Project Concept Note

Scaling Up of the Tree Biotechnology Project in East Africa

Submitted to

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By

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1.0 ABSTRACT

The proposed project on up-scaling clonal tree technology to smallholder farmers in East Africa through the use of the tunnelling technique is aimed at providing a logical and necessary extension of an on-going project entitled "*Tree Biotechnology Project*" in Kenya Uganda and Tanzania, which is funded by the Gatsby Charitable Foundation (GCF) of the United Kingdom (UK) with technical backstopping from Mondi Forests (MF) of South Africa. Its main focus is to stimulate in a sustainable way the production, distribution and utilization of clonally derived *Eucalyptus* and other indigenous trees, geared towards impacting forestry in the region. The overall aim is to provide quality tree seedlings in a bid to help afforest the region, reduce environmental degradation, hunger and poverty by developing a sustainable production and access to affordable high quality seedlings by smallholder farmers. The key players in the project are the Tree Biotechnology Project at Karura who will train private nursery entrepreneurs in tunneling techniques to produce clones, the KEFRI, TAFORI, FORRI and Tree Biotechnology Projects in Kenya, Uganda, Tanzania, who will provide monitoring and evaluation as well as extension service, K-Rep, TGT and VEDCO who will train the nursery operators in credit management and administer the credit and ISAAA who will play a facilitative role. A budget of US$518,128.4 is estimated for a period of three years.

2.0 BACKGROUND

The forests of Africa cover 520 million hectares and constitute more than 17 per cent of the world's forests. They are largely concentrated in the tropical zones of Western and Central, Eastern and Southern Africa. With more than 109 million hectares of forests, Congo Kinshasa alone has more than 20 per cent of the region's forest cover, while Northern Africa has little more than 9%, principally along the coast of the western Mediterranean countries, according to FAO. This still, however, makes Africa one of the continents with the lowest forest cover rate. African forests include dry tropical forests in the Sahel, Eastern and Southern Africa, humid tropical forests in Western and Central Africa montane forests, diverse sub-tropical forest and woodland formations in Northern Africa and the southern tip of the continent, as well as mangroves in the coastal zones (Forests and deforestation in Africa *the wasting of an immense resource http:/www.afrol.com/features/10278)*

2.1 Forestry in East Africa

East Africa (Kenya, Uganda and Tanzania) extends over an area of about 180,689,484 hectares and has a population of about 88.6 million people. Agriculture and related activities contribute over 50% of the GDP and employs about 80% of the largely poor rural population at small-scale subsistence levels. In the recent years, the three governments' priority focus has been to enhance strategies and priorities for poverty eradication. One of the sectors targeted for improvement has been forestry.

As in other parts of Africa, forests are vital in East Africa where fuel wood traditionally is the main source of energy. Between 93-96 percent of rural households' energy needs are met by fuel wood with a projected more than 65 percent of the demand going unmet by the year 2020 if no major policy changes are to be implemented (World Bank, 1991). Reduced availability of fuel wood has critical socio-economic consequences for the rural poor, the regional economy and the environment. In addition to providing wood products such as fuelwood, poles, posts and medicine for the rural poor, forests maintain biodiversity through conserving water, protecting unique ecosystems and providing wildlife habitat. The forestry sector also contributes significantly to the economy of these countries. For example in Tanzania, forestry and wildlife are estimated to contribute about 3.3% of the GDP and about 10% of the country's registered exports. In Uganda, the sector contributes about 5.2% of GDP The sector's real contribution is however, grossly underestimated as there is substantial unrecorded consumption of wood fuel in the rural areas in addition to other forest products that are traded informally.

2.1.1 Kenya

Only 1.7% of Kenya's land mass is currently covered by forests; ideally it should be 10%. Indigenous forests are being decimated at an alarming rate as Kenya's growing population places immense pressure on the forests as a source of livelihoods; wood is consumed and sold as the most popular energy source in the country. Eighty per cent of Kenya's people use biomass energy; KEFRI data suggests that charcoal and fuelwood provide almost 95% of the total energy needs in people's homes. Forests are also being cleared for small and large scale agriculture as only one third of Kenya's land is arable.

Replacing the forests and at the same time ensuring sustainable livelihoods are national priorities. Most of Kenya's trees have grown from seed either indigenous or imported. But since 1997, the country introduced clonal trees through a pilot project funded by the Gatsby Charitable Foundation (GCF) of the United Kingdom. A clonal propagation nursery with clones donated by Mondi Forests (MF) of South Africa has been established by the Tree Biotechnology Project (TBP) of the Kenya Forest Department at Karura near Nairobi. The transfer of the clones was facilitated by the International Service for the Acquisition of Agri-biotech Applications (ISAAA).

2.1.2 *Tanzania*

There are about 38.8 million hectares of forests and woodlands in Tanzania, all of which are located in only about one third (35%) of the country's land area. Over 96% of forested land is classified as other wooded lands, 3.4% is closed forest and 0.3% mangroves. There is a diversified ecosystem, ranging from the Coastal Plains covering about one-fifths of land area. This region has a warm climate with mean temperatures of over 25° C. The other three-fifths of the country's mainland form a broad inland plateau between 750 and 1,500 metres above sea level (m a.s.l.). This region has a moderately warm climate whose mean daily temperatures range between 21° C and 24° C. Highlands from 1,500m to about 2,300 m a.s.l. cover slightly less than one-fifth of the country's land surface area. There, the climate is moderately cool and average temperatures range from 15° C to 20° C. Only about 13 million hectares of forests are reserved as productive industrial plantation forests and protective/ water catchment forests. Out of the gazzetted area, about 90,000 ha are under plantation forestry.

Over the years, Tanzania's forests have been cleared to meet the ever-increasing demand for agricultural land and fuel-wood. Like most households in East and southern Africa, Tanzanians utilize wood in 97% of their energy requirements for cooking, heating and cottage industry (food processing, brewing, fish smoking, salt production, baking, restaurants, schools, hospitals, tobacco curing, tea drying, production of burnt bricks, lime, etc.) (Malimbwi *et al.*, 2001). It also appears that urban Tanzanians will keep depending on fuel wood for a long time because it is relatively cheap compared to other energy sources.

It is estimated that at least 91,300 hectares of forest are degraded every year, which is 2% of the forest cover change in the country. The major reasons for degradation are clearings for agriculture, overgrazing, wildfires, charcoal burning, and over-exploitation of wood resources and encroachment of forest reserves (FBD, 2002). This practice results into serious land degradation, and hence decreased land productivity, diminishing returns from forest investment, environmental degradation and depletion of plant and animal genetic resources among others.

Charcoal burning in the rural areas is among the major economic activities, but exerts pressure in natural forests where charcoal is obtained. Charcoal makers usually select suitable indigenous tree species with high calorific values to produce dense and hard charcoal that is preferred by the consumers. Worse still is that those who do not have species preference clear woodlands for agriculture. The sustainable allowable cut of the woodlands to produce charcoal is only one bag of charcoal per hectare and yet about 6000 bags of charcoal per day are transported to Dar-es-Salaam City alone.

2.1.3 *Uganda*

Uganda has 4.9 million hectares of gazetted natural forests that cover roughly 24% of its land surface area (Anon. 2002). The majorities (81%) of these forests are woodlands, 19% is tropical high forests and less than 1% is forest plantations. The management of these forests is equally shared between National Forest Authority (NFA) and Uganda Wildlife Authority (UWA). There are in addition 3.5 million hectares of forest resources under private ownership in the form of scattered trees, woodlands and agro-forestry crops. Collectively these forest resources form a major source of wood and non-wood forest products that drive the rural livelihoods. For trade, the recent estimate by Plumptree (2004) showed that the net annual value of Uganda forests is about 594 billion shillings (US$ 350 million); making a contribution of 5.2% to the GDP of Uganda.

Nationally, large volumes of timber sourced mainly from natural forests are used for construction, furniture making and manufacture of other products. Over 875,000 m^3 of building poles are harvested from these forests yearly. Fuel wood consumption stands at 17 million tons per year, while 200,000 tons of wood is used for charcoal production. This level of fuel wood consumption in comparative terms is 30 times the combined energy obtained from electricity and petroleum (Anon. 1996).

Uganda's natural forests and woodlands have been cleared to meet the ever-increasing demand for agriculture, forest products, rural settlement and urbanization. For agriculture alone, it is estimated that more than 100,000 hectares are cleared every year (Anon. 1996). Indeed as pointed out way back by Dawkins (1948) this level of forest utilization is not sustainable. Natural forest productivity needs to be supplemented by plantation forestry.

3.0 PROBLEM STATEMENT AND THE PROJECT'S RATIONALITY

3.1 Problem Statement

Over the last five decades, tree planting in the East African region has not met the wood and woodfuel demand. Indeed, 65 percent of the demand will be unmet by the year 2020 if no major policy change is implemented, (World Bank, 1991). Reduced availability of fuel wood has critical socio-economic consequences for the rural poor, the regional economy and the environment.

In an effort to respond to the above problem and in consultation with relevant organization in East Africa, a clonal *Eucalyptus* tree project entitled "Tree Biotechnology Project was first initiated in Kenya in 1997 and later in Uganda and Tanzania in 2000 and 2003 respectively. At the onset of the implementation of the project in all the countries, which was facilitated by ISAAA *Afri*Center and funded by the Gatsby Charitable Foundation (GCF) of the United kingdom (UK) with technical backstopping from Mondi Forests (MF) of South Africa, an integrative strategy for technology transfer and application was devised, with feedback and monitoring at all stages of the project - from field trial, clonal production to planting by farmers. This entailed selection of appropriate trial sites and participation of appropriate partner institutions from both the private and public sectors.

Preliminary results from the pilot activities in Kenya indicate that clonal *Eucalyptus* is gaining popularity with both small and large-scale farmers because of its ability to grow fast and straight. Local landraces have poor germination rates and therefore the promise of hybrids and improved seeds which TBP supplies is very attractive to farmers all over Kenya. Similar empirical evidence exists in Uganda and Tanzania where the project is in its juvenile stages.

The proposed project on enhancing diffusion of clonal forestry technology to smallholder farmers in East Africa through a micro-credit scheme to private entrepreneurs, capacity building and quality control aims at providing a logical and necessary extension of the on-going pilot project on *"Tree Biotechnology Projects"* in the region. Its main focus is to stimulate in a sustainable way the distribution and utilization clonally derived trees geared towards impacting on forestry in the region. It builds on the experiences and lessons learnt from the pilot activities, which have drastically raised demands for the clonal *Eucalyptus* in the region.

3.2 Project's Rationality

It is becoming increasingly clear to those who generate technology that many technologies are not diffused because the majority would-be beneficiaries cannot afford the capital outlay required to acquire the technology. In the case of clonal forestry, accessing planting material by small-scale farmers has remained a major challenge in view of the limited nurseries that produce these clones. Indeed it is only the Karura nursery in Kenya that is currently producing *Eucalyptus* clones commercially in the region. The widespread and increasing poverty levels among the smallholder farmers also makes it difficult for them to afford purchasing the clones because of the increased overhead costs in terms of production at the Karura nursery and poor distribution network.

3.2.1 The need for fast growing trees for fuel wood and timber

Trees are generally difficult to improve genetically because of their long generation times and prevalence of out-breeding. Among the many constraints experienced in both agro-forestry and plantation forestry in East Africa

include limited supply and use of improved sources of seed, seedlings, wildings, scions etc.; lack of mother trees near to farmers' lands; lack of knowledge, skills and facility for the extension staff to produce various improved planting materials; little or no effort to domesticate traditional plants for medicine, food, building poles and timber.

In-situ conserved forest genetic resources are facing great pressure from total clearance to encroachment of natural forests in favor of agriculture and other forms of land development. Annual fires, destructive insects and pathogens are impeding the smooth development of juvenile forests. Other constraints are linked with minimal financial support and limited research facilities.

3.2.2 The technology under consideration

The clonal forestry technology is a proven form of biotechnology that has been fully commercialized in many countries including South Africa, Brazil and China. The technology is particularly appropriate in the provision of large quantities of superior planting material within a short period of time. Increased population as well as declining farm sizes has put pressure on forest land in East Africa, causing severe environmental degradation. In view of its proven commercialization status, clonal *Eucalyptus* is therefore conceived as an appropriate intervention measure to address problems related to availability of fast growing trees. This has potential to increase the availability of trees on farm to address the wood and wood fuel crisis.

The initiation of a Tree Biotechnology Project (TBP) in East Africa was therefore needs driven. The project has a potential to play an important role by increasing trees planted on farms in form of woodlots thus removing pressure from the few remaining natural forests and indirectly conserving the environment. The proposed project will greatly contribute to the availability of more building poles and timber. In addition there is a ready and continuous growing market for transmission poles, charcoal and sawn timber from *Eucalyptus spp.*

It is however, important to note that in order to make tree planting a viable enterprise, it must be profitable to stakeholders. Use of a technology that produces planting materials of superior qualities with guaranteed, quick financial return would be the starting point for a viable tree-planting program. Secondly, such planting materials must be mass-produced cheaply while at the same time ensuring uniformity of the envisaged end products. Experiences from the ISAAA facilitated clonal project indicate that tunneling is an option to cheaper production of clones (F. Mwaniki and E. Machoki, 2004). With proper training and management interested private nursery operators can adopt the technology. Through this technology farmers can have access to large quantities of superior germplasm at reduced costs since the large overhead costs of a central nursery like Karura and the transportation costs will be minimized. Similarly, it is important that the mass-production technique(s) so adopted should guard against diseases and insect pests. Here we note that whereas certain technologies may eliminate diseases from planting materials, pest problems in the long run may actually become inadvertently exacerbated. So, adopting such a technology may necessitate parallel investigations into new methods for circumventing native pests, which may switch over to tree crops of such narrow genetic base. Notwithstanding such minor concern, however, this project seeks to systematically put up an environmental monitoring system to ensure that any arising concern is responded to timely and appropriately

3.2.2 Implications of Developing Clonal Nurseries

In both South Africa and Brazil, from where clonal technology has been adopted, large-scale production and commercialization of the technology as a profitable business have only been achieved through private sector operations. The clonal nursery establishment requires heavy investment in terms of capital costs and high-level management. As such, sustaining the operations within the public sector domain has proven difficult. On the basis that an open public facility is needed in the region for training and for technology transfer experience that can spread and sensitize the private sector establishment, Gatsby Charitable Foundation (GCF) has justified funding a relatively small commercial operation in Kenya of 3 million cuttings per year. GCF has also funded a

smaller nursery in Uganda with a capacity of 1 million clonal plants per year and plans to do the same in Tanzania for demonstration purposes to interested private sector.

Not withstanding the efforts by the GCF to make clonal forestry a reality in the region, a recent study consultancy study by the GCF shows that diffusion of the clonal tree technology has to be addressed alongside awareness campaigns, effective distribution network and reduced costs to facilitate adoption and that technology generators and technology transfer institutions need to work together with smallholder private nursery entrepreneurs to facilitate the uptake of the technology (Kapila, 2004). The ISAAA/KARI experience with a different project on tissue culture banana is that a credit scheme to smallholder farmers tremendously helps technology uptake (*ISAAA quarterly reports on Micro-credit schemes)* and this proposal could borrow leaf from such experience to help finance smallholder private nursery entrepreneurs willing to invest in tunneling for clonal forestry.

This project proposal therefore represents a continuing effort to transfer the clonal forestry to smallholder farmers using tunneling technology, training and micro-credit as the main strategy of the technology transfer. In this context, the transfer of clonal technology to farmers in East Africa holds great promise as it has been tested in different agro-ecological zones of the region and its uptake by smallholder farmers has been established. The target is to train and establish at least three nurseries in each country in the next one year, each with a potential annual production of 50,000 rooted *Eucalyptus* clones. This proposal, developed under the aegis of ISAAA, requests the Kilimo Trust to fund the tunnelling clonal technology transfer and application in the East African region from the TBP project at Karura in Kenya for the period between 2005/6-2007/8 at an average of US$518,128.4 to help scale-up production of clonal *Eucalyptus* by providing training and micro-credit for tunnelling nursery establishment. To begin with, the exiting Clonal Nursery at Karura in Kenya will be upgraded to cater for training. This fund will also cover costs towards credit, credit management, provision of extension and facilitation in monitoring and evaluation.

This project proposal has a broad range of benefits that impact agro-forestry and domestic wood production for resource poor communities in East Africa. Institutionally, the project represents a model for strengthening South-South co-operation through donating, sharing and transferring biotechnologies to meet the needs and priorities of the resource poor farmers. This will open new ways of transferring technologies and extending the benefits of biotechnology to the poor. However, this demand will decrease and as the necessary awareness, training, distribution and marketing infrastructure is developed, the small farmer sector, being a consumer market for fuel wood and building materials will ultimately sustain the operations. Since the project is to be hosted by private sector nurseries with technical support from TBP Karura and the respective national forestry institutions in the region, it is urged that plant health institutions in the region be positively influenced to control the quality of clonal plants produced by the private sector for the target communities.

5.0 PURPOSE AND OBJECTIVES

The purpose of this project is to improve the living standards of rural communities in East Africa, particularly of the resource poor segment of the population, by enhancing forestry production. This will be done by up-scaling clonal technology through the tunneling technique for small-scale multiplication of selected elite materials using proprietary Eucalyptus clones donated from Mondi Forest of South Africa to East Africa. The aim is to positively impact the overall economy through commercial forestry, afforestation and reforestation, thereby building a sustainable environmental resource base, conducive to socio-economic development and thus reduce poverty.

The specific outputs are:

i) Train smallholder nursery operators in clonal technology through the tunneling techniques
ii) Improved access by farmers in East Africa to improved clonal forestry material for planting.

6.0 METHODOLOGY

6.1 Tunneling technology

The tunneling technology for clonal *Eucalyptus* has been developed and optimized by the TBP, Karura. Briefly, a bed is marked out measuring 1m x 4m. A wooden frame is constructed around the bed perimeter to identify the area in which the polytubes will be arranged. The bed is divided into half, using a wooden frame and hoops made of readily available sticks such *Lantana camara* to support the polythene sheeting are placed every 1m along the bed. The hoops are slightly curved so that rain water can easily run off the surface of the polythene and are placed about 30cm above the top of the polytubes. The curved hoops across the bed made them look like tunnels. Four posts, each measuring about 4m above the ground are placed in holes dug 1m away from the each corner of the bed. Frames are then constructed along and across the posts, so that they can support the shade made of shade net, which covers the top and sides of the bed. This shade is high enough for someone to walk around.

Clay sub soil is used as rooting media. Clay sub soil is filled in polytubes measuring 1.75 x 6 inches. Both sides and the lower end of the polytubes are punched with 3 holes per side, and one hole at the bottom. The tubes are then arranged along the bed in batches of 200.

6.2 Process of identifying nursery operators

The entrepreneurs identified for this project will be those who are already in tree nursery operations and willing to obtain a loan to invest in such an operation. At least three such operators will be selected from each country. These will be located in strategic areas where there is demand for clonal *Eucalyptus* and to reduce on the cost of transportation of the clones from the planned establishment of other clonal nurseries previously funded under the GCF funding.

6.3 Partnerships and their roles

The proposed project will be implemented through partnerships. The partners have in principal agreed to work together as shown the attached letters of support and will develop a Memorandum of Understanding (MOU) once the project commences. Division of responsibilities will be as follows:

6.1.1 ISAAA

ISAAA is a not-for-profit organization registered in USA under category 501 (c) 3 status. The organization has globally facilitated many model projects to developing countries It opened its offices in Kenya in 1994 and is located in ILRI campus where it operates under the aegis of the International Potato Center (CIP). The organization exists to provide farmers with access to the promising new technologies they need. It is based on a novel new vision of technology transfer that treats North and South as equal partners in projects that offer gains to both sides. ISAAA's unique approach mobilizes private-public partnerships in which developing countries are not exploited but catalyzed for economic growth that benefits small-scale farmers. These new partnerships, moreover, produce benefits that extend beyond the technology transfer itself. This dynamic synergism accounts for ISAAA's success in generating sustainable agricultural projects with long-term impacts. ISAAA is the vision bearer in the proposed project and will play the facilitative and coordination role.

6.1.2 *TBP Project Karura, KEFRI in Kenya, TAFORI in Tanzania and FORRI in Uganda.*

These are the institutions have hosted the clonal tree projects in their respective countries. They have the comparative advantage of having a network of research centers throughout their respective countries and have the human resource capacity and the necessary infrastructure to offer extension services and monitoring.

The TBP Karura of the Forest Department (FD) in Kenya has a clonal facility capable of producing 3 million clones annually. The project has optimised the production of clones through the tunnelling technique. The project has ably provided some training to FORRI and TAFORI staff in clonal technology. The TBP on her part will facilitate the training of nursery operators from Kenya Uganda and Tanzania and provide them with technical backstopping. At least three smallholder nursery operators from each country will be selected from areas where clonal *Eucalyptus* has the highest demand. These will be trained in clonal technology and tunneling by the TBP at Karura, Kenya. This approach will be used to up-scale the production and delivery of clones to farmers. This methodology has several advantages. Among them is that (i) it will strengthen the nursery operators capacity (nursery management skills and knowledge) for further expansion to other areas without additional facilitation since the trained nurserymen can become the "trainers of trainers" (TOTs); (ii) increase the cost-effectiveness of production and delivery of clones to the farmers.

6.1.3 *K-Rep Development Agency*

K-Rep Development Agency (KDA) is a micro-finance development organization, which aims to promote the participation of low-income people in the development process. Its main focus is on expanding financial services to those who have traditionally been left out by formal financial institutions. It is registered as a Non-Governmental Organization (NGO). From a humble beginning in 1980s, K-Rep has evolved and developed into a group of three autonomous institutions: K-Rep Development Agency (K-Rep). K-Rep Bank Limited and a consulting company, K-Rep Advisory Services Limited, which make the K-Rep Group of Companies. KDA is the Research and Development subsidiary company of the K-rep Group. K-Rep's Development strategies are, one to identify, test and develop new micro finance products for low-income people and two, to institutionalize those products that prove effective and sustainable.

Among the projects K-Rep is currently pilot testing is the *Small holder farmer's savings and credit project:* This project aims to increase access to credit facilities to small scale farmers as one way of improving small holder farm productivity and thus, farmer income. Through this project K-Rep has made 960 loans to smallholder farmers in Migori, Gucha and Kisii districts and currently has an outstanding loan portfolio of KSh. 8.6 million and a repayment rate of 96.6%.

Another project that K-Rep is pilot testing is *Financial Services Association (FSA) Project:* Known unofficially as village banks, FSA are rural financial institutions providing a wide range of services e.g. savings, loans, money transfer, etc. FSA are owned, financed and managed by communities. K-Rep has established 62 FSAs in 18 districts of Kenya.

The role of K-Rep in the project will be in developing and managing the credit scheme and providing specialist inputs into its design, refinement, management and eventual handover to a micro-finance bank - The K-Rep Bank. K-Rep has been chosen for this role due to their specialization in micro-finance and the fact that they are the first NGO in Africa to transform a credit scheme for the poor into a regulated financial institution – The K-Rep Bank.

6.1.4 Tanzania Gatsby Trust (TGT)

TGT is a Trust established in Tanzania and an independent organization under the NGO and Trust Ordinance Act The organization enhances the growth and productivity of micro and small enterprises through provision of micro credit and facilitating market access. TGT has a credible track record of its activities in Tanzania. The role of TGT on this project will be similar to that described for K-Rep.

6.1.5 VEDCO

VEDCO is registered as a Non-Governmental Organization in Uganda specialized in micro-finance development to help promote the participation of low-income people in the development process. Like KREP, the organization expands financial services to those who have traditionally been left out by formal financial institutions. The role of VEDCO on the project will be in developing and managing the credit scheme and providing specialist inputs into its design, refinement, management and eventual handover to its micro-finance bank arm RUCREF for sustainability.

7.0 OUTPUTS

The main outputs of this project will be empower at least three smallholder nursery operators in each country in clonal technology through the tunnelling techniques. This will result in improved access by farmers in East Africa to improved clonal forestry material for planting and reduce encroachment on natural forests thus resulting in biodiversity conservation.

8.0 POTENTIAL FOR SUSTAINABILITY

Currently, clonal forestry is better established in Kenya. The aim of using tunneling techniques for clonal production is to ensure a sustainable system of production, distribution, marketing and utilization of clones once the project funds and support such as the one anticipated from Kilimo Trust come to an end. The nurseries will be encouraged to form an association as a key ingredient for environmental, social financial and institutional sustainability. This way, they will be able to continue receiving the services they require on field training and technical support. The nurseries association will particularly be useful in enhancing the skills and quality control of the clones produced. The availability of clones closer to farmers at prices they can afford will greatly strengthen the social and economic base of farmers.

9.0 MONITORING AND EVALUATION

KAFRI, TAFORI and FORRI will be charged with the role of monitoring and evaluating the performance of the nurseries in addition to providing extension services to farmers. A private independent environmental impact assessment (EIA) organization will be recruited to undertake an EIA

10.0 BUDGETS

So far there are no clonal *Eucalyptus* propagation nurseries at the small scale farmers' level in East Africa. Estimates derived from the TBP, experimental low cost tunneling technology with a capacity of 50,000 rooted cuttings annually may be used as a basis for developing a prototype for farm level clonal propagation nurseries.

Appendices I-V- respectively show the estimated cost of constructing one high shade structure: 6m long x 3m wide x 2m high, a rooting tunnel (1m wide x 4m long) holding 2400 cuttings, consumables required to operate such a nursery, labour costs required to operate the nursery and costs for installing an irrigation system. In total, a

sum of US$10,712.40 is required to put us one such an operational facility. To establish 9 such facilities in the region (3 in each country) will therefore require a sum of US$96,411.60

Appendix VI shows the finances required to strengthen the TBP to perform the roles as a training facility and regulatory functions in the nurseries of trained entrepreneurs. A sum of US$88,104.1 is required for these activities.

Table 1 below shows a summary if the budgetary requirements to implement the project

Table 1: Budgetary costs

ACTIVITY	YEAR		
	2005	**2006**	**2007**
Credit for cost of constructing high shade structures, 3 in year 1 and 6 in year 2 with a capacity of 50,000 rooted cuttings inclusive of labour, supplies and irrigation @US$10,712.4 per unit	32,137.2	64,297.4	
Credit management costs and training in credit by K-Rep, TGT and VEDCO @10% of loan portfolio	3,214	6,430	
TBP Karura costs of training and strengthening the role in training	33,342.8	35,596.9	18,164.4
Monitoring and Evaluation costs to KEFRI, TAFORI and FORRI 3 persons per country 8 days quarter @US$100 inclusive of meals accommodation and travel	114,400	28,800	28,800
Environmental Impact assessment costs per country @US$6,000			18,000
A regional workshop to disseminate information			35,000
Contingency costs@5%	9,154.7	6,756.3	4,998.2
ISAAA Facilitation fee 18% on non-capital investments	34,604.8	25,538.5	18,893.3
Total	**226,853.5**	**167,419**	**123,855.9**
Grand total	**518,128.4**		

APPENDICES

Appendix I: Cost of constructing one high shade structure: 6m long x 3m wide x 2m high (To hold 2400 cuttings)

	Item	Quantity	Cost US$	Remarks
1	Poles 3"-4Θ x 8.6 ft long	6	12.86	*Eucalyptus* poles at Nairobi price
2	Fittos (withes)	57 running metres	24.00	*Eucalyptus* poles at Nairobi price
3	Papyrus mat	54m²	19.47	Thika Road price
4	4" nails	1kg	1.14	Nairobi price
		Sub-total	***57.47***	

Appendix II: Cost of constructing one rooting tunnel (1m wide x 4m long) to hold 2400 cuttings spaced.

	Item	Quantity	Cost US$	Remarks
1	Hoops	5	-	Free from *Lantana* weed
2	Poly sheet, clear, gauge 500 x 8ft wide	6m long	6.86	Nairobi price
3	Fittos at least 2 - 3"Θ	10m	5.71	Nairobi price
4	4" nails	½ kg	0.64	Nairobi price
		Sub-total	***13.21***	

To obtain 50,000 rooted cutting a year, will need to place 100,000 cuttings. Therefore number of above structures required to accommodate 100,000 will be 100,000 ÷ 2,400 = 42 (the 42 structures are only necessary if all the 50,000 cuttings are to be produced in one season but if production is spread across the year then number of structures would vary according to capacity and demand) .The cost of structures therefore will be 42 structures multiplied by 70.68 (the sum of subtotal in appendix I and II) = **US$ 2,968.56**

Appendix III: Consumables and utilities required to operate the nursery.

	Item	Quantity	Cost US$	Remarks
1	Soil	10tons	7.14	Karura forest price
2	Polybags	100,000	271.43	Nairobi price
3	Paper punch	1	25.71	Nairobi price
4	Crates (bread type)	4	25.71	Nairobi price
5	Wheelbarrow	1	32.14	Nairobi price
6	Secatears	2	51.43	Ocean Agri price
7	Scissors	6	12.86	Nairobi price
8	10 liters bucket	4	5.71	
9	Bowls	4	2.29	Nairobi price
10	Pruning saw	1	4.29	
11	Emulsion paint (PVA)	1 liter	3.57	
12	Jembes	2	12.86	
13	Rake	1	3.57	
14	Root inducing hormone	5kg	485.71	0.8% IBA chryzoplus
15	Simple structure for cutting preparation 3m x 4m	1	71.43	Grass, Makuti, Papyrus to be used as roof and walls
16	Grow out (1m x 4m) polysheet gauge 500 timber or fitos.	$40m^2$	71.43	Two rainy seasons are considered, cost includes the sheet and fitos.
17	Fungicides	3kg	64.29	
18	Insecticides	½kg	10.71	
19	a. Fertilizers (NPK + Micro 50kg bag)	4	100.00	
	b. Micro feed fertilizer	2kg	37.14	
20	Cleansing agent	5 liters	21.43	
21	Gloves both industrial and surgical		14.29	
22	Watering cans	2	12.86	
	Sub total		***1,348.00***	

Appendix IV: Labour cost based on the Government of Kenya minimum wage of US$ 2.86 per day

	Item	Quantity	Cost US$	Remarks
1	Clonal hedge establishment	11 w/d	31.43	Assuming the land is prepared
2	Harvesting & maintenance	69w/d	197.14	
3	Clipping and placing and potting	168w/d	480.00	TBP rates
4	Hygiene, sorting, irrigation at tunnels	58w/d	165.71	
5	Cleaning, grading and spacing at grow out or hardening section and cutting spacing sticks	48w/d	137.14	
6	Irrigation and fertigation at hardening stage	270w/d	771.430	For only 9 months, 3 months assumed to be rainy
7	Dispatch	10w/d	28.57	
8	General	24w/d	68.57	
	Sub Total		***1,880.00***	

NOTE

- To produce the 50,000 cuttings, at least 500 - 1000 ramets in clonal hedges are required.
- A good source of clean water (not chlorinated) should be identified.
- A reliable supply of power either the national grid or generator is a requirement if drip irrigation is to be used on hedges.

Appendix V: Cost of construction and maintenance of irrigation systems.

	Item	Quantity	Cost US$	Remarks
1	Electricity	12 months	714.29	
2	Water pumps	1	714.29	Assuming drips lines are used. If not, this is not a cost
3	Online filtration system	1	142.86	Assuming drips lines are used. If not, this is not a cost.
4	Water storage tank	40m^3 tank	4,285.71	- Plastic tank - Storage for one month
5	Piping and drip lines for clonal hedges	468m drip line	100.00	Including accessories
		About 56m of piping	42.86	Including accessories
	Sub Total		***6,000.00***	

TOTAL COST for clonal cuttings = US$ 10,712.40

Appendix VI: Cash Flow for the Sustainable Up-scaling of TBP 2005 – 2007

	Activity	2005	2006	2007
1.	**Regulatory Framework Development**			
	National Stakeholders Workshop		714.3	
2.	**Coordination Committee**			
	Support to the coordination committee	357.1	178.6	178.6
3.	**Strengthen the role and capacity of TBP in Training and accreditation**			
	Training of nursery propagators (3 in first year and 6 in second year @US$349.4 per person per day for 3 days(inclusive of accommodation and transport)	3,144.8	6,289.6	
	Additional Project staff to support training (one in the first year and another in the second year @US$238.1per month	2,857.2	5,714.4	5,714.4
	Additional reconditioned vehicle for training @US$17,857.14 and maintenance @UUS$3571.4	21,428.6	3,571.4	3,571.4
	Training scheme and basic propagation manual	2,857.1	11,242.6	
	Technical support to the propagators 6 days per country, 2 visits by 2 persons @ US$100 per person inclusive of accommodation and per diems) + travel costs@1,500 per country	8,700	8,700	8,700
	GRAND TOTAL	**33,342.8**	**35,596.9**	**18,164.4**

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