

IMPROVING LIVELIHOODS AND BIODIVERSITY CONSERVATION IN FARM FORESTRY LANDSCAPES



Celsus Senhte, Byaruhanga Chris Dickson, Ekapolon George and Tusiime Loyce



Integrated Rural Community Development Initiative (IRUCODI)

ACRONYMS

FFASG	Farm Forestry Advisory Service Groups
IRUCODI	Integrated Rural Community Development Initiative
LG	Local Government
NFA	National Forest Authority
NGO	Non Governmental Organisation
UWA	Uganda Wildlife Authority
RSGF	Rufford Small Grants Foundation

DEFINITION OF FARM FORESTRY

For the purposes of this report, farm forestry is defined as: The incorporation of tree growing and management by farmers into farming systems for the production of both wood and non-wood products, increasing agricultural productivity and encouraging sustainable natural resource management.

EXECUTIVE SUMMARY

This is a detailed report of the achievements of the third phase of the RSGF sponsored biodiversity conservation project in Sango-bay, Rakai district, Uganda, under theme “Improving Livelihoods and Biodiversity Conservation in Farm forestry Landscapes”. The project commenced in April 2009 and ended in April 2010. Its aim was to boost Farm forestry among the various stakeholders in order to create deep rooted sustainability in terms of income, environment and wildlife conservation. It was focused on boosting farm income, rural employment, and regional biodiversity through additional self motivated stakeholder afforestation, and value addition. The project also created specialized forestry extension agents and Farm forestry social network groups. The objectives of the project were to carry out Local campaigns to boost Farm forestry, to introduce Apiary and to carry out market survey for Farm forestry products.

The following activities were executed: (1) Local campaigns to boost through setting up of Farm forestry Advisory service groups, introducing social Farm forestry networks (i.e. involving the silent majority in forest management), and rolling out tree planting to other areas based on the shared knowledge, and sensitisation workshops and networking were done to increase adoption of Farm forestry and to create more positive attitude towards biodiversity conservation (2) Education of the local people about honey bee production, purchase and distribution of bee hives and bee colonies to the selected stakeholders and (3) Market research to identify market niches for various Farm forestry produce.

After visiting and talking to some RSGF grantees, a proposal was raised about the formation of the Uganda Rufford Small Grants Beneficiaries network, and so far, four individuals have subscribed to the network.

1.0 BACKGROUND

Uganda has the world's third-highest birth rate, with 47.8 births per 1,000 people. Such exponential population growth puts the country's population in dire need for multiplicity of resources. The country continues to rely on woody biomass for its domestic fuel consumption. Other products such as timber, poles and non-timber forest products are also collected from the forests. To make it worse, majority of these products derive from natural forests that are in protected areas and on private land rather than from farm or plantation forests. The pressure of the current population demands is quickly leading to absolute loss of most of the forest cover and the associated products, as well as the various flora and fauna that previously existed because of the forests.

Forests play a big role in livelihood security, and poverty alleviation. Forests also provide a broader economic benefit by stabilising the environment locally, regionally and internationally. They are the key element in terms of carbon sequestration and rainfall formation. In Uganda, several civil society organisations, community based organisations and concerned conservationists have started projects aimed at disseminating knowledge about the importance of forests in biodiversity conservation. In addition, many people with the help of external donors have managed to implement afforestation drives through promotion of farm forestry, agro-forestry, community forestry, and many other activities aimed at improving livelihood, and at the same promoting forest conservation.

Farm forestry incorporates forestry related activities and the use of trees around the farm. This includes planting of woodlots for fuel and wood products, for wind breaks, for shelter and shade for livestock and wild animals, for beautification and conservation of biodiversity, to control soil erosion, to safeguard water quality, to lower saline water tables, to improve soil properties, and to conserve soil moisture. The history of human interaction with forests has been relentless clearing of forests to support agriculture, grazing animals, providing fuel in terms of firewood, and building towns and cities. Good enough, there is now a strong move by some farmers to reverse the trend and bring back trees in rural agricultural landscapes with the intention of restoring their lost biodiversity as well as for profit through sale of forestry products. Such a move has resulted from frequent education programmes provided by enthusiastic forest conservationists and civil society organisations by the help of funds from external donors and the government.

In the poor rural households of Uganda, this is a rational response to improving livelihoods and living standards. Middle class Ugandans, farmers and small investment syndicates are becoming aware of the potential of the forestry business, making small scale farm forestry more significant. Farmers in Rakai are strongly motivated towards caring for the environment and passing on the farm, and the knowledge to the next generation. This kind of passion among the farmers is very exemplary and will lead to many more farmers adopting the same technology/business.

1.2 PROJECT AIM

The aim of this project was to boost farm forestry among the various stakeholders in Sango bay, Rakai, in order to create deep rooted sustainability in terms of income, environment and wildlife conservation.

1.3 OBJECTIVES OF THE PROJECT

The main objectives of this work were to:

- extend local campaign to boost farm forestry,
- educate communities about apiary development and management and
- carry out market research and disseminate marketing information to the stakeholders.

1.3 JUSTIFICATION OF THE PROJECT

Uganda's nationally and globally important biodiversity is threatened by several factors: (i) extensive livestock grazing; (ii) over harvesting of forest and aquatic tree species for timber, fuelwood, food and traditional herbal medicine; (iii) habitat fragmentation from conversion to agriculture, infrastructure, industry and human settlements; (iv) industrial pollution; and (v) unsustainable development in areas adjacent to high biodiversity areas. The root causes of this are poverty and lack of sustainable alternative livelihoods for resource dependent communities, sheer lack of conservation knowledge; lack of integration of biodiversity and livelihood considerations into development planning around biodiversity rich areas; lack of financial and social incentives to local communities from conservation efforts and related funding; and the inability to effectively translate and replicate lessons and benefits of the very diverse and successful previous experiences in participatory forest resource and benefit sharing programs in the country. It is therefore imperative to have a number of programmes at community level aimed at reversing the trend of events into the direction that may be disastrous to the environment and would literally consequentially make the universe inhabitable for the next generations. Community farm forestry is one such programme that if embarked upon by many, and strengthened through continuous advocacy, will be able to reduce and in some areas end the rate of disappearance of Uganda's forests. The farm forestry programme that has been initiated in Sango-bay area, Rakai is a an important stepping stone to the future of forest conservation and poverty alleviation in Uganda, and when this programme combines efforts with other related programmes by other NGO's especially those sponsored by RSGF, synergies will be established resulting into greater achievements.

2.1 STUDY AREA

Rakai district has three counties, namely Kooki, Kakuuto and Kyotera. Sango bay covers parts of the two counties i.e. Kyotera and Kakuuto. There are many sub counties in each of the three counties. Kabira and Kyeba sub counties form the sango bay area and these are the ones close to Lake Victoria. Kabira S/c has five parishes (Ndolo, Kyanika, Njara, Bisanje and Bwamijja) while Kyeba S/c has four parishes (Kanabulemu, Nangoma, Gwanda and Minziro).

2.3 ACTIVITIES

The following activities were implemented:

Local campaign to boost Farm forestry

- Setting up of Farm Forestry Advisory Service Groups (FFASG)
- Introducing social farm forestry networks (involving the silent majority in forest management).
- Rolling out tree planting to other areas based on the shared knowledge values in biodiversity conservation and improving rural livelihoods (Figure 1).
- More community sensitisation workshops done to increase adoption of farm forestry and to create more positive attitude towards biodiversity conservation.



Figure 1: Vast piece of land being prepared for seedling transplanting

Apiary:

Education on Apiary management and production: the created Farm forestry extension agents educating selected stakeholders on purchase of bee colonies, management and production.

Marketing:

- Market research to identify market niches for various farm forestry produce.
- Market information dissemination and helping farmers know how to add value to various farm produce.

2.4 ACHIEVEMENTS

The following achievements observed;

2.4.1 Local Campaigns to Boost farm forestry

Set up of Farm Forestry Advisory Service Groups and Networks

Two Farm forestry Service Groups (FFASGs) were formed in Kooki and Kakuto counties, each comprising five individuals. These groups are responsible for disseminating information on the role of Farm forestry to the communities as well its contribution to biodiversity conservation. They will give advice on nursery bed construction and management, and silvicultural practices, among others. In addition, after contacting and talking to some members working with forestry and community projects, and sponsored by RSGF, we have agreed to form a Rufford Small Grants Beneficiaries network. This network will share knowledge about their works. We will be able to advise each other and learn from each other in terms of successes and difficulties. The aim of the network is to carry out exchange visits with beneficiary farmers, stakeholders and other interested communities to facilitate knowledge sharing. This spirit is hoped to continue even in our next projects. At the moment four individuals have subscribed to this and we hope to bring more on board.

Main partners/collaborators

- Busia Women producers Association (BUWOPA), Uganda
- Integrated Rural Community Development Initiative (IRUCODI): the NGO that I am affiliated to.
- Pro-Biodiversity Conservationists of Uganda (PROBICOU)
- Wildlife and Animal Resources Management Department (WARM), Makerere University, Kampala.

Other Partners/Collaborators

- Natural Enterprise Development (NED), Uganda
- Uganda Women in Development (UWD)



*Figure 2: Visiting one of Katebaka Raymond's field sites, to observe his work with the Raymond **Hornbills** and fragmented forests of Uganda: Raymond is a First RSGF grantee (beneficiary) (Photo by Peregrine Sebulime)*

Over the years, we have been approached by some NGOs, and individuals interested in knowing more about the work I have been doing with the help of RSGF. Some were seeking consultancies while others wanted to have an experience of the work we are doing in Rakai. It is important to note that from all the associations, meeting, and phone calls, we as a team have management to establish links with the above bodies. These links are bound to stay active and from them we shall expand on the work we are doing to include a broader community, and further promote conservation issues countrywide, as well as region wide. A few individuals have been enlightened and are compelled to apply for funds to do related work in other areas of the country. Such spirit expressed by young conservationists is very promising.

Introducing Social Farm forestry Networks

Networks have been formed among some beneficiary farmers and other stakeholders in Kabonela ad Kakuto (Figure 3. More networks will be formed as the project continues in the next phase of the project so that there is communication amongst all RSGF beneficiary individuals. The Social Farm Forestry Networks have been formed by the help of the newly created FFASG and by the end of the project period in future; it is projected that the entire district will have a lot

of knowledge about farm forestry and its roles in biodiversity conservation s well livelihood improvement.



Figure 3: Participatory meeting: Brain storming about the formation of Social Farm forestry Networks (Photo y Celsus Senhte)

Tree Planting

Rolling out tree planting to other areas was based on the shared knowledge values in biodiversity conservation and improving rural livelihoods. Tree nursery construction and planting of seeds was started in late April 2009. The parishes/villages of Kakuto, Kabonela and Kooki were the main stations.

Seven thousand eight hundred trees were planted in the booster phase of the project; an excess of 1800 trees from the 6000 that were originally planned for in the project. In total, 14,800 trees have been planted since the commencement of the project (Table1).

Table 1: Overall number and species of trees planted

Tree species	Quantity				Comment
	Phase 1	Phase 2	Booster phase	Total	
<i>Eucalyptus</i> spp	2500	2000	3000	7500	Income generation, cheap to raise and rapidly re-grows after being cut down
<i>Pinus</i> spp	0	800	1500	2300	Grow rapidly and straight and good for storm formation
Orange trees	0	800	0	800	Carbon sequestration, and nutrition in form of fruits
Mango trees	0	0	1100	1100	Carbon sequestration, and nutrition in form of fruits
<i>Ficus</i> spp	0	0	1000	1000	Soil improvement tree species and provides good habitat for many birds
<i>Albizia</i> spp	0	0	1000	1000	For holding the soil in place
<i>Acacia</i> spp	300	200	200	700	Nitrogen fixing
<i>Moringa Oleifera</i>	200	200	0	400	Herbal medicine
Total	3000	4000	7800	14800	



Figure 6: Owl found injured roosting in one of the trees planted in 2006. It fell down as we were observing, upon which we examined it and found it was injured (Photos by John Giribo)

Education

Meeting with Local Leaders and Provision of More Extension Services

It is a rule of thumb to meet with Local council chairpersons, opinion leaders and key informants before start of any grassroots project. As routine these meetings were carried out and the way forward was drawn. The local leaders were very appreciative of the work and commended RSGF for their immense concern about nature conservation in the sub-Saharan Africa.

Continued Training

Stakeholders were educated about the following and given practical hands on in some areas:

- Silvicultural practices
- Seedbed management
- Fertilisation
- Increasing patchiness
- Increasing microenvironment
- Secondary succession
- Vegetation climax
- General Biodiversity conservation



Figure 7: Knowledge dissemination: students being taught about herbal medicine extraction from natural and planted forests (Photo by Celsus Senhte)

From Figure 8 below, it is evident that the youth and women are more inclined towards conservation than the men and elderly group. This is a good observation as the youth are tomorrow's greater conservationists. From the three phases of the project, Rakai Youth for Conservation, a Community Based Organisation has planted over 5000 tree seedlings around Lake Victoria region and is working towards creation of bore holes for easy access of water for the community.

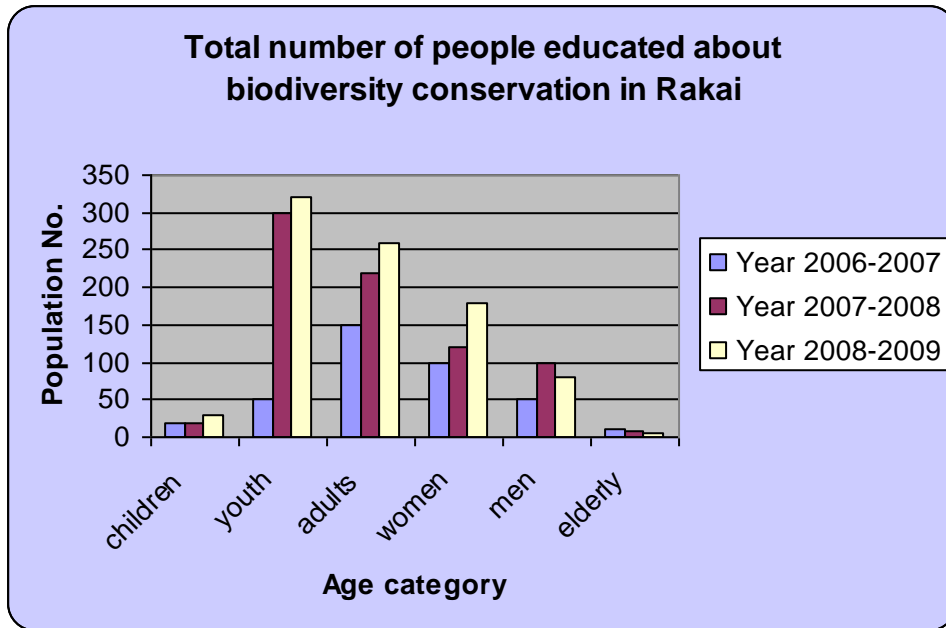


Figure 8: Summary of the number of community members educated from 2006 to 2009

2. 4.2 General contributions by Farm forestry Project in Rakai

a) Biodiversity

A variety of new life forms (animals, insects, micro-organisms, plants) have been established in the project area since the commencement of the project.

b) Soil management

The stakeholders were taught how to use land within its capability; i.e. employing systems, types and intensities of land use with minimum risk of damaging soil resources.

c) Water quality: reducing salinity and water logging

Trees can reduce water tables thereby contributing to reduction in water logging and dry land salinity problems in agriculture.

d) Carbon sequestration

Farm forestry implemented in Rakai, will help to sequester carbon on agricultural land because it can capture and store significant amount of carbon while still leaving the bulk of the land in agricultural production.

e) Wind breaks

Trees hat were planted along the farm as shelters belts are protecting stock and crop from the damaging effect of the wind.

2.4.3 Apiary

Honey bee production

Education on production - the created Farm Forestry Extension Agents educated the selected stakeholders on purchase of bee colonies, management and production. The beehives were constructed (Figure 9) and bee colonies distributed thereafter (Figure 10). They were supplied to the farmers who previously participated in the first and second projects, and had evidence of grown trees and land for apiary set up.



Figure 9: construction of bee hives (Photo by Celsus Senhte)



Figure 10: Bee colony (Photo by Celsus Senhte)

2.4.4 Some general outcomes from the project after the three project phases

- Five tree nursery centers have been established (two in Kakuuto, one in Kabonela and another in Kooki)
- 14800 trees have been planted and are expected to complement on the native vegetation
- Income generation by the stakeholders is evident through sale of seedlings
- Adoption of the seedling transplantation is on the increase in the district and many are not catered for especially those that cannot afford to buy the seedlings
- Biodiversity conservation is being taken to another level. There has been attitude change among the stakeholders and more are willing to take part in exercise and initiatives leading to biodiversity conservation.
- Twelve new families/households have been incorporated into the project and will be followed in the next phase
- Some farmers recently harvested their oranges and others will be harvesting oranges and mangos in the next nine months.

Discussions

From a global point of view, it is widely recognised that we need to find ways to use agricultural lands in ways that produce environmental and social outcomes as well as sustaining livelihood. Farm forestry is one of the best methods of producing such outcomes. The farm forestry designed in Sangobay, Rakai, combines forestry activities with crop and animal farming. In farm forestry, our focus has been producing valuable returns from the trees. However, apart from the returns farm forestry has led to important social networks that have in turn led to better organisation and increased dissemination of knowledge regarding biodiversity conservation. Other benefits that it has brought to the area, region and probably at a global scale is maintaining soil and water quality and contribution to carbon sequestration.

Women and the youth are showing more interest in tree planting and forest conservation as a whole. The youth movements are encouraging alternative sources for water and other natural resources to the communities and this helps in preventing the local people from constant use of the Lake Victoria waters in which they end up dumping a lot of wastes. Together with the women's tree planting movement, the capacities and capabilities of rural women and youth groups are developing to implement programs aimed at wise resource use and therefore restoring and maintaining the environment, the natural resource base and supply of tree products.

Such interest in tree planting is the cornerstone to increased biodiversity conservation in Rakai and Uganda at large. It is well understood that native vegetation, especially remnant vegetation, provides the best range of habitat to sustain and enhance terrestrial biodiversity (Gurr *et al.*, 2009). Protection and expansion of vegetation areas is a vital component of biodiversity conservation. However, in primary production areas, adding farm forestry to the mix of land uses can contribute to positive biodiversity outcomes. Plantation forests can buffer edges between native forests and non-forest lands and thereby improving connectivity between forest habitats. Farm forestry shelterbelts provide benefits to birds, bats and insect biodiversity (Gurr *et al.*, 2009); this is evident in the Sango bay project areas which is increasingly becoming a suitable habitat for more bird species, micro-organisms and insects. This area is going to harbor more biodiversity as

the project continues and as more trees are planted in vital areas. Lyon *et al.* (2009) also confirmed that there were more abundant vertebrate populations in native forests than there were in cleared farm lands. This means that re-planting certain cleared areas will bring back vertebrate populations as there will be creation of more habitat.

Farm forestry can help and protect soil resources by protecting soils from wind and water erosion, increasing soil organic matter, fixing of nitrogen and other nutrients into the soil through tree species acting as hosts for micro-organisms, increasing soil carbon levels and cycling nutrients through the soil. According to Udawatta *et al.* (2008), establishing farm forestry buffers on previously cultivated agricultural areas has significant effect on soil quality in less than ten years. Benefits to soil fertility and therefore tree and crop productivity can be enhanced by mixing species, as has been done in Rakai district. In several of the plantations, leguminous acacia species were incorporated. *Acacia spp* mixed with eucalyptus has been shown to improve productivity of both species due to the soil nitrogen fixing capacity of bacteria which populates acacia root system (Foresster *et al.*, 2006).

Through inculcating new ideas, it was overwhelming to observe the level of positive response from the communities. Most of these ideas have been adopted by a number of stakeholders and are now being put into practice. This is evidenced by the number of tree nurseries mushrooming through out the district. The sale of seedlings to communities has become a business in Rakai. This is good as it is promoting afforestation indirectly. This is also clearly shown by an increase in the number of trees around homesteads. This is truly a good answer to the widespread deforestation and unsustainable agricultural practices; which are a significant part of the growing problem contributing to about 20% of the current greenhouse emission (Leach, 2008).

Socio-Economic Factors Affecting Farmers' Decisions to Adopt Farm forestry in Sango-bay, Rakai District

Exponential population growth in Rakai district has led to an increased demand for tree products (timber, medicinal herbs, firewood, etc) in the district resulting in high deforestation. Because the level of enforcement of the laws regulating the use of forests and natural habitats in the area is weak, the local communities have been depending on trees from their farms, neighboring areas and those areas in the wetland without replacement.

Our project has been educating local people on various silvicultural practices and the art of harvesting trees for home consumption without degrading the environment and destroying biodiversity. The scope of the work up this period has been various parishes of Kabira and Kyebi in Kooki sub-counties in Kakuuto and Kooki counties. From our research it has been noted that the art of planting and harvesting trees for home consumption in many of the parishes has not been adopted well to the extent of self reliance, indicating that more education and demonstrations should be performed to enlighten them more.

From the start this project was concerned with education, demonstrations, campaigns, and research. The research component aimed at identifying the socio-economic variables that affect the farmers' decisions to adopt farm forestry in Rakai district.

The maximum likelihood analysis results showed a positive relationship between age and the

decision to adopt farm forestry. This indicates that age influences the farmers' decision to adopt farm forestry. The age of the farmer affected the farmer's knowledge and the awareness of the activities in the surrounding environment among other farmers.

The results showed a non significant positive relationship between gender and the decision to adopt Farm forestry showing that males are not necessarily better adopters than females. Gender is thus not a critical issue in a farmer's decision to adopt farm forestry. That means that both males and females can equally adopt Farm forestry if the right measures such as education and demonstrations are equally provided.

A significant difference was found between the level of literacy among adopters and non-adopters. That means that formal education is a vital aspect in the farmer's decision to adopt Farm forestry and the fact that literate farmers would be adopters.

There was also a significance difference between in the adoption between those that were previously given lessons on silvicultural practices and demonstrations by the project team and those that were not. That means that spreading out education about farm forestry, biodiversity conservation and various silvicultural practices in many new areas would influence the level of adoption positively.

Land size is an indicator of the available economic resources and the willingness to adopt new technologies. This often revolves around factors such as the risk, preference, capital constraints, labour requirement and the tenure arrangements.

In agricultural zones, tree crops compete with cash crops with the latter being preferred. Farmers in high potential areas are unwilling to divert land available for food and cash crops to trees which do not generate an equally lucrative product.

Non-farm income incorporates income earned by the household from different sources other than the farm. It is apparent that a non-farm income source varies greatly. This included trade, employment, casual work, credit, relatives, friends and miscellaneous sources. That means that the off farm income earned by the farmer does not affect the farmers ability to adopt farm forestry. This is because its investment is low cost.

Furthermore, disposable income is the income that is left to the household to spend after taxation. It encompasses money accrued from different sources and used as expenditure for the household and savings. From the research, the household's level of income is a pre-disposable factor. It is not critical in the decision-making framework. Statistically, the decision to adopt is not based on the income level. This is attributed to the fact that tree seedlings are cheap and in other instances the farmers are given the seedlings free by organizations trying to promote Farm forestry in the area, as is the case with Integrated Rural Community Development Initiative, in Rakai District.

Implications to biodiversity conservation

Limitations

- Overwhelming interest to participate in the the aforestation exercise by many stakeholders was limited by lack of sufficient funds to extend the the farm forestry business/farm forestry implemetation, and biodiversity conservation education to other areas in the district.
- Tree eating insects became a a common destroyer to the trees, hindering them from growing to maturity
- Lack of forestry business ideas led the stakeholders to argue about the usefulness of the entire project.

Conclusions

The government working hand in hand with interested Non Governmental Organizations should put in place clear policies that emphasizes on the need to promote farm forestry within a view of alleviating general poverty. Each of the socio-economic variables studied should be addressed at levels in which it affects the farmer's decision to adopt farm forestry. The policy implementation should be concentrated at the district level to bring it closer to the people. Promotion of farm forestry will help to reduce the imbalance in the market of timber and poles and make the marketing of the product efficient.

Both formal and informal education is vital in promoting farm forestry in Rakai through educating farmers and the general community about its importance and the risk of deforestation. Attention should be focused on farmers/individuals over 45 years who are mainly the decision-makers in most households, and conservatives in technology adoption.

Small-scale farmers should be encouraged to grow more trees and to commercialise this investment so as to diversify on their source of income.

Recommendations/way forward

- Provision of more funds to continue the project; ie. Roll out more treess, and continue the education comonent of the projecct as well as start more initiatives.
- Provide pesticides/insectides that will control the tree eating pests/nsecticts
- Provide more business ideas to the rural stakeholders, how to market their their farm forestry products and honey.
- Increase the number of stakeholders adopting apiculture.

References

Gurr G.M., Gamez-Virus, S., Bonifacio, R., Kinross, C and Raman, A (2009). Farm trees: enhancing biodiversity, nature conservation and pest control, Publication No. 09/39

Barton, ACT, Rural Industries Research and Development Corporation.

Udawatta, R.P., Kremer, J., Adamson, BW and Anderson S.H. (2008). Variations in soil aggregate stability and enzyme activities in a temperate agro-forestry practice.

Forrester, D.I., Bauhus, J and Cowie, A.L (2006). Carbon allocation in a mixed species plantation of *Acacia mearnsii* and *Eucalyptus globulus*. Forest ecology and management. 233: 275-284.

Leach, G and Leach, M (008). Carbonizing forest landscapes? Linking climate change mitigation ad rural livelihoods.

Annexes

Annex 1: Cover photographs



Vast area prepared for new *Ficus spp* tree plantations (left), and first Apiary to be set in Kakuuto (right) (Photos by Celsus Senhte)