be used from zones certified free of BBTD as Bioversity is doing in Burundi.

- restricted movement of planting materials out of zones with BBTD. While the aphid vector of BBTV can be carried by winds over long distances, the primary spread of the disease is through infected planting material. Zones with BBTD present should be monitored for movement of planting materials.

- eradication of BBTD infected plants. The protocol for eradication includes early detection by specialized plant protection field technicians, spraying with kerosene or insecticide soap to kill aphids on infected plants, elimination of infected plant biomass through burial or controlled composting and uprooting of corm parts to avoid re-sprouting.

For the countries menaced by BBTV proposing this project, developing a public-private response to this disease represents a serious challenge. For small farmers, nearly 100% of bananas originate from locally produced suckers. Suckers are only infrequently sold, and farmers usually trade for or give suckers to friends and neighbours. This results in extremely low costs for planting material. However, this informal seed system is highly vulnerable to sucker-borne diseases. In the partner countries featured in the proposal there are scarce facilities for virus testing and no trained virologists (see table below). There are no commercial tissue culture labs in the region (nearest labs in South Africa and Burundi) and the public sector labs do not test bud-material for the presence of virus before multiplying vitro-plants. Perhaps one positive factor is that Cavendish tissue culture plants are widely available through tissue culture and there is a large international commerce with these planting materials. However, teaching small-scale farmers on how they can maintain clean planting materials is central, since the cost of planting materials for each replanting is normally out of reach of these target farmers.

Table 1: Infrastructure for virus detection and multiplication of virus-free planting material in Malawi, Zambia and DR Congo

Country/Region	Number of virologists	Lab technicians trained for virus detection	Labs with virus screening equipment	Private tissue culture labs	Public tissue culture labs
DR Congo Haute Katanga	0	0	0	0	1 (small research lab/ UNILU)
Malawi	1	1	0	0	3 (not at full strength, but potential high)
Zambia	1	1	1	0	1 (planned)

In a recent workshop convened by SADC with FAO, IITA and Bioversity in Arusha, Tanzania in late July 2009, 15 country representatives from Southern, East and West Africa issued a joint call for action on the looming crisis of BBTD to smallholder income and food security (Annex 1).

Research and development organizations and farmers' associations from Malawi, Zambia and Democratic Republic of Congo – Haute Katanga have joined forces with Bioversity International to formulate a proposal to strengthen clean seed strategies and build national capacity to rebuild Cavendish banana production in areas affected by BBTD. A successful project would provide the way forward for thousands of rural households throughout southern Africa threatened or already devastated by BBTD. A successful model for market-oriented production to rebuild areas devastated by BBTD would also provide the basis for private sector commercial tissue culture and macro-multiplication service providers. More effective BBTD management would also reduce the risk of transmission of the disease to neighbouring countries of Zimbabwe, Mozambique and South Africa.

OBJECTIVES

Goal: Rural communities growing Cavendish in southern Africa, currently facing the threat of banana bunchy top virus, significantly increase food security and income from banana

Objective: public and private organizations, grower organizations and civil society implement innovative approaches to widespread availability of clean seed systems, to the eradication of BBTD-infected plantations and to replanting of market-oriented Cavendish banana production in regions

Outputs:

1. Alternative strategies for market-oriented cultivar deployment and clean seed systems in BBTD-threatened areas developed by public-private stakeholder groups representing BBTD management, clean seed and commodity chains in pilot zones and nationally;

2. Public, private and civil society agencies serving pilot zones equipped with tools and knowledge for improved BBTD management;

3. Use of tissue culture plants and BBTD field management carried out by over 1000 growers in 5 pilot zones in three countries;

4. Promising approaches to virus-free planting material of Cavendish bananas and marketing and direct supply chains piloted by farmer associations, field organizations and private sector enterprises with potential impact among 6000 households.

PROJECT COMPONENTS

OUTPUT 1:

Alternative strategies for market-oriented cultivar deployment and clean seed systems in BBTD-threatened areas developed by public-private stakeholder groups representing BBTD management, clean seed and commodity chains in pilot zones and nationally;

Activity 1.1: Carry out diagnostic baseline on formal and informal seed systems, BBTD presence and farmer coping strategies and farmer organizations and service providers in potential pilot zones.

The project involves diverse partners in the initial planning stages and provides training on problem diagnosis, farmer surveys and multi-stakeholder strategy building. The project convenes relevant stakeholders in the *Musa* sector from formal and informal elements to analyze current strengths and weaknesses of cultivar deployment and seed multiplication. In each of the target regions, a survey is conducted with farmers' associations on their prevailing seed problems, production strategies and marketing approaches.

Activity 1.2: Identify pilot zone for grant work with motivated local growers' organization and agro climatic and soil conditions for highly productive Cavendish production

The pilot zone in each country chosen based on information gathered in Activity 1.1 should have an active and well organized grower organization, favourable conditions for improved production techniques and possibilities for successful eradication and replanting approaches.

Activity 1.3: Organize national working groups to plan and monitor project activities, with option to incorporation of additional organizations and funding for pilot zone work with farmer groups;

Multiple public and private sector stakeholder working groups are organized in each of the pilot zones, for the zones covering several countries and at the national level in each partner country in the project. Stakeholders meet at regular intervals. Initially they review the baseline diagnostic, the resulting strategy and the action plan. At intervals of 3-6 months groups meet to review the progress in the field and identify opportunities for improving and expanding the impact. Each year the groups conduct reviews of project activities and report back to policy makers and planners about progress and difficulties.

The project team and partner organizations identify organizations in the other zones with capacity and interest to multiply the work being completed. These organizations provide their own funding for field activities, but have access to the technical approach, tools and contacts of the project.

Activity 1.4: Develop strategies and procedures for cultivar deployment and seed multiplication, also involving commercial tissue culture labs based on study results.

National institutes, plant protection agencies, universities, farmer associations, and private sector interests review studies and plan formal-informal mechanisms to ensure clean BBTV-free planting material at affordable prices. Of particular concern is an on-going low cost source of virus-free planting material run as a commercial business. However, initially the project will be based on virus-free tissue culture plants from commercial labs.

Activity 1.5: Monitoring and planning for scaling out and scaling up by pilot zone and nationally throughout the remaining years of the grant.

Once field activities have been planned, working groups will meet regularly during the four years of the proposed project to monitor results coming from the field in objectives 2, and 3. These results will also be reported and discussed regularly with relevant national fora.

OUTPUT 2:

Public, private and civil society agencies serving pilot zones equipped with tools and knowledge for improved BBTD management;

Activity 2.1: Strengthen capacity for detection of BBTV in national pathology and diagnostic labs

To monitor BBTV in farmers' fields and to support the development of local clean seed multiplication strategies, national and local labs need facilities for the detection of BBTV. ELISA tests are commercially available, but minimal infrastructure and human resources are needed to implement the test and interpret results. International virologists work with national counterparts to identify organizations to provide BBTV testing service and design minimal infrastructure and training to ensure effective support to rural communities and organizations developing procedures for the multiplication of clean planting material. Minimal investment in each pilot zone is a micro-titre reader, water distiller, refrigerator and ELISA kits which are available commercially.

Activity 2.2: Train researchers, extensionists and policy-makers on ecology and management of BBTD and on clean seed systems.

Project staff and international technical assistants prepare training materials for diverse clients on the ecology and management of BBTD and on clean seed systems. As new results are generated by the project, these training modules are updated using local examples. Introductory training is given to all multiple stakeholder steering committees, to extensionists working with farmers and to professors and teachers providing courses on banana and plantain production.

Activity 2.3: plan training and field implementation of eradication, temporary cash or food crop planting, new plant nurseries, replanting banana fields and monitoring of BBTD re-infection.

Based on field diagnostics and the international expertise in BBTD, a working group in each pilot zone develops a progressive strategy to eliminate BBTD-infected plantations, maintain a period free of banana cultivation of 6-8 months and then replant with virus-free plants. An alternative, short term crop will be promoted with growers to provide income during the period after bananas have been eradicated. The strategy will also identify alternatives to mobilize groups of growers to take collective action against BBTD.

Activity 2.4: Monitor levels of BBTD in high-demand local cultivars and BBTD tolerant cultivars in farmers' fields.

Project staff, national collaborators advising national students and international technical consultants will monitor the re-infection of BBTD into diverse plantings from virus-free planting material in the field activities implemented in Output 3. Additional studies, needed to ensure science-based management of BBTD will also be carried out to understand the epidemiology of the virus and its vector. Students will be engaged to participate in this research.

Activity 2.5: Advice pilot zone and national working groups on strategies for market-oriented cultivar deployment and clean seed systems in BBTD-threatened areas;

National collaborators and international technical assistance will meet regularly with multiple stakeholder groups to identify strategies for clean seed systems.

OUTPUT 3:

Use of tissue culture plants, tolerant cultivars, macro-propagation and field management of BBTD validated by growers and field organizations

Activity 3.1: train extension field staff in five pilot zones on BBTD ecology and management and grower participatory training and experimentation;

Experienced trainers will introduce field technicians to participatory methods and crop-phase, farmer learning and experimentation.

Follow up meetings with field technicians will be organized every one to two months to review results and provide further training. This training process will be open to other participants who are financing additional farmers' associations in improving *Musa* production where BBTV is present.

The content of the training will be documented for use in other regions of the three countries and will provide the basis for the preparation of farmer training material.

Activity 3.2: grower associations in each pilot zone meet for training and to identify the zone for rebuilding Cavendish banana based on virus-free planting material, to plan eradication of infected plantations, new plot establishment and monitoring of plot status, to analyze results and to demonstrate advances to neighbouring farmers.

In each country, collaborators form grower groups to discuss the problems of how to improve production and income from bananas and approaches to solving BBTV. Each group identifies proposed actions and plans for a process of experimentation and training. These will include eradication of infected plants, the planting of a temporary food crop and the establishment of new plantings with virus-free planting material. Approximately every 2-3 months the groups meet to present data on plots, to learn new themes on *Musa* management and reach conclusions about cultivars and production techniques. Two pilot zones are proposed for Malawi and Zambia and one for DR Congo – Haute Katanga.

Other organizations and projects will have the opportunity to follow a similar method with their own financing.

Activity 3.3: a pilot group of 25 growers eradicate existing banana plots, plant a temporary cash crop and then replant their banana fields with virus-free planting material.

An initial small scale replanting procedure is undertaken with 25 growers in each zone. These growers will be concentrated in a small geographic area to facilitate elimination of nearby sources of BBTV or banana aphids. The small scale effort will serve as a learning strategy for technicians and a demonstration area for groups of growers in activities 3.4 and 3.5. In a zone free of BBTD-infected plants, farmers first plant a temporary food crop and then plant 1.0 hectare of Cavendish banana for market. Commercial tissue culture labs will provide the first clean planting material which will then be multiplied locally in tissue culture labs and in local macro-propagation labs.

Activity 3.4: 75 additional growers in each pilot zone eradicate existing banana plots, plant a temporary cash crop and then replant their banana fields with virus-free planting material based on the experiences of planting in Activity 3.3.

The group of farmers will begin to work 6-8 months after the first group.

Activity 3.5: 100 additional growers in each pilot zone take full advantage of the lessons learned by the first groups of growers to be more effective in the eradication of existing banana plots, plant a temporary cash crop and then replant their banana fields with virus-free planting material.

The re-infection rate will be monitored in the new banana fields planted in the other zones. If these continue to be virus-free, then growers in Activity 3.5 can use local planting material to establish new plantations. However, if BBTD has begun to appear, growers will need to use virus-free tissue culture plants.

OUTPUT 4:

Promising approaches to virus-free planting material of Cavendish bananas and marketing and direct supply chains piloted by farmer associations, field organizations and private sector enterprises with potential impact among 7500 households;

Activity 4.1: train field extension field staff on facilitation of farmer participatory market studies and farmer association governance.

Once the initial test plots are set up, the project team trains local extension staff and representatives from farmers' associations to facilitate participatory market studies run by farmers and to analyze the capacity of farmers' associations to run marketing businesses.

Activity 4.2: farmer associations conduct farmer participatory market study and chain analysis to identify alternatives for greater value added.

Trained field technicians facilitate their grower groups to carry out a market study with a small budget. Activities include meetings to plan study, interviews of traders and transport, visits to market towns and processors.

Other organizations and projects will have the opportunity to follow a similar method with their own financing.

Activity 4.3: grower associations linked to the growers establishing plots in Output 3 diagnose problems to meet market demand and plan strategies for clean seed production and alternative marketing for greater added value and formulate strategies to scale out market-oriented clean seed approaches.

Based on the results of the market chain analysis and alternative marketing strategies, farmers' associations review their current production system and product quality to develop alternative strategies to respond to current and new market options.

Activity 4.4: grower associations test-market bananas and plantains from clean planting materials and improved production methods and evaluate results.

The production from plots established in activity 3.5 are test-marketed and updated strategies for plant multiplication, production and marketing strategies are developed based on the tests.

Activity 4.5: grower associations, field organizations and private sector review lessons from grower plots with clean planting material, with production and marketing to establish plans and proposals post-project;

Nearing the end of the project, farmers' associations review the experiences with clean seed, improved production systems and alternative marketing strategies and develop plans and proposals post-project. Over 1500 farmers from surrounding communities in each pilot will be mobilized to review the results in field days and meetings.

3. BUDGETS

Summary table: Cost per output by CFC and Partner counterpart contribution ('000 USD)

OUTPUT	CFC	Counterpart[1]	Total
Output 1	239	115	354
Output 2	434	205	639
Output 3	710	342	1052
Output 4	170	54	224
Project management	354	40	394
Total	**1,907**	**756**	**2,663**

[1] Counterpart contributions consist of human resources, equipment and infrastructure already existing in collaborating countries which will be used to further the goals of the project.

Summary Table: Detailed List of Inputs proposed for financing by CFC by category of Expenditure (x000 U$)

Cat. Code	Category name	Sub-cat. Name	Total Cost
1	Vehicles, machinery, equipment	Vehicles (4 Twin-cab)	165
		Computer equipment (5 laptops and other electronic equipment)	25
		Virus detection equipment	48
3	Materials, supplies	Virus detection kits	25
		Temporary field nurseries	50
		Planting materials food crop	25
		Bud material cleaning/ multiplication	25
		Tissue culture plants	120
4	Personnel national	Salary complement counterparts	125
		Communications specialist	72
5	Technical assistance	Virus	60
		Multiplication methods	14
		Participatory methods	14
		Plant nutrition	14
		Regional coordinator	90
		Planning/monitoring/coordination	65
6	Duty travel	CFC annual meeting (3 meetings)	12
		Field review	12
		Admin supervision	12
		Travel among country partners	60
7	Dissemination/training	Stakeholders for clean seed	83
		Farmer baseline	30
		Farmer training	125
		Technician training	50
		Student theses	50
		Publications	50
8	Operational expenses	Vehicle operations	140
		Office communication	79
		Local admin	120
		Audits	18
		Overhead	129
	Total Budget		**1,907**

TENTATIVE TIME LINE

	Year 1				Year 2				Year 3			
Output 1: Strategies developed by pilot zones and countries												
1.1 Complete baseline on seed systems, BBTV and potential partners												
1.2 Select pilot zone												
1.3 Set up national and pilot zones steering committees with an option to bring in additional partners to pilot zone work												
1.4 Plan approach to clean seed												
1.5 Monitor progress and plan scaling out and scaling up												
Output 2: Organizations equipped with tools and knowledge for improved management of BBTD												
2.1 Strengthen capacity for BBTV detection in laboratory												
2.2 Train research, extension and policy makers on BBTV and seed systems												
2.3 Plan sequence of activities in pilot site												
2.4 Monitor BBTV levels in farmers' fields												
2.5 Advice steering committees on alternative strategies to BBTV management												
Output 3: Use of Vitro-plants, tolerant cultivars and other practices validated by farmers												
3.1 Train extension staff in BBTV mgmt and participatory learning												
3.2 Grower associations plan strategies for replanting												
3.3 Pilot group of 25 growers eradicate BBTD-infected plants, plant temporary food crop and establish new plots free of BBTD												
3.4 Pilot group of 75 growers eradicate BBTD-infected plants, plant temporary food crop and establish new plots free of BBTD												
3.5 Pilot group of 100 growers eradicate BBTD-												

infected plants, plant temporary food crop and establish new plots free of BBTD												
Output 4: group marketing and seed multiplication piloted by grower associations												
4.1 Train extension staff in participatory market studies and association governance												
4.2 Facilitate participatory market studies by farmer groups												
4.3 Plan virus-free production oriented to markets with farmer associations												
4.4 Test market bananas and develop new strategies based on results												
4.5 Review lessons learned and establish plans to scale out												

BENEFITS AND BENEFICIARIES

Economic Impact:

The proposed project will have an immediate impact through the recovery of banana production for income of 1000 growers in the five targeted pilot zones. The target zones will form the basis for scaling out within the same zones and to other zones reaching another 2000-3000 farmers within 5 years of the end of the project. The development of strategies to improve the quality of grower planting materials free of bunchy top virus will benefit thousands of growers in the next decades. The technologies for virus-free planting material will also serve to improve the sanitary quality of planting material by eliminating two other important seed-borne pests – weevils and nematodes. The proposal is also designed to increase the awareness among local and national policy makers who can propose strategies to reduce the spread of BBTV into new zones. Successful implementation of this point will broaden the usefulness of the results of the project. The neighbouring countries which do not yet have BBTD will also benefit, since effective management and limitation of the spread of BBTD will reduce the risk of country to country spread.

Social Impact:

Cavendish banana production is at least partly in the hands of smallholders. The proposal targets not only the technologies for management of BBTV, but also the strengthening of farmer organizations for improved marketing. This close link to markets is important to generate farmer motivation to improve seed quality. The market driven approach will also contribute to greater sustainability for clean seed strategies and to the scaling out to other zones with market potential. Medium size growers use hired labour which suffers loss of work if banana production declines due to BBTD. Replanting will contribute to restoring jobs lost.

Environmental Impact:

Banana is a semi-perennial crop. With their loss to BBTV, growers can be expected to substitute other crops. These crops are often annuals, meaning that land needs to be cleared every year for planting. In addition, the harvesting of these crops loosens the soil, subjecting it to soil erosion and to the loss of soil organic matter. The strengthening of banana production systems therefore has positive impacts on the environment.

REFERENCES

Lescot, T. 2008. Banana – Estimated world production in 2006. Fruitrop 155:29-33.

Molina, A., Sinohin, V., de la Cueva, F., Crucido, S., Vida, E. Esguerra, A., and Anit. E. 2009. Managing *Banana bunchy top virus* in smallholdings in the Philippines. ISHS/ProMusa symposium Recent advances in banana crop protection for sustainable production and improved livelihoods. Greenway Woods Resort, White River, South Africa. September 10-14, 2007

Niyongere, C., Miinda Ateka, E. Losenge, P., Lepoint, P., and Blomme, G. 2009. Screening 40 Musa Genotypes for Banana Bunchy Top Virus Resistance in Burundi. ISHS/ProMusa banana symposium Global Perspectives on Asian Challenges. Guangzhou, China. September 14-18, 2009

SNSA. 1996. Annuaire de Statistiques Agricoles. Ministère de l'Agriculture et du Développement Rural, RDC. Service national de statistiques agricoles, Projet PNUD/FAO/ZAI/96/003.

Thomas, J.E. and Iskra Caruana, M.L. 2000. Bunchy Top. *In* 'Diseases of banana, abaca and enset' Jones, D.R. (ed) CABI Publishing: Wallingford, U.K. pp. 241-253.