The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Full Project Proposal Guidelines

Third Call for Proposals under the Benefit-sharing Fund

Deadline for submitting full project proposal: 5th of December 2014
at Treaty-Fund@fao.org and PGRFA-Treaty@fao.org

TABLE OF CONTENTS

PROJECT PROPOSAL COVER SHEET

Project No. _____ (*For Treaty use. Do not write anything here)*

Project Title: Promoting open source seed systems for beans, forage legumes, millet and sorghum for climate change adaptation in Kenya, Tanzania and Uganda

Project duration: 48 months

Target crops: Beans, forage legumes, millet and sorghum

Targeted developing country/ies Kenya (L), Tanzania (P), Uganda (P)

Other Contracting Party/ies involved

- Uganda National Genebank (UNGB)
- National Plant Genetic Resources Centre of Tanzania (NPGRC)
- Bioversity International
- Humanist Institute for Cooperation with Developing Countries (Hivos)
- Environmental Resources Management Center for Sustainable Development (ERMCSD)

Project geographic extension (km²) 1000 km²

Total requested funding 800.000 USD

Total co-funding 429.262 USD

Please select the type of project you are applying for:

☐ Single-country Immediate Action Project (Window 2)
☒ Multi-country Immediate Action Programme (Window 2)
☐ Single-country Co-development and Transfer of Technology project (Window 3)
☐ Multi-country Co-development and Transfer of Technology project (Window 3)

Applicant

Name of Organization: Genetic Resource Research Institute
Type of organization: Government Organization

Project Contact: (*name and position)* Dr. Desterio Nyamongo (Officer-in-Charge)

E-mail address: dnyamongo@yahoo.co.uk

Telephone: +254 20 2519701

Fax:

GENERAL REQUIREMENTS

These guidelines have been prepared to support applicants in the development of full project proposals. They describe the requirements that all applicants should adhere to when developing their full project proposal.

Please make sure you read these guidelines carefully before proceeding to fill in the Project Proposal Form. The full proposal should be prepared taking into account the thematic focus of the Third Call for Proposals, including in particular, the rationale, scope and expected outputs for each Window and sub-Window.

Project proposals must be clear and realistic on the problem to be addressed and objectives it tries to achieve. Project objectives have to fit in the thematic focus of the call and ultimately contribute to food security and poverty alleviation. Project objectives have to be logically interlinked with the planned activities, outputs and expected outcomes. The objectives and outputs have to be feasible in terms of duration and resources requested. The information to be provided in each section has to be focused and straightforward, qualitatively and quantitatively measurable in terms of what will be done, with what purpose, who, why and how will be involved in the activities to be implemented, who and how many will directly and indirectly benefit from the implementation of the project. A good full proposal will have a sound, clear and logically linked methodology of implementation and management.

The full project proposal should contain no more than fifteen (15) pages of text (Appendixes, table of contents and cover sheets excluded). The number of pages allocated to each section is a guide. The information required can be less but not more than the pages stipulated. All Appendixes should be duly filled in according to the provided guidelines as they form an integral part of the full project proposal. Project proposals lacking at least one Appendix, will be excluded from the selection process. The Appendixes will be provided to you in separate files together with the present document.

When submitting the full project proposal, additional attachments (endorsement letters, funding commitments, certification of the status of the organization) can be provided.

Please ensure that the project proposal and all attachments are legible in Times New Roman 12 and provided in two formats (pdf and word). Make sure the signature of the project coordinator is put on the signature page.

The project proposal, if approved for funding by the Bureau of the Sixth Session of the Governing Body, will form an integral part of the contractual agreement (Letter of Agreement) that will be signed with each applicant organization of the approved projects.

SECTION A: EXECUTIVE SUMMARY

1. Executive summary

Climate change poses a serious and ever growing threat to the food and nutrition security of resource-poor farmers globally. In Kenya, Tanzania and Uganda, in particular, levels of undernourishment remain high and climate change is likely to increase this further. Agricultural production rates are low and are estimated to drop on average by 22% by 2050, sending farmers who are already struggling to feed their families throughout the year deeper into poverty traps and malnutrition. Erratic rainfall and droughts are expected to become more frequent as a result of climate change affecting production. The homogenization of agriculture to single crops or varieties in the hope of higher yields, coupled with the associated loss of biodiversity, have decreased the resilience of resource-poor farmers and contributed to soil degradation, which is one of the major challenges in the region. Increasing farmers' access to a much wider range of agricultural biodiversity will arm them with options to better manage climate risks and biotic stresses such as pests and diseases, while also creating an important source of resilient planting materials that will be vital for future generations to continue adapting. Unfortunately, due to inadequate food systems, few options are available to farmers to maximize the potential benefits this difference can bring to them in terms of resilience, nutrition and livelihoods. Gender inequality also makes the systems more vulnerable. It is estimated that if women had the same access to quality productive resources as men, farms would likely have 20-30% higher yields.

To help resource-poor male and female farmers better cope with climate change, this project will increase the availability and diversity of climate-smart varieties of four important crops, namely beans, forage legumes, finger millet and sorghum. We will test, breed, produce high-quality seeds, and increase access to a wider range of locally adapted varieties using a crowdsourcing approach and by establishing or strengthening community seed banks. Marketing channels will be strengthened to disseminate the most promising varieties of beans, forage legumes, finger millet and sorghum.
With the active engagement of local and national governments, extension services, communities and the private sector, we will promote a seed system that balances breeders' and farmers' rights and that gives opportunities for farmers and researchers to further improve material developed using germplasm from the Multilateral System by all interested actors: we call it open source seed systems. We believe that such a system will enhance the use of a wider range of locally adapted crops and varieties.
The project envisions a collaborative participatory approach where the primary beneficiaries implement the project in close collaboration with project partners and other stakeholders. Several methodologies for scaling up will be utilized within our proposed interventions, such as the use of mobile technology to record preference testing of varieties, using a citizen science approach and creating sharing and learning platforms to ensure stakeholder interest and engagement.

We will work in Hoima in Uganda and Lushoto in Tanzania, located in the sub-humid tropics, and Makueni and Hombolo in the semi-arid regions of Kenya and Tanzania where the project will benefit from well-established links with research and development institutions in these benchmark sites for a CGIAR research program on Climate Change, Agriculture and Food Security.
The project focuses on cereals and legumes which have a high market potential and also play an important role in increasing food and nutrition security in the four sites. Finger millet and sorghum are drought tolerant crops and their importance is likely to increase under future climatic conditions. Common beans are an important source of proteins and can grow on marginal lands. It is estimated that due to climate change, there will be a shift towards more pastoral systems, thus better fodder crops will be needed. Different crops and varieties of forage legumes are tested for the viability as part of a mixed cropping system.

SECTION B: PROJECT DESCRIPTION AND CONTENTS

2.1. Problem definition

Food production currently is insufficient to feed the growing population in East Africa. A heavy reliance on agricultural imports of cereals which compete with local production is threatening to increase food insecurity even further (NEPAD, 2014). Countries have to find novel ways towards greater self-sufficiency and increase production to become less dependent on imports and food aid (Pretty, Toulmin and Williams, 2011). This daunting task is further challenged by the negative effects that climate change has on agricultural productivity, likely increasing arid and semi-arid land, water scarcity and a further degradation of ecosystems and the associated loss of biodiversity it contains (IPCC, 2014).

Lack of food and/or nutritional security is evident in our target countries: according to FAO, Tanzania is considered food self-sufficient but 35% of the population is still undernourished. In Uganda and Kenya rates of undernourishment are 26% and 24% respectively (FAO, 2014). Yet, at the site level food security is a major issue: in Hoima, Uganda only one-third of the households are food secure throughout the year and 10% of the families face food deficits for more than six months every year. In Wote, Kenya only 2% of the households are food secure all year long with 81% struggling to feed their family for more than 2 months out of a year. In Lushoto, Tanzania only 4% of the households are considered food secure and over one-third face food deficits for more than 6 months every year. In Hombolo Tanzania 7% of the households has enough food throughout the year but 63% struggles to feed the family for 3 or more months of the year.

Climate change can further exacerbate this pattern and make it more difficult for the situation to be reversed. According to the latest IPCC report (IPCC, 2014) crop productivity will decline and poverty will increase. For example, sorghum yields are expected to decline in parts of East Africa but have the potential to increase in the highlands of Kenya and Tanzania, making an adaptation plan essential (IFPRI, 2013).

While one option for adaptation is to diversify crops and varieties, conventional methods of increasing agricultural productivity have focused on increasing inputs on few high yielding varieties which has led to the homogenisation of agriculture. The availability of well-adapted quality seed to make this transformation possible is declining due to poor support systems and technological advances that have made formal seed markets more uniform. Local communities currently have limited access to information and a diversity of planting materials to diversify their production system to cope with unpredictable weather and stabilize their livelihoods. There are currently limited and scattered mechanisms in place to share and increase diversity of farmer varieties beyond the local level. Establishing new community seed banks and linking them with the existing ones will create an effective network that will allow the national system to monitor the status of on farm conservation and enhance flow of seeds between them.

Also, legislation can impede these 'intermediate seed systems'. For example the Crops Act adopted in Kenya in 2013 is providing limitations to smallholder farmers in their freedom to manufacture, process or sell certain crops unless they are licensed manufacturers. Community seed banks can act as an institution through which farmers' exchange is facilitated and can potentially acquire a license through which farmers can trade.

The nexus between food security, poverty and climate change, the role of seed systems in providing solutions to these issues and the legal challenges will be the three main problems this proposal will address.

2.2.Project objectives: Overall and specific objectives

Overall objective

To improve adaptation to climate change and enhance the food and nutrition security of resource-poor farmers in Kenya, Tanzania and Uganda, through the availability, sustainable management and use of a wider range of quality plant agricultural biodiversity.

Specific Objectives

- To pilot open source seed systems to enhance the use of high quality seeds of climate-smart varieties
- To identify and strenghten marketing channels with supportive financial services to disseminate best bean, forage legumes, millet and sorghum varieties.
- To enhance national PGR systems' capacity to coordinate conservation measures, MLS germplasm exchange and knowledge dissemination at local, regional and international levels

2.3. Targeted outputs, activities and related methodology of implementation

Output 1: New varieties generated from the MLS and national genebank materials and other genetic material introduced, tested and disseminated

Bioversity-Kenya and 3 national PGRFA institutions will identify a pool of one hundred varieties per crop (or mixture in the case of forage legumes) from genebanks collections using an agro-ecological model already used by Bioversity in other Seeds for Needs initiatives[1]. The selected accessions will be shared between genebanks through Standard Material Transfer Agreement (SMTA).

The accessions will be sowed in the four sites (Hoima, Uganda, Lushoto, Hombolo in Tanzania and Makueni in Kenya) in a replicated experiment to collect agro-morphological information and simultaneously multiply seeds for future activities. Thirty farmers (15 males and 15 females) will be asked to evaluate the accessions using their own traits identified through focus group discussion.

Twenty to thirty best performing varieties per crop will be evaluated by farmers and scientists using agro-morphological and farmers' criteria with a balance between male and female farmers' preferred varieties if differences occur.

Climatic conditions at each plot will be recorded using i-buttons[2] and rain gauges to link performances of different varieties with specific climatic conditions. National PGRFA institutions together with Bioversity will supplement characterization and evaluation data in the national genebanks information systems.

The selected accessions, together with known varieties and one check variety, will then be sowed in smaller mother trials in 4 villages per site with a replicate. Twenty farmers consisting of 10 men and 10 women will select their preferred varieties from the mother trials.

Parallel to the mother trials, 500 farmers per site will be given 3 blind varieties in small quantities to be tested under their own conditions (the crowdsourcing approach) and will be asked to evaluate the material and provide feedback on their preferences, they will become citizen scientists. Data and feedback will be collected by ERMCSD with the engagement of extension services after receiving appropriate training by Bioversity. The feedback will be collected using a simple questionnaire using mobile phones/tablets for immediate submissions to the data manager.

This data will be linked to a global portal developed by Bioversity and CIAT to upscale the approach and will be analyzed using ClimMob software developed by Bioversity (van Etten, 2014). We will target 10.000 farmers by year 4 of which 30% women using this approach. A snowball approach will be established to ensure farmers to farmers exchange and upscale after the first crowdsourcing trials. The method has been already tested in Hombolo and Makueni with sorghum varieties.

---

[1] *http://www.bioversityinternational.org/e-library/publications/detail/seeds-for-needs-atlas-of-crop-suitability/*

[2] *http://www.bioversityinternational.org/e-library/publications/detail/collecting-weather-data-in-the-field-with-high-spatial-and-temporal-resolution-using-ibutton/*

The smaller mother trials and crowdsourcing trials will identify the best accessions per site to enter into a breeding program. We will start crossing this material with elite varieties and to further self the F1 seeds to develop at least 100 lines for at least 3 crops by year 4. All steps of the breeding activities will be participatory and will be set up in each site. Farmers will be trained in participatory breeding techniques and linked to professional plant breeders in year 3-4. Farmers will be involved in all activities from selecting lines for crossing to hosting the trials and multiplying, distributing and commercializing the seed at the end of the process. The goal of the breeding program will be, among others, to increase new and better adapted genetic diversity, thus reducing genetic vulnerability, increase yields, resistance to pests and diseases, and quality traits. Plant breeders will assist and train farmers throughout the process. Gender equality will be encouraged in the farmers groups participating in plant breeding. Continuity will be ensured by working through production groups (see output 2). An award mechanism will be put in place for best group and individual performance in breeding activities.

In year 1 we will also conduct an agro-biodiversity assessment to identify local varieties that are currently grown on farms and require further conservation actions. The assessment will be done by groups disaggregated by age and gender. They will be guided by a methodology of four cell analyses through a series of focus group discussions organized by Bioversity and ERMCSD and held in 4 locations in year 1. The identified material will enter into crowdsourcing and other dissemination pathways (see output 2) while the remaining material will be conserved in the national genebank.

The knowledge collected during the mother and crowdsourcing trials will be documented and made available to the wider farming community. Additional data will be collected during a series of focus group discussions held with gender disaggregated groups capturing their traditional knowledge, information about use and best agricultural practices. A variety portfolio catalogue will be published and shared in a suitable format which will provide farmers with increased knowledge on the available varieties. To a certain extent documenting and publishing information can prevent biopiracy of local varieties. To further facilitate knowledge and seed exchange a large seed fair is organized in each research site during the harvesting period in year 3.

As the material used in output 1 will come through the national system, we will work on the assumption that any derivative developed through the breeding program will come as open source, thus the information and the material developed under this project can be used by any breeding program, public or private, national or international.

Output 2: Value chains for open source climate-smart seed systems with equitable access by women and young farmers developed and strengthened and the establishment of seed production units and seed quality determination attained.

The identification of promising climate-smart varieties will not be enough to guarantee its adoption if proper livelihood opportunities do not arise from those varieties. To this end the consortium of partners will work on developing or strengthening value chains for the most promising varieties with commercial value. There are three key factors considered in this output: 1. Capacity development of farmers to develop the ability to produce commercially viable seeds, 2. Policy issues related to the production and marketing of farmers' produced seeds. This includes registration of farmers' cooperatives, standards for seed quality and other aspects related to the open source approach that we will identify at the beginning of the project, and 3. Develop gender sensitive value chains for the crops/varieties of interest including strengthening farmers' capacity on marketing, including access to credit for initiating business activities.

We aim to develop at least 1 production unit per site for at least 2 crops.

To achieve this we will organize a stakeholder workshop involving small and medium-sized seed enterprises, seed breeders, Agrovets, extension workers and local governmental organizations to better understand the marketing potential for the crops and varieties included in this project and how they can be engaged in the actual development of the value chain. These value chain partners will help identify potential barriers early in the process and will identify best practices for seed production and commercialization.

At least 8 production groups will be trained through Farmers' Field Schools (FFS) on seed multiplication and production based on the standards of the individual countries. Farmer field schools will cover the whole production cycle up to post-harvest management and seed quality testing. We will try to engage the seed companies in FFS who have strong capacity in seed production and in many cases use farmers to multiply their seeds. The training will balance participation of youth and female farmers.

Once trained, the groups will be involved in the organization of diversity and food fairs, farmers' field days and other awareness raising events aiding a further exchange and creating a spillover effect for other communities.

The political challenge will have two aspects: on one hand we will need to understand the best mechanisms to enable the operations of the production units from an organizational as well as a technical point of view. The other key point is the identification of a legal mechanism to sell the seeds as open source material. The legal implication of this at the light of the national and international (ITPGRFA) legislations will be further studied as part of this project.

Based on feedback from the legislative set of activities, the 8 groups will be further trained on seed commercialization as open source material, marketing and distribution. Site specific solutions will be identified to guarantee access to credit to initiate the activities. If needed, new credit schemes will be developed.

Output 3: Four community seed banks with a supporting local seed network established.

Four local communities will establish community seed banks to conserve their landraces and farmer varieties for the target crops. These community seed banks (CSB) will be linked to existing community seed banks in the 3 countries and will aim at creating a network of interlinked seed banks under the supervision of the national systems. Strategic location to maximize the outreach of the CSB will be identified by the national PGRFA institutions with local authorities. National PGRFA institutions and local government will establish the facilities of the seed bank in 4 locations and help the management teams to develop a management and monitoring plan. Seed bank staff will be trained in leadership, preserving seeds, pest control and multiplication of high quality seed. The managers will be able to keep records on crops and varieties turnover and advise on the varieties they store and 'lend' out. A community registry based on the information collected during the trials will be made available to the community with relevant information on agronomic performance, quality traits, and tolerance to prevailing biotic and abiotic stresses. Community seed banks will have a spillover effect in terms of capacity building as they will have to train other farmers who receive seeds on how to produce high quality seeds and will have the skills to monitor and test seed quality to ensure that seeds returns by farmers are of high quality standards. Awareness raising events will be organized during the opening of community seed banks and farmer field events to further raise awareness on the importance of crops and genetic diversity. Community seed banks will be co-monitored by national genebanks who can also provide long term storage facilities.

Innovation funds are established in 4 locations enabling the community to have access to funds to complement their efforts in conserving plant genetic resources. Skilled and experienced local trainers of recently established SACCOS (Savings and Credit Cooperatives) in 3 sites will oversee the implementation and formation of the local institutions. The financial authority will ultimately empower the communities to manage their plant genetic resources more effectively.

Output 4: Enhanced national PGR systems' capacity to coordinate conservation measures at local and international level

National PGR systems' capacity will be enhanced at several levels. The project will help in promoting a national system for integrating in-situ and ex-situ conservation efforts through a network of community seed banks and of thousands of farmers that will test new material through crowdsourcing turning them into citizen scientists. The national system will be linked and trained to the platform developed by Bioversity and CIAT to ensure the national system has access to information related to crowdsourcing.

In addition they will have additional agro-morphological information from multi-location trials and how they relate to climatic conditions.
This will result in capacity development initiatives in areas of using agro-ecological models to identify crops and varieties for climate change adaptation, citizen science, information system that link information from the field, participatory approaches to better manage genetic resources.
At the regional level, we will encourage to engage other countries members of ASARECA and participating in the East African Plant Genetic Resources Network (EAPGREN) to adopt some of the methodologies of this project to further enrich the network. This will be done through presentations at EAPGREN meetings. Further to actively contribute to project implementation, national PGR organizations will also link to global ABD initiatives such as the ABD community led by Hivos where issues related to seeds are discussed globally.

Output 5: Sharing and learning platforms (at national and international levels) established and utilized in enhancing scaling-up and influencing favourable policy changes.
The efforts described above will have a wider reach than the four locations in which the trials and the community seed banks are established. To scale up the efforts made in this project Hivos, ERMCSD and Bioversity will engage stakeholders through a series of dialogues, platforms facilitating continuous learning. Development institutions are partners in our consortium bringing knowledge on value chain creation, creating knowledge sharing platforms and sharing the results actively within development networks like the agricultural biodiversity community (www.agriculturalbiodiversity.org). Linkages will be sought with the Agricultural Biodiversity Community who have experience in creating open source seed networks in India and the Philippines and making the transformation towards a robust future-proof and farmer-centered agroecological system based on agricultural biodiversity.
Five hundred local practitioners are trained by ERMCSD in collaboration with Bioversity and Hivos to disseminate relevant technologies using a Training of Trainers approach. These local trainers are involved in the training of resource-poor farmers for management of PGRFA and adaptation to climate change. They will provide training on crop management, post-harvest handling and production planning. Micro-credits entrepreneurial skills, marketing as well as training on gender mainstreaming for common and joint household decision making and resource utilization using a GALS (Gender Action Learning System) approach will be provided to local practitioners. The capacity of national government and other stakeholders is strengthened in the area of policy development to sensitize policy makers to the management of plant genetic resources.

Output 6: Awareness on the International Treaty and value of PGRFA to meet future challenges is raised at the national, regional and international levels.
The relevance of the International Treaty as a catalyst for the management of PGRFA for adaptation to climate change will be heavily emphasized. The open source climate smart seed system will be fully built on the provisions of the Treaty and thus its role will be clear to other communities through posters, "variety portfolios" documenting the traditional knowledge, use and performance of each crop variety, and a series of farmer field events. Ten thousands farmers, local practitioners, seed companies, government officials and politicians will be participating in awareness raising sessions during the opening of community seed banks, farmer field days and seed fairs and through the use of media. Hivos Kenya Media programme will be used to find an appropriate method of providing information about the project, about the value of PGRFA for the community and about ongoing activities from the outset.
A broader public of scientists, NGOs, government, extension staff is reached through reports, scientific publications and a series of policy briefs. Information on the new varieties and their value for climate change adaptation and suitability to meet the needs of farmers is made available online. An atlas of crop suitability for each crop will be published and made available online. Farmer organizations are linked to programmes that provide market information (MFarm in Kenya), and similar partners are sought in Uganda and Tanzania.

2.4. Targeted PGRFA

The four target crops are bean (*Phaseolus vulgaris)*, forage legumes (*Lathyrus and Medicago*), millet (*Eleusine coracana L.)* and sorghum (*Sorghum bicolor*). They are Annex 1 crops of the ITPGRFA.

Common bean is a major staple food in East Africa and provides an important source of dietary protein especially for resource poor farmers. The main bean producers in Africa are Kenya, Tanzania and Uganda. In 2010, Uganda was ranked second producer of beans after Tanzania in the East Africa Community region (Kilimo Trust, 2012).Beans are a versatile crop and often intercropped with competitive plants such as maize or planted on marginal lands. A broad base of genetic diversity exists in Kenya, Tanzania and Uganda and this variability serves as a good entry point to evaluate adaptive traits to climate change (CCAFS, 2014). A recent study by Okii (2014) showed that the risk of genetic erosion through the continued adoption of elite bean varieties which are replacing landraces in Uganda.
Two forage legumes are potentially interesting for experiments in East Africa; sweet peas (*Lathyrus* spp) with an estimated 24 different subspecies occurring naturally in East Africa and Alfalfa (*Medicago*) a well known fodder crop. Forage legumes are of two broad types: alfalfa, clover or vetch (Vicia), which are sown in pasture and grazed by livestock and woody shrubs such as Leucaena or Albizia that are either broken down by livestock or regularly cut by humans to provide livestock feed. Within the project time will be allocated to research the potential of forage legumes for incorporation in crop-livestock production systems. A mixture of different crops and different varieties will be identified, introduced and tested for their contribution to the agro-pastoral systems.
Finger millet originates from Ethiopia and Sudan. Crop wild relatives are common in East Africa. Finger millet is an important cereal in all three countries although production in Kenya is lagging behind compared to Uganda and Tanzania. Market prices are high but it is a labour intensive crop due to its small grain size. Most of the varieties used in East Africa are landraces. There is low variation in accessions recently screened in Uganda which indicates a loss of diversity possibly due to the adoption of improved varieties, commercialization and selecting elite lines or loss of varieties during war *(Manyasa et al.* 2014). Finger millet is highly adaptable to heat, drought and humidity and the crop is found in a wide geographic range (Mathur & Guarino 2011). The crop is valued by farmers for its high nutritional content and versatility in use. Issues surrounding market access and processing finger millet are looked into. Finger millet has a potential to become an important crop to provide food security for farmers with the ability to build up and hold stocks for years without pest infestation.
Sorghum is the fifth most important cereal grain in East Africa. Although largely a food subsistence crop, recent production of commercial varieties favoured by breweries has increased in popularity. Production is highest in Tanzania with 832.084 tonnes. Kenya and Uganda produce 138.533 and 299.000 tonnes respectively (FAOSTAT accessed on 20 Nov. 2014). In Kenya only 30% of the domestic production is marketed. Sorghum's ability to withstand drought and periods of high temperature make it a suitable crop for semi-arid areas. At the same time sorghum is able to tolerate waterlogging making it suitable for areas which have to deal with high concentration of rainfall. It is an adaptable crop which is able to grow in a wide range of climatic conditions with the possibility of making it a cornerstone of food security in the region.

2.5. Target groups and beneficiaries

Target groups

By project completion 150,000 resource-poor smallholder farmers (at least 40% women) in two semi-arid areas in Kenya and Tanzania, and two sub-humid sites in Tanzania and Uganda will benefit in terms of higher productivity, increased resilience, adaptive capacity to face climate change, innovative pro-poor value chains. Targeting **youth and women farmers** will increase equitable access to high quality climate-smart seeds and better access to seed markets.

Knowledge sharing activities will ensure uptake of lessons learned for **NGOs, research institutes, extension agencies, local and national governments and policymakers** and will link these groups to organizations in other part of the world, e.g. SEARICE in the Philippines and Li-BIRD in Nepal to share experience about participatory breeding. **National genebanks'** capacity to manage decentralized

projects for conservation and sustainable use of PGR, and to exchange material within the region will be strengthened. Private sector partners in the value chains such as **seed companies, plant breeders and dealers** have higher more steady supplies of high quality climate-smart seeds with quality control systems in place.

Direct beneficiaries

10.000 resource-poor farmers (at least 4.000 women farmers) are directly benefitting from supported activities for on-farm conservation and management of PGRFA. Using a citizen science approach 10.000 farmers can be reached in 4 years by crowdsourcing a portfolio of 20 varieties (for 4 crops) for crop improvement and receiving knowledge products on varietal diversity and climate information products. They will also benefit from the participatory plant breeding program and their enhanced capacity to participate in breeding programs.
Two thousands resource-poor farmers (disaggregated by gender) are trained and involved in the development of new varieties and other relevant technologies for climate change adaptation and strengthening food security. Farmers participating in on-farm trials will be involved in farmer field schools and trained in seed multiplication, participatory breeding and licensing their seeds as farmers' varieties and trading seeds under open source labels. The community seed banks are run by community members who will receive additional training on management of SMEs and documentation of traditional knowledge. Using existing social structures and community-based organizations and a Training of Trainers approach we are able to reach a large number of farmers. Five hundred extension officers and local practitioners from community-based organizations will benefit directly from training on seed multiplication, climate information products and quality control systems through a Training of Trainers approach.
At least 30 private sector partners will benefit from a direct supply of high-quality climate-smart seeds that are locally produced with traits preferred by farmers.

At least 4 MSc and/or PhD students from national universities will have the opportunity to complete their studies on phenotyping landraces of beans, millet, sorghum or forage legumes and gain knowledge on participatory methods of plant breeding and community-based management of PGRFA resources. At least 4 bean, cereal and forage legume breeders will benefit directly from the participatory breeding programme and pre-bred materials.

National PGRFA institutions are linked to community seed banks and continue to provide support in management and collection of genetic materials. National genebanks serve as a backup for locally collected accessions. An exit strategy for the establishment phase of the community seed banks has been developed and put into place.

Indirect beneficiaries

The inclusion of pre-bred materials in the Multilateral System and the availability of PGRFA-related information in the public domain will benefit researchers and cereal growers and growers of beans and forage legumes. The growers will benefit from increased knowledge on traits and preferences of locally adapted varieties of sorghum, millet, beans and forage legumes.
Local and county level government in the program area will benefit from increased knowledge on seed production, policy development, review and implementation. Local markets are supplied with more diversity, and have increased availability of open source seed varieties (affordable quality seed) which potentially brings a positive effect on nutrition.

We estimate that 150,000 farmers in the region will be more aware of the importance of preserving agricultural biodiversity and will have an improved access to on which seeds to use and how they can access this from national collections. Testing varieties in different agro-climatic conditions constitutes an important background for subsequent activities, i.e. participatory plant breeding programs, seed production and marketing of climate-smart varieties allowing resource-poor farmers with improved access and equitable access by women and young farmers to adapted genetic material.

Countries participating in the EAPGREN program can benefit from the lessons learned from this project. The scientific community globally can improve their knowledge on adopting a citizen science approach.

2.6. Impact and impact pathways

2.6.1. Food security and poverty alleviation

This project aims at providing options for livelihood diversification within the agricultural sector by promoting seeds that are better adapated to local conditions and can thus enhance food production. Yet, we also have the ambition to develop strong value chains for the seed sector as well as for the grain in order to maximize the benefits accrued by better adapted varieties. Promoting novel technologies and breeding approaches, strengthening seed systems for the target crops, developing value chains and creating knowledge platforms for exchange of information is how food security and poverty will be alleviated. We expect that the targeted 150,000 farmers in the four sites will see positive impacts from the project. It is difficult to quantify the benefits in terms of poverty alleviation, yet we expect a 20% increase in productivity of the target crops by the end of the project.

2.6.2. Adaptation to climate change and environmental sustainability

According to the latest IPCC report (IPCC 2014), climate change will impact on all aspects of food security. This is one important justification for this project. New solutions need to be proposed to tackle climate change as business as usual is not enough and more transformative actions are needed. If no actions are taken, productivity will decrease despite the fact that demographic and economic growth call for an increased productivity of 70% by 2050. Testing new material from genebank originating in the region will introduce in production systems new genes and combination of genes with better adaptation to climate change. We will monitor the performance of these new varieties using i-buttons and we will be in the position to make proper recommendations based on different environments. We will develop models and suitability maps to show when and where some varieties and crops can offer the best adaptation options. This knowledge passed on to extension services and national agricultural research systems will cascade down to the beneficiaries. Seed systems will also be tailored taking into account climate change and adapted material will be made available to farmers.

2.6.3. Scientific impact

The project will promote the use of genetic diversity in an innovative way. Two main innovations are foreseen: the adoption of a citizen science approach to promote new varieties and other technologies of interest of the national agencies and the active management of plant genetic resources to adapt to climate change. The method to select the varieties to be tested based on ecological suitability will be a tool in the hand of the national genebanks to easily create mini-core collections for climate change adaptation. Further, testing and linking performance to climatic conditions will add important knowledge that will make the material on MLS more valuable for other users. The approach will immediately benefit regional exchange of target crops based on suitability of different varieties to different part of the three countries involved. An information system will be developed through Bioversity co-financing of a global intiative aiming at upscaling the citizen science approach and will be available to the project partners.

2.6.4. Capacity development and empowerment

One of the key features of the citizen science approach promoted here is empowerment. After a first screening men and women farmers receive seeds which will become their own. Unlike other participatory methods, in this case farmers become the owners of the seeds immediately and have the power to decide what they want to do with them.

Yet, while having seeds with adapted traits will be important for food security, it will not be enough for farmers to maintain the diversity unless they can also contribte to improving livelihoods. For the project to be successful, women farmers and youths will need to have equitable access not only to to seeds but also to reliable markets and financial services. To this end we propose a full set of capacity

strengthening activities that will benefit the men and women farmers during the project life and after the project ends. The modules will include:

- Training on crop management technologies for farmers (land preparation, tree / crop interaction (intercropping), planting, pest and disease control, harvest, soil management, marketing);
- Training micro-credits procedure for producer groups and co-operatives;
- Training farmers on post harvesting handling and production planning methods;
- Training farmers on food loss, food safety and crop protection;
- Training farmers on sustainable production systems and production methods through use of technology. A growing number of farmers and representatives of the cooperation will receive training on crops genebanks using technology including, for example, good, agricultural practices, use of minimum tillage, storage, and packaging;
- Farmers and their representatives will be trained on gender mainstreaming for common and joint household decision making and resources utilisation through GALS approach;
- Trainings on group dynamics, farmer entrepreneurial skills, collective sourcing and marketing and contract management and farming;
- Capacity building of county government and partners staff on policy development, review and implementation;
- Training partners farmer leaders on institutional engagement, linkages and knowledge sharing on sustainable farming and storage systems.

National partners' capacity will be significantly enhanced, particularly in the area of managing diversity for climate change adaptation. They will have the capacity to identify suitable crops and varieties for different climatic regions using GIS technologies. In addition, the national system that integrates in situ and ex situ conservation will be significantly strengthened.

2.7. Relevance to national or regional priorities in its plans and programmes for PGRFA

With regard to international commitments, all three countries are signatories to the United Nations Framework Convention on Climate Change (UNFCCC); National Adaptation Programmes of Action (NAPAs); the Convention on Biological Diversity (CBD); National Biodiversity Strategies and Action Plans (NBSAP). The New Partnership for Africa's Development's (NEPAD) has initiated a Comprehensive African Agricultural Development Program (CAADP). Our project aligns well with Pillar 4 which forms a strategy for revitalising and increasing agricultural productivity in Africa. The East Africa Community (EAC) takes collective measures to address climate change in the region through the EAC Climate Change Policy (EACCCP) which prioritises the National Adaptation Programmes of Action (NAPAs) and climate change strategies drawn up by Tanzania and Uganda. The NAPA for Kenya still needs to be finalized. Our project is well aligned with the recommendations on Climate Smart Agriculture from the Food and Agricultural organisation. In Kenya the National Climate Change Response Strategy (NCCRS) takes on a landscape approach and incorporates climate smart agriculture into the political agenda.

A regional network on plant genetic resources (EAPGREN) coordinated by the Association for strengthening Agricultural Research in Eastern and Central Africa (ASARECA) aims to create a conducive policy environment for conservation and use of plant genetic resources. Most of the partners in this project are also partners in EAPGREN.

Maintaining a rich diversity of crops along with wild crop relatives will be a critical component of climate change adaptation in the coming years (UNDP, 2014).

The Kenyan National Climate Change Action Plan (2013-2017) aims to operationalise the National Climate Change Response Strategy and meet its international obligations. Issues of climate change have also been addressed through the National Environmental Policy (2012). A recently adopted new agricultural law in Kenya: the Agriculture, Fisheries and Food Authority Act (AFFA; 2013) recognises that the effects of climate change have a significant impact on agricultural production and that farming can significantly reduce climate change by adopting more sustainable practices. The AFFA authority administers the Crops Act and the Fisheries Act. Beans, finger millet and sorghum are listed as

scheduled crops in the Crops act (2013) and can only be bred under compulsory certification. As this is a newly adopted law our project will contribute to finding out what this means for our project implementation.
Efforts have been made to harmonize seed policies in Kenya, Tanzania and Uganda and as a result all three countries have made changes to their legislation to ease the move of quality seed amongst the three countries.

SECTION C: OPERATIONS

3.1. Methodology of project implementation

The project will establish a management unit composed of each member of this consortium. Bioversity International – Kenya will chair the committee and will have overall coordinating responsibilities. While all partners will participate in all activities, Bioversity-Kenya will also ensure coordination of scientific activities to guarantee scientifically rigor and Hivos will coordinate the implementation of development activities and the sharing and learning platform. At the national level coordination is ensured by the National PGR authority. At the site level ERMCSD will have the responsibility to establish site teams and to implement activities with local communities.

An inception meeting involving all partners and major stakeholders will be held at the start of the project to present baseline reports and develop national working plans with clear targets, milestones and outputs and to develop a monitoring and evaluation plan. The inception meeting will also discuss provisions and procedures required for efficient and timely implementation, including assignment of personnel to various tasks, outlining mechnisms for fund dispersal and identifying knowledge-sharing mechanisms. Any partner can call a virtual or physical meeting of the management unit if needs arise.

A first management unit meeting will be organized during the Inception workshop and once every year until the final project meeting in year 4. At the end of year 2 a mid-term review workshop will take place to present preliminary results to broader audience, monitor achievements and make changes if needed. Daily communication will be facilitated through telephone, email and virtual meetings. Documents are shared in an online platform with adequate back-up of data. All data will be shared with the Donor within 12 months after collection is completed and other data (reports, analyses) within 24 months after collection.

Bioversity-Kenya will monitor the progress of the project through frequent visits to the research sites to verify progress and to ensure that milestones are met. Opportunities to scale-up and scale-out our efforts are actively pursued by involving local and national government as stakeholders in our project and creating sharing and learning platforms. Workshops and learning platforms to share lessons learned will involve a large number of regional stakeholders and is aimed at deliver policy recommendations on how to enhance food sercurity of resource-poor farmers by strengthening the sustainable management of plant genetic resources for food and agriculture.

Field staff and students will be properly instructed on the ethical issues of their activities including the confidentiality and conditions of use of the data collected. Field staff will be contracted on the basis of targeted outputs ensuring that results are obtained. Students will be co-supervised by national PGRFA institutions, universities and Bioversity offering them sufficient guidance to carry out and make sure their research conditions are met.
Field reports will be compiled after every field activity by the activity leader to inform project management. Monitoring and evaluation visits will take place after every season. Communication commitments are agreed upon before activities take place. Performance of each staff member is measured. Project evaluation will take place on a continuous basis. We will conduct regular internal inspections of our work.

3.2. Partnerships and collaboration arrangements

The Kenyan Genetic Resources Research Institute (GeRRI) will act as the lead applicant and Bioversity-Kenya will act as the contracting party and will sign the LoA with FAO to ensure smooth coordination between countries. In turn, Bioversity will establish Letters of Agreement with the project partners and sub-contractors. Letters of Agreement are detailed documents which clarify and outline project activities and modes of operation, including provisions for disbursement of funds based on satisfactory delivery of defined milestones and the submission of interim and final reports. Technical and financial reports and financial audits will be submitted in strict accordance with the Donor's regulations, along with any supplementary reports audit certificates as requested.

There is a clear division of roles between partners. ERMCSD will establish field teams at each site and ensure smooth implementation of field activities, including trainings, crowdsourcing, trials etc. Hivos will be largely involved in the policy dimension of the project as well as in the capacity building to create value chains, general coordination of development activities. They will also be co-responsible for the learning sharing platform. The national genebanks will be responsible for overall coordination of activities at national level. In addition, they will provide germplasm for project implementation and they will develop training modules on seed management for the management committee of the community seed banks. Bioversity will coordinate the scientific part of the project and will develop modules for the citizen science approach, the GIS methodology to identify suitable varieties and will create an information system to manage the information collected in the field. All partners will be trained on data collection that will suite the information system.

The project envisions a collaborative participatory approach which emphasizes a bottom-up approach where primary beneficiaries implement the project in close collaboration with other stakeholders. Partners mentioned above will provide the technical assistance, guidance and financial resources needed to successfully implement the project and bring in stakeholders needed to successfully share insights and results and develop scaling up pathways. the management committee will ensure collaboration between countries with overall backstopping from Bioversity and Hivos. The management committee will agree on action to be taken based on specif needs and success of implementation.

For successful implementation we will work closely with producers groups, farmer groups and cooperatives within the communities in which we establish community seed banks. We will involve local government in each phase of our project and use the expertise of extension workers and other local practitioners to provide training to the target groups. Seed companies, county government officials, agricultural research institutes and NGOs on site level as well as universities, national agricultural research organizations and national government on national and regional level will play an active part in our project through sharing and learning platforms.

3.3. Project management team

All partners will be involved in conceptualizing and developing open source seed systems, knowledge dissemination and capacity building. Partners' capacity, expertise and specific roles are described below:

The **Genetic Resources Research Institute (GeRRI),** under the Kenya Agricultural and Livestock Research Act of 2013 was elevated to a semi-autonomous research Institute. It takes over from the former National Genebank of Kenya (NGBK) which became operational in July 1988. The institute is responsible for conserving plant genetic resources, animal and microbial genetic resources. Genetic resources are essential basic building blocks utilized in research to develop improved technologies for enhanced agricultural production. Their effective conservation and use is therefore a critical role in food security assurance, agricultural resilience and economic growth. The Genetic Resources Research Institute is the applicant institution and will be responsible for the implementation of the national workplan in Kenya, for supplying germplasm, supervise students and to ensure ensure full compliance

with donor regulations and the functioning of the Multilateral System and will also assist with establishment and the management of community seed banks. They will act as the lead applicant.

The **Tanzanian National Plant Genetic Resources Centre** (NPGRC) was established in 1991 by the government of the United Republic of Tanzania, under the Ministry of Agriculture, Food Security and Cooperatives and placed at the Tropical Pesticides Research Institute (TPRI). The centre has the National mandate of conserving (ex situ and in situ) plant genetic resources, and promoting its utilization in the country as well as participation in the development and harmonization of national policies and legislations pertaining conservation and utilization of plant genetic resources. Among the activities of the centre are: to inventory and conduct ecogeographic survey of plant genetic resources, germplasm exploration and collection, ex situ conservation (seed bank, field genebank and in vitro gene bank), preliminary evaluation and characterization, documentation, undertake in situ/ on farm conservation and advice the government on policies related to plant genetic resources conservation. NPGRC will be responsible for the implementation of the national workplan in Tanzania, for supplying germplasm and will also assist with establishment and the management of community seed banks in two locations.

The mission of the Plant Genetic Resources Centre is to ensure the conservation, management and sustainable use of Uganda's Plant Genetic Resources for Food and Agriculture (PGRFA) while optimizing their full potential in contributing to national development goals. It is an entity comprising the historical Entebbe Botanic Gardens (EBG) and the **Uganda National Genebank** (UNGB) falls under Uganda's Plant Genetic Resources for Food and Agriculture (PGRFA) at the National Agricultural Research Organization. Its mission is to ensure the conservation, management and sustainable use of Uganda's plant genetic resources, to promote community based and on-farm conservation of PGR as a basis for sustainable resource management and to contribute to the development and promotion of acceptable germplasm exchange mechanisms. UNGB will be responsible for the implementation of the national workplan in Uganda, for supplying germplasm, supervise students and to ensure ensure full compliance with donor regulations and the functioning of the Multilateral System and will also assist with establishment and the management of community seed banks.

Bioversity International is a global research-for-development organization. Bioversity International is a member of the CGIAR Consortium – a global research partnership for a food secure future. Bioversity delivers scientific evidence, management practices and policy options to use and safeguard agricultural biodiversity to attain sustainable global food and nutrition security. Bioversity's regional office in Kenya is working with partners in sub-Saharan Africa where agricultural biodiversity can contribute to improved nutrition, resilience, productivity and climate change adaptation. Bioversity will provide technical backstopping for testing genetic material and the citizen science component, establishing community seed banks, policy alignment, co-developing a model for open source climate-smart seed systems and enriching datasets of national PGRFA institutions. Bioversity will be accountable and responsible for the implementation of the project and subcontract financial resources to the partner organizations. Bioversity will oversee the overall project management and will be responsible for submitting the required technical and financial reports to the ITPGRFA.

Humanist Institute for Cooperation with Developing Countries (Hivos) is an international development organisation guided by humanist values. Together with local civil society organisations in developing countries, Hivos wants to contribute to a free, fair and sustainable world. A world in which all citizens – both women and men – have equal access to opportunities and resources for development and can participate actively and equally in decision-making processes that determine their lives, their society and their future. Quality, cooperation and innovation are core values in Hivos' programme development and business philosophies. Hivos regional office in Kenya is committed to people in Africa who are systematically blocked from rights, opportunities and resources. Hivos will be responsible for working towards a more supportive legal system together with local and national government and developing value chains through market studies and financial services. Hivos will be advising on gender mainstreaming for the implementation of our activities and will create financial

linkages and knowledge sharing and development through interaction with new and existing stakeholder learning platforms.

Environmental Resources Management Center for Sustainable Development (ERMCSD) was registered and established in Kenya in the year 2004 as a result of the desire of civil society organizations to take advantage of mutual interests, distinct geographic situations and diverse skills in the area of agriculture, environment and sustainable development in sub Saharan Africa, but with sharp focus on the east African region. The ultimate objective of ERMCSD is to promote the organization and coordination of agriculture, environment and development activities within the regional NGO community, promote environmental education and capacity building and, consequently, foster a more influential environmental civil society in the region. ERMCSD will be responsible for implementation of project activities at local level, and will supervise permanent field staff. ERMCSD will assist in testing genetic material and the citizen science component and will also be responsible for information and knowledge dissemination.

Name	**Designation**	**Responsibility within project**
Desterio Nyamongo/Zachary Muthaima	Genebank curator, GeRRI Kenya	National workplan Kenya, supervision students
Margaret Mollel	Genebank curator, NPGRC Tanzania	National workplan Tanzania
John Mulumba Wasswa	Genebank curator, NARO Uganda	National workplan Uganda, supervision students
Carlo Fadda	Theme leader Productive Agricultural Ecosystems, Bioversity	Overall project coordination and technical backstopping, co-supervision students
Jeske van de Gevel	Associate scientist Genetic Diversity, Bioversity	Overall project management (regional) and technical backstopping
John Recha	Participatory Action Research (PAR) Specialist, ERMCSD & CCAFS	Coordination field activities (regional)
Felix M'mboyi	Deputy Director & Director of Programmes, ERMCSD	Coordination field activities (regional)
Willy Douma	Programme Officer Green Entrepreneurship, Hivos	Coordination capacity building, knowledge generation and development
Boniface Kiome	Programme Officer - East African Region, Hivos	Gender mainstreaming, coordination of financial incentives and market systems

3.4. Sustainability

Research sites (3 of the 4) are located in benchmark sites for the research program on Climate Change, Agriculture and Food Security (CCAFS) which is a strategic collaboration of 15 CGIAR research centres and Future Earth bringing together researchers in agricultural science, climate science, environmental and social sciences to identify and address the most important interactions, synergies and trade-offs between climate change and agriculture. This project will benefit from trained field staff,

community based organizations and the infrastructure to implement on-farm trials, collaborate with farmers groups and engage the community in our research activities. Furthermore there is already a vast literature produced by CCAFS on these sites on agricultural science, climate science, environmental and social sciences as well as reports on how to address the increasing challenge of global warming and declining food security on agricultural practices, policies and measures that the project can access.

As such both Bioversity and ERMCSD have worked in these areas for several years and have created networks of farmers, local government and extension, research organizations, community-based organizations and NGOs. Besides this ERMCSD have helped establish the Savings and Credit Cooperations (SACCOS) and have field staff permanently based in the research sites. Bioversity has undertaken trials and crowdsourcing activities on sorghum and drought tolerant legumes in Makueni and Hombolo. Phenotypic and preference data as well as the use of tested methodologies will benefit this project. Similar activities have taken place with bean varieties in Hoima, Uganda. Furthermore our research activities on testing germplasm take place in a wider initiative called Seeds for Needs with research activities and technology development taking place in 11 countries worldwide in close collaboration with the scientists involved.

Research activities will equitably involve community members, government representatives and extension, and researchers in all aspects of the research process and in which all partners contribute expertise and share decision making and ownership. All activities will take place on the basis of free prior and informed consent. Field staff and students will be adequately supervised by qualified researchers and practitioners.

After the project institutional capacity on the management of PGRFA is built at national level and grass-roots organizations are developed. Useful examples and tools for the implementation of conservation through use efforts at local level are available at PGR institutions at local, county and national level.

The project will have developed an effective link between national PGRFA institutes and local farming communities through better seed dissemination systems, community seed banks and local seed organizations set up by the project. The program will also work in partnership with local and county government and private sector to enhance sustainability.

Farmers in the region will be more aware of the importance of preserving agricultural biodiversity and will have an improved access to on which seeds to use and how they can access this from national collections. Testing varieties in different agro-climatic conditions constitutes an important background for subsequent activities, i.e. participatory plant breeding programs, seed production and marketing of climate-smart varieties allowing resource-poor farmers with improved access and equitable access by women and young farmers to adapted genetic material. Ultimately, the participatory approach developed by the project, the early engagement of farming communities and other stakeholders, strengthening or creating new local institutions (community seed bank, seed production units) will create solid ground for the sustainable management of plant genetic resources for food and agriculture.

SECTION D: APPENDIXES

Appendix 1: Information of the applicant

Appendix 2: Logical Framework

Appendix 3: Workplan

Appendix 4: Budget

Appendix 5: Disbursement information

Appendix 6: Letter of Endorsements

Appendix 7: References

By signing this submission form for full proposal, the applicant confirms that all the above statements, including the attached Appendixes, are true to the best of his/her knowledge. Any deliberately untruthful response will lead to the automatic exclusion from the further screening and appraisal process, and may lead to the denial of awarded grants from the Benefit-sharing Fund.

Signature of contact person: **Date and location**