TREES FOR FOOD SECURITY-2 PROJECT

UGANDA HIGHLIGHTS

Project overview

The 'Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa' project also known as Trees for Food Security phase 2 (T4FS-2) is an Australian Centre for International Agricultural Research (ACIAR) funded project aimed at improving food security and smallholder livelihoods through the widespread implementation of appropriate locally adapted agroforestry practices in key agricultural landscapes of Uganda, Rwanda and Ethiopia.

In Uganda, the project was implemented around Mount Elgon region, one of the biodiversity hotspots and an important water catchment area in East Africa. Despite being a biodiversity hotspot with abundant rainfall, this area faces severe environmental challenges including flooding, soil erosion and mudslides. High population pressure and demand for wood products with about 95% of the poor people relying on firewood for cooking. This, coupled with a major rural-urban trade in charcoal, creates a lot of pressure on forests and allied tree resources.

The need for an integrated approach to accelerate adoption of agroforestry technologies using a broader range of species with: i) market access for high value tree products; ii) firewood and fodder production and iii) soil and water management to ensure tree survival and crop productivity informed the T4FS-2 project implementation framework. In addition, there was also a need to consider tree cover changes at landscape as well as farm scales to manage the provision of ecosystem services as well as develop a comprehensive policy and institutional framework that specifically focuses on development and promotion of agroforestry.

The T4FS-2 project is aligned to the Uganda National Development Plan 2 on increasing the contribution of forestry to Gross Domestic Product (GDP) and livelihoods, the Uganda's Vision 2040, and Forest and Landscape Restoration Commitment on reversing deforestation and restoring degraded farm lands using agroforestry.
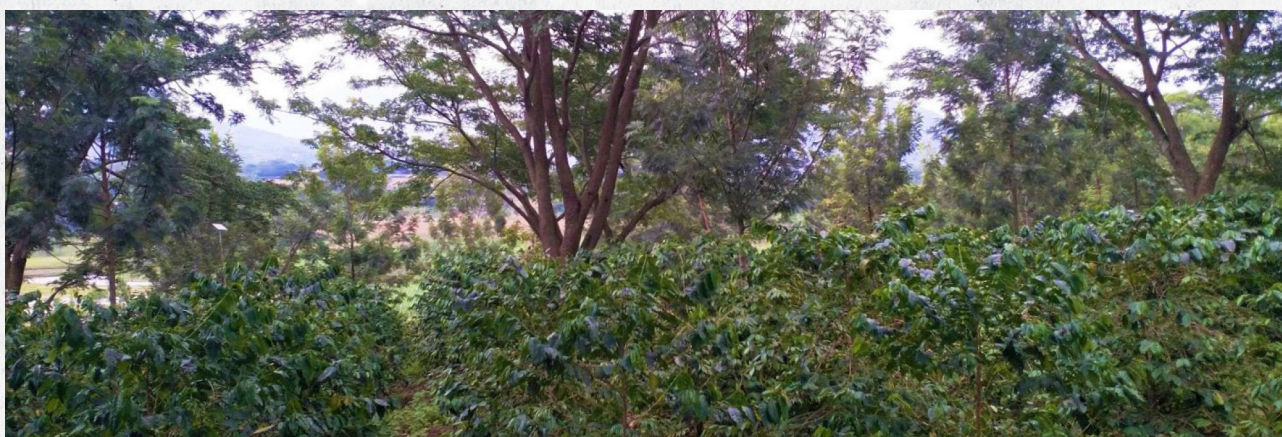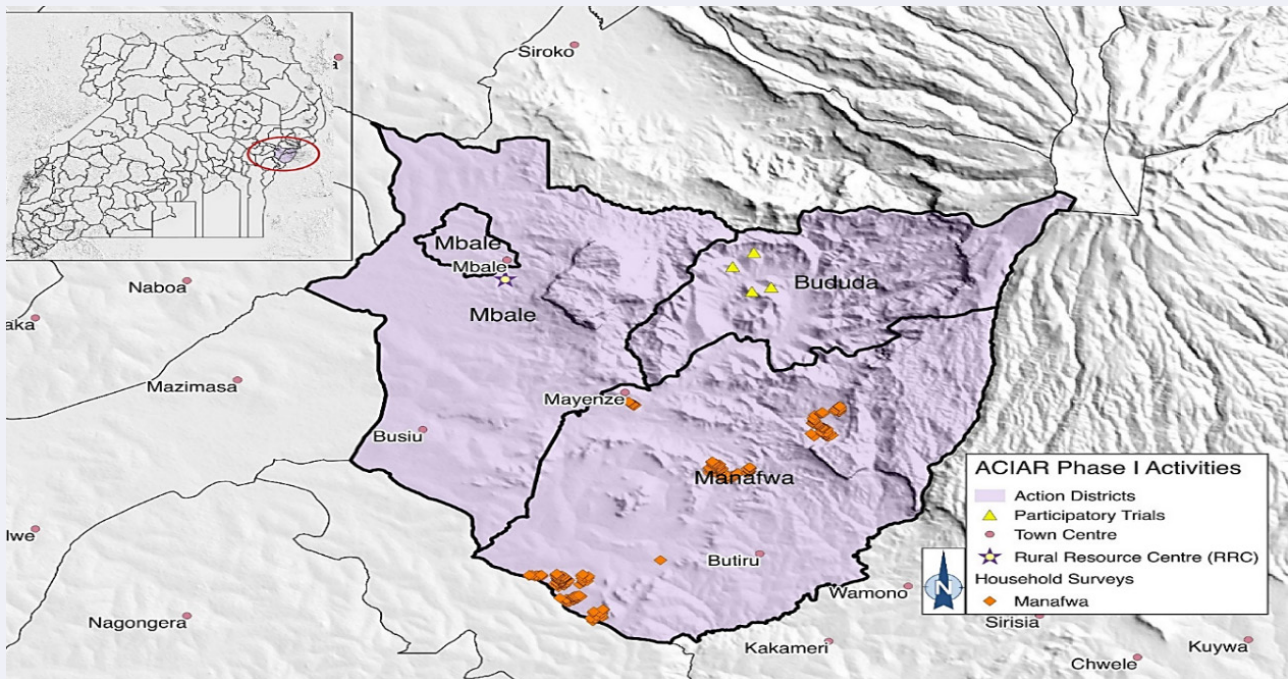
Coffee (Coffee arabica) is one of the commercial crops grown in Mount Elgon region © Joel Buyinza

Where the project works

The project is implemented in the sub-humid highlands of Eastern Uganda specifically in Mbale, Manafwa and Bududa Districts.

Map of the project sites in Uganda

Project partners

The project is coordinated by World Agroforestry (ICRAF) in partnership with: National Forestry Resources Research Institute (NaFORRI); Makerere University (MAK); World Vision Uganda (WVU); Mount Elgon Tree Growers Enterprise (METGE); African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE) and Commonwealth Scientific and Industrial Research Organization (CSIRO).

Project achievements

1. Project reach

Through the various scaling out strategies such as participatory trials, capacity development, tree distribution, sensitization meetings and farmer exchange visits, the project has reached more than 11,000 participants directly and more than 40,000 indirectly.

Table 1: Summary of number of people reached by the project in Uganda

Activity	Direct participants	Total participants*
Capacity development	4609	18897
Farmers involved in Participatory trials	513	2103
Training, tree distribution and training in RRCs	2876	11792
Tree distribution outside RRC	579	2374
Other activities: sensitization meetings, farmer exchange visits etc	2721	11156
Post graduate students	1	1
Total	**11299**	**46323**

* Total participants multiplied by 4.1 which is the average number of people in a household

2. Contribution to policy influence and stakeholder engagement

The project had a positive kick-start in 2017 with Ms. Beatrice Byarugaba, Director Agricultural Extension Services, Ministry of Agriculture Animal Industry and Fisheries (MAAIF) assuring the team of the government's continued support and commitment during the implementation of the project. "*Uganda's vision is to see progressive improvement in annual incomes for households that are dependent on agriculture*," she stated during the project's inception workshop.

The project, in conjunction with the Ministry of Water and Environment (MWE) has contributed to the formation of a National Forestry Consultative Forum (NFCF), a platform through which stakeholders engage independently and objectively to discuss and develop strategic and operational measures that are relevant for sustainable management of forest and tree resources in Uganda.

Under the Forum, ICRAF together with other stakeholders notably, VI Agroforestry and Uganda National Farmers Federation (UNFFE) have contributed towards the revision of the existing

National Agroforestry Strategy. The strategy is currently under review and stakeholder validation. This will be followed by submission to the Ministry of Water and Environment for approval. Once approved, the strategy will guide efforts on sustainable food production, restoration and long-term financing of agroforestry in Uganda.

The project through ICRAF and the Energy and Environment Working Group of the Comprehensive Refugee Response Framework has also contributed to the development of the Water and Environmental Refugee Response Plan. The plan which was launched in early 2020 provides a comprehensive framework to tackle environmental degradation in refugee and host community settings.

3. Farmer participatory trials

More than 800 participatory farmer trials were established across a range of contexts (Table 2). The participatory trials provided an opportunity to test various agroforestry options together with smallholder farmers and other stakeholders from the three districts.

Table 2: Number of participatory trials established and farmers hosting the trials per district

Type of Trial	Mbale		Manafwa		Bududa		Number of trials		
	No. of trials	No. of farmers	No. of trials	No. of farmers	No. of trials	No. of farmers	Year 1	Year 2	Year 3
Trees on farms	95	28	85	26	78	35	148	82	79
Boundary planting	48	35	62	25	73	55	30	29	116
Woodlots	32	20	21	16	33	28	41	13	38
Fruit orchards	20	25	14	26	30	15	8	40	16
Fodder bank and hedge rows	24	16	18	10	29	31	24	15	7
Soil and water conservation	16	16	16	21	12	13	14	16	22
Integrated	9	9	24	18	19	16	0	29	0
Riverbank stabilization	22	8	15	6	18	15	9	18	19
Total	**266**	**157**	**255**	**148**	**292**	**208**	**274**	**242**	**297**
Farmers									**513**
Trials									**813**

Establishment of the farmer participatory trials enhanced the understanding of factors influencing smallholder farmers' intention to adopt agroforestry.[1] Findings indicated that the intention of farmers to integrate trees in coffee plantations was mainly driven by their evaluation of the benefits of shaded coffee (attitude) followed

[1] Buyinza, J., Nuberg, I.K., Muthuri, C.W. and Denton, M.D., 2020. Psychological Factors Influencing Farmers' Intention to

Adopt Agroforestry: A Structural Equation Modeling Approach. Journal of Sustainable Forestry, 39(8), pp.854-865. https://doi. org/10.1080/10549811.2020.1738948

by beliefs about their own capability (perceived behavioral control). However, social pressure (subjective norm) was insignificant, implying that smallholder farmers tend to deny the influence of other people's behavior on their actions. Therefore, the farmers' positive evaluation of shading coffee and the perceived capability to overcome tree planting barriers reinforced their intention to integrate trees in coffee. This renders attitude and perceived behavioral control as reliable predictors of farmer tree planting behavior, especially in the context of developing countries.

Another study to identify differences in farmer motivations to adopting agroforestry practices in the Mt. Elgon region of Uganda[2] showed that About 40% of the variation in farmer motivation to integrate trees in their coffee plantations was explained by the significant variables of 'attitude' and 'perceived behavioural control' among farmers actively participating in the T4FS project from phase 1. However, the neighbors of participating farmers and farmers who had never interacted with the project were only motivated by 'attitude' and 'social norms' respectively.

Farmer motivation resulting from social pressure was strongest among farmers who had never interacted with the project, and in the absence of project interventions, they rely on existing social structures to drive change in their community. The findings indicate that psychological factors are key drivers to the farmers' internal decision-making process in agroforestry technology adoption and can be context specific. The adoption behaviour of smallholder farmers is mainly shaped by existing community social norms and beliefs that tend to promote knowledge exchange, as opposed to the conventional knowledge transfer extension approaches.

Some of the trials have already contributed towards livelihood improvement through supply of small stems to support agricultural crops as well as provision of construction poles. Before the project, such resources were being harvested from the National Park thus threatening its biodiversity and exacerbating conflicts between the park management and the surrounding communities. Wood contributes approximately 60% of construction materials, and establishment of woodlots for timber provision was a perfect intervention in the region.
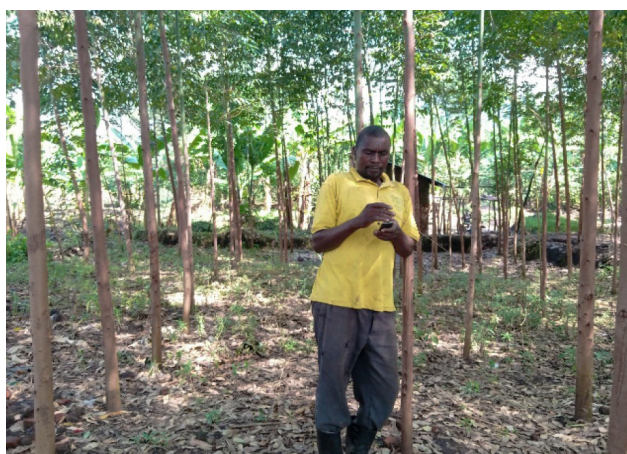
A farmer standing in his Eucalpytus woodlot. Eucalyptus poles split to supply sufficient wood materials for house construction in Bududa District © Charles Galabuzi

[2] Buyinza, J., Nuberg, I.K., Muthuri, C.W. and Denton, M.D., 2020. Assessing smallholder farmers' motivation to adopt agroforestry using a multi-group structural equation modeling approach. Agroforestry Systems, 94(6), 2199-2211. https://doi.org/10.1007/s10457-020-00541-2

Provision of free tree seedlings as well as training on farm management practices such as soil and water conservation, tree pests and disease management have motivated smallholder farmers to actively take part in other community service activities such as access road maintenance and tree planting to prevent landslides.

4. Long term trials and sap flow experiments

One long-term trial was established at Buginyanya Zonal Agricultural Research Institute (Bugi-ZARDI). The purpose of the trial was to enhance understanding of tree-crop interactions and their impact on crop yield, water and soil resources. The five treatments under study include: *Cordia africana* and beans; *Grevillea robusta* and beans; *Albizia coriaria* and beans; A mix stand of *G. robusta, A. coriaria*, and *C. africana* with beans, and Beans alone as a control.

Bonny Woniala a research technician with NARO setting up experimental plots in the Long-Term Trial at Bugi-ZARDI, in Bulambuli District © Ivan Wanambwa

Through the project, six sap flow meters were deployed on stems of three selected trees each of *C. africana* and *A. coriaria* on-farm. The objective of the study was to assess the daily water use patterns of these agroforestry tree species at different times of the year.[3] Results showed that there was a significant effect of the interaction between tree species and season on daily water use. The two species showed contrasting patterns of seasonal water use across leaf shedding schedules characterized by episodes of reverse flow in *A. coriaria* at specific periods of the year. We propose that reverse flows in *A. coriaria* were triggered by leaf shading while the zero flows in *C. africana*, which occurred during rainfall events, could have resulted from a lag phase, an indication that the two species may have different water-use strategies. Although *C. africana* uses 12–15 litres per day and *A. coriaria* uses 20–32 litres per day based on the studied trees, *C. africana* generally uses 12% more water than *A. coriaria* on a standardised daily basis. This knowledge of *C. africana* and *A. coriaria* tree water use provides critical insight for developing successful long-term

[3] Buyinza, J., Muthuri, C. W., Downey, A., Njoroge, J., Denton, M. D., Nuberg, I. K.,2019. Contrasting water use patterns of two important agroforestry tree species in the Mt Elgon region of Uganda, Australian Forestry, 82:sup1, 57-65*, DOI: 10.1080/00049158.2018.1547944*

tree monitoring and management programs in agroforestry systems.

In another study, sap flow meters were used to monitor the impact of pruning on tree water use[4] in *Cordia africana* (Cordia), *Albizia coriaria* (Albizia) and *Coffea arabica* (coffee) trees on two farms in Eastern Uganda. The trees were subjected to a 50% pruning regime at a 6-month interval over a period of 20 months. The results from the Albizia site showed that the mean daily sap flow was generally lower in pruned Albizia than in the unpruned trees. Daily sap flow generally declined during high rainfall events (for example August to September and mid-October to early November) and increased during the dry seasons (January to February) in 2018 and 2019. From December, *Albizia* trees begin shedding their leaves through January. During this period, daily sap flow declined and the trees eventually experienced episodes of reverse flows in January 2019 and 2020.
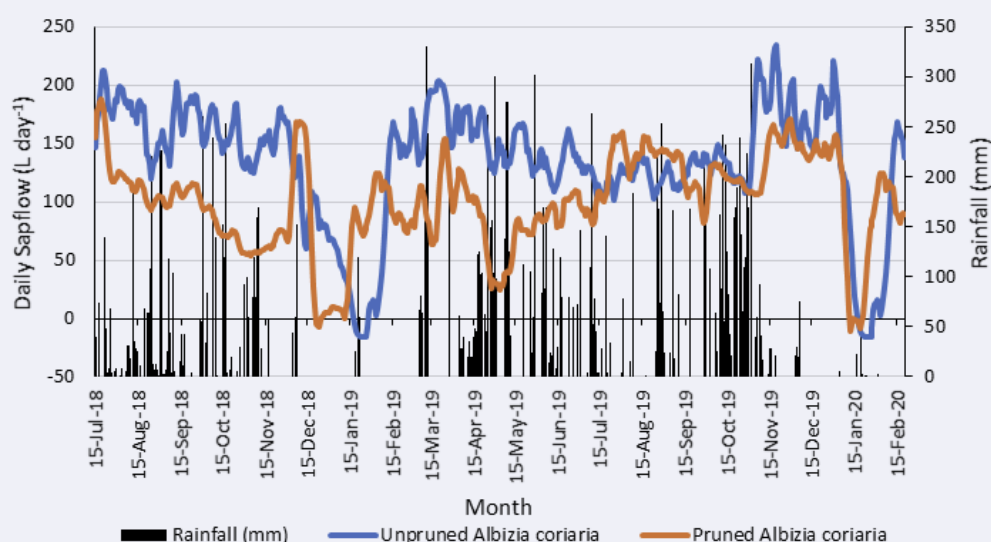

Fig. 1: Time courses in daily sap flow in pruned and unpruned Albizia trees over a 20-month period

Joel Buyinza explaining how sapflow data is downloaded from an sap flow meter installed on an Albizia coriaria tree to the project leadership and the former Australian High Commissioner to Kenya, Rwanda, Tanzania and Uganda, Ms. Alison Charters

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[4] Australian Centre for International Agricultural Research. 2020. The art of pruning. *https://aciar.gov.au/media-search/blogs/art-pruning*

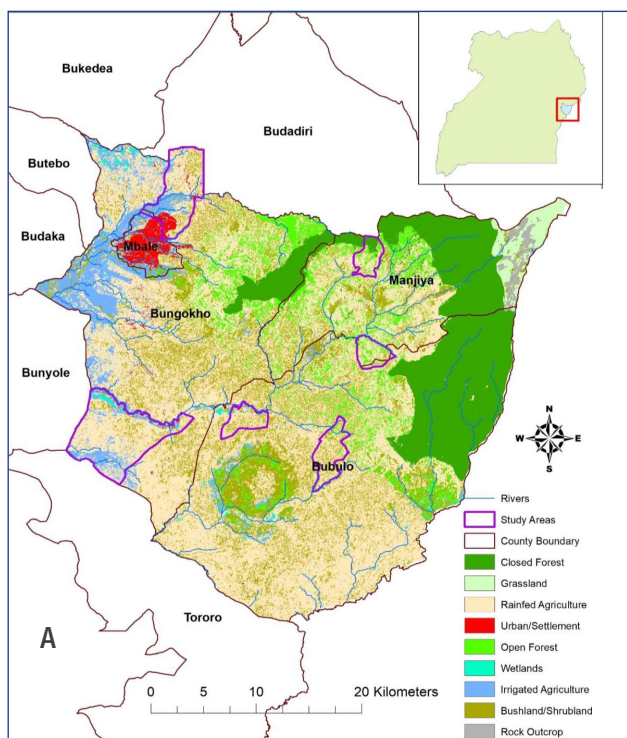# 5. Land and Water management options

Geospatial assessment of land and water management options for enhanced tree survival and growth was undertaken in the three districts. The assessment entailed mapping using the options-by-context approach as well as training in and facilitation of implementation of water management technologies appropriate for enhanced tree seedling establishment and growth. To understand the biophysical characteristics of the project areas, comprehensive maps were generated depicting rainfall, slope, elevation, soil type, land use/ land, run-off and soil loss potentials as well as recommended sustainable land and water management interventions for each site. This information is necessary to prioritize attention and resources based on extent of land degradation for implementation of appropriate land management interventions for the different sites. A total of 289 households including 109, 92 and 88 smallholders are implementing contour grass strips, terraces, and unlined runoff ponds for irrigation in Bududa, Manafwa and Mbale districts respectively.
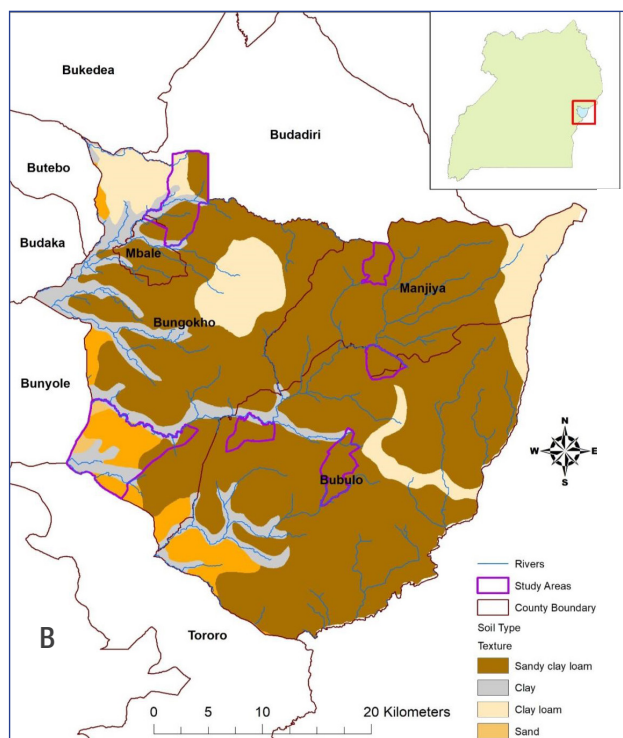

ICRAF water engineer, Maimbo Malesu) engages participants on how to use the spirit level during the construction of soil conservation structures at Mbale Rural Resource Center (MRRC), Eastern Uganda © Charles Galabuzi
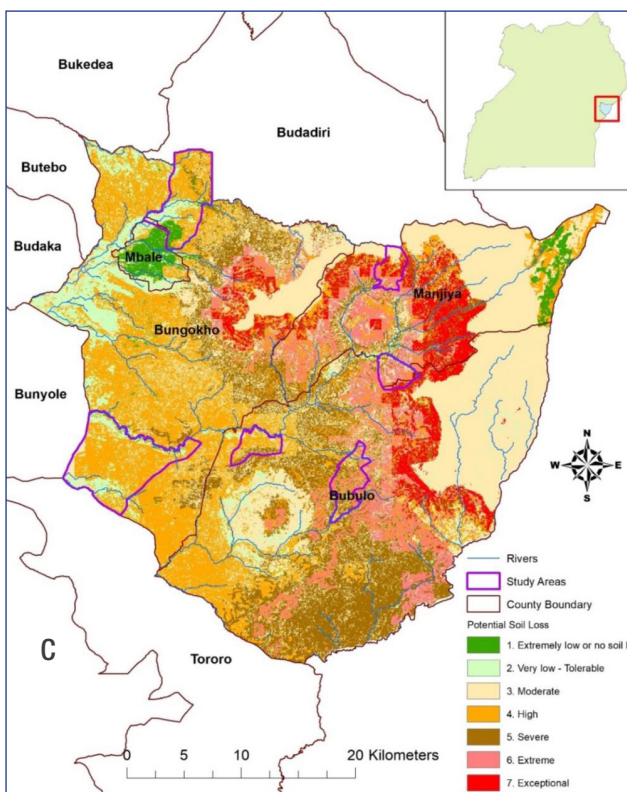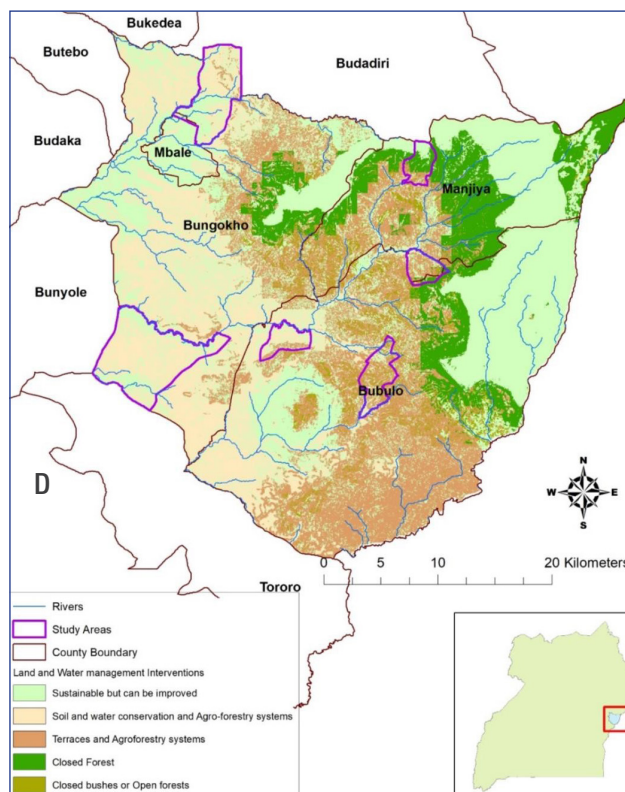
Landuse/Landcover

Soil Type

Potential Soil Loss

Land and Water Management Interventions

Maps showing the main landuse/ landcover types in Mbale district (A) soil types (B), potential soil loss (C) and appropriate land and water management interventions that should be implemented (D)

Further, up to nine Trainings of Trainers (ToTs) Workshops were held bringing together and equipping stakeholders with knowledge and skills in appropriate water management technologies that support tree establishment and growth in the different farming contexts. Other ToTs focused on sourcing quality tree seed/germplasm production and management as well as increased soil productivity, food security, product marketing and value chain. We anticipate that the knowledge and skills acquired through these trainings will be shared among stakeholders through the various farmer to farmer engagements that will continue beyond the project time frame.

A NaFORRI scientist (Dr. Bernard Fungo) explains agroforestry systems to farmers at Namanyonyi Sub-county Headquarters, Mbale District © Immaculate Sekitto, 2018

6. Rural Resource Centre: Bringing quality tree germplasm and agroforestry extension closer to the people

Established in the first phase of the project, Mbale Rural Resource Centre[5] (RRC) has increased access to good quality tree germplasm materials to farmers. Up to 417,000 quality tree seedlings of various fruit and multipurpose tree species have been produced from the RRC and other tree nurseries run by community groups. The seedlings have been distributed to farmers, churches and schools for planting in their land spaces to increase tree cover, derive various products and contribute to restoration efforts. The Centre also serves as a hub where farmers and the wider community access a wide range of reference materials and technical advice to enable them to select and grow trees that match their specific contexts.

[5] Okia C, Buyinza J, Agaba H, Carsan S, Kiptot E, Muthuri C. 2016. Mbale Rural Resource Centre: A community-based approach to deliver agroforestry technologies to rural farmers in Eastern Uganda. Factsheet. Kampala, Uganda: World Agroforestry (ICRAF) *https://www.worldagroforestry.org/publication/mbale-rural-resource-centre-community-based-approach-deliver-agroforestry-technologies*

The project has been at the forefront to build the capacity of tree-seed dealers, nursery operators and smallholder farmers on identifying quality tree seeds sources, management of tree pests and diseases in nurseries and basic practices for quality seedling production. This is geared towards raising standards in tree germplasm production and ensuring availability of tree planting material of desirable traits.

Over 600,000 tree seedlings including exotic and indigenous species have been produced and distributed for planting by farmers hosting the participatory trials under different farming contexts. This has contributed towards restoration efforts of up to 350 hectares of land and increased tree cover both on-farm and bare hills of Mount Elgon.

The use of *Calliandra* as forage for livestock including cattle and bees has boosted milk and honey production in the region. As a result, the farmers are reporting improved incomes and reducing on the burden pf traveling long distances to collect animal feeds.

ACIAR staff and a team of reviewers visit Mbale Rural Resource Centre during the mid-term review process. © Ivan Wanambea

Numerous trainings have been undertaken at Mbale RRC geared towards empowering farmers on nursery/ tree establishment, hence making them self-sustaining which enhances their future livelihood strategies. A total of 400 members in the region were trained in agroforestry for increased soil productivity and food security. At least 100 tree farmers and nursery operators were trained on collection and tracking criteria for quality tree seed materials and nursery accreditation system and up to 170 farmers were trained on various agroforestry practices, benefits, challenges and strategies for promoting adoption of agroforestry technologies. Also, since majority of farmers in the area rear livestock, intensive training sessions have been held on the growing of fodder tree species.

Training of dairy farmers on growing and management of Calliandra for increased milk production at Mbale RRC
© Jude Sekatuba

7. Tree-based value chains and financing options

Avocado and timber were identified as the potential tree-based value chains for development in Uganda. Avocado is produced by the farmers and sold to both large- and small-scale traders while timber consisted of a number of actors including tree farmers, timber brokers, timber traders and timber transporters. The other actors included timber processors (constituting of loggers and carpenters), consumers of semi processed materials and consumers of finished products. Opportunities for developing both value chains included; forestry/tree growing increasingly becoming a viable business; due to high demand for tree seedlings; existing research knowledge generated on tree management and value addition and growing interest financing institutions in tree growing as a viable enterprise.

Richard Namunyu a tree farmer in Butta sub-county, Manafwa District already boasts of benefits from a mature Albizia coriaria tree from his farm. Some of the timber from this tree was sold and the rest of the timber was used to upgrade his mother's house © Charles Galabuzi

Most of the tree-based enterprises accessed financial services from Savings and Credit Cooperatives Societies (SACCOs), followed by self-funding, microfinance institutions and lastly commercial banks. SACCOs were preferred to other sources because they are less stringent in their requirements when issuing of loans as well as low interest rates on loans compared to commercial banks.
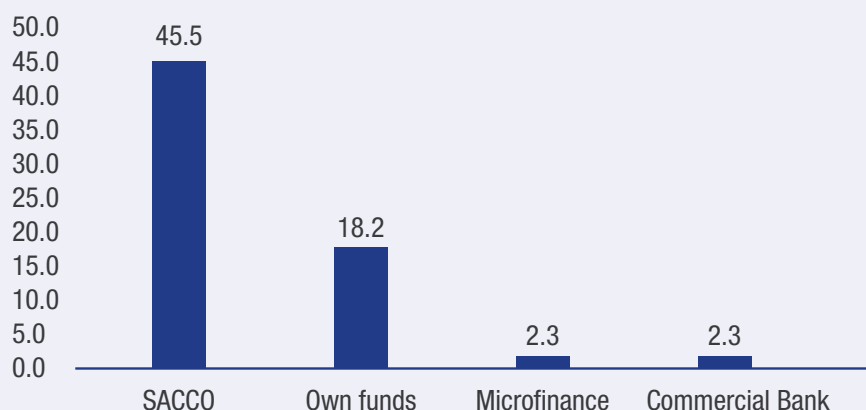

Fig. 2: Financial options accessed by tree-based enterprises in the Eastern Highlands of Uganda

The private financing mechanisms are more suitable for these tree-based enterprises which are largely informal, small-scale and long term in nature. The down side is that the cost of capital is very high and reduces the profit margin. Other constraints include, skills and knowledge gaps, lack of subsidy system for tree-based enterprises and risks of credit, production and marketing tree-based products. The tree-based enterprises could be expanded if cost of capital is reduced, training in risk management is done and in providing production subsidies for the tree-based enterprises.

8. Adoption of reviewed agroforestry curriculum

An assessment of curriculum on agroforestry and extension for eight tertiary institutions was conducted. The institutions that participated in the assessment include: Busitema University, Bukalasa Agricultural College, Ndejje University, Makerere University, Gulu University, Nyabyeya Forestry College, Busoga University and Uganda Christian University. Findings from the assessment revealed that the agroforestry curriculum is comprehensive and rich in content though this might not be adequately covered due to limited time allocated per module. Most of the teaching has been delivered in theory since resources to facilitate practical learning are usually unavailable especially in the private institutions. Some relevant agroforestry content is missing in the curriculum notably: developing agroforestry interventions, biodiversity conservation, environment management, landscaping, modelling agroforestry systems and nutrition and food security. However, the tertiary institutions are willing to introduce the missing content periodically during the curriculum review processes. Using the Regional Innovative Agroforestry Curriculum Guide developed during the ANAFE regional workshop, Gulu University conducted an agroforestry curriculum review to update its content for undergraduate students pursuing agroforestry/forestry degrees.

Participants during the agroforestry curriculum review process at Makerere University Agricultural Research Institute Kabanyolo (MUARIK) © Prossy Isubikalu

9. Women and Youth Empowerment in Agroforestry

A study on factors affecting adoption of agroforestry by women and youths showed that land size and family size affected adoption decisions. Land scarcity, seed shortage, lack of market and limited technology were among the challenges identified (Figure 3). The incentives however, involved farmer trainings, rising demand for tree products and access to free seedlings while the strategies comprised of strengthening farmer capacity building programs, community sensitization on climate change and promoting fast growing tree species.
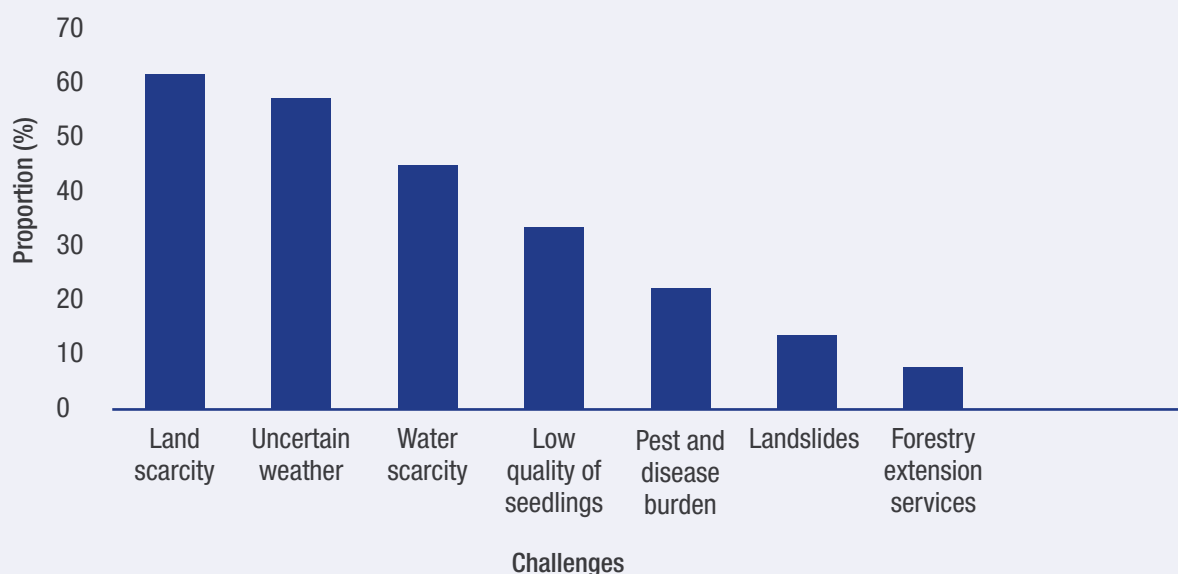

Fig. 3. Factors affecting adoption of agroforestry

Agroforestry presents an opportunity to undo the effects of deforestation and climate change in the region but selection of incentives for adoption will be most effective if tailored and kept updated to address specific needs according to farming contexts.

The youth and women have been engaged during the various field days and training workshops in which awareness about agroforestry for increased soil productivity and food security has been increased.[6]

Practical session on proper pruning during one of the trainings for women and youth on agroforestry in Mount Elgon
© Charles Galabuzi

Some of the skills learnt during the trainings have been helpful to the youths and women to start up tree-based enterprises. For instance, Nkoma Youth Development Association (NYDA) established a commercial tree nursery where they raise and sell an assorted of fruit and multipurpose tree seedlings. In addition, the youth group started their own savings and schemes that is enabling members to access loans for improving their livelihoods. The project provided potting bags, shade mats, watering cans and seeds to start them off. "*The training opened our eyes not only on the numerous benefits of trees but also on tree nursery operations and management. We took it up and applied what we learnt to start and run a tree nursery as business*" explained Bashir Wapaya, Chaiperson of Namanyonyi Youth Group.

As a result of the various community engagements through trainings field days, farm visits, drama and participatory trial establishment awareness about agroforestry tree-based enterprises among women and the youth has increased. Consequently, more groups have formed especially among the youth and women. Tree nursery establishment and beekeeping activities for income generation have become popular among these groups.

6 Njoki C, Kimenya G. 2020. Women and youth turning to tree-based enterprises for livelihoods in Mount Elgon, Uganda. *https://www.worldagroforestry.org/blog/2020/07/10/women-and-youth-turning-tree-based-enterprises-livelihoods-mount-elgon-uganda*

Suunu Women Group meet every week to monitor progress of their apiary in Busiu Sub-county

10. Capacity Development

A total of 4609 people have been directly been reached by the project through the various capacity building development activities as shown in the table below.

Table 3: Number of people reached through the various capacity development activities in Uganda

Capacity development activity	Total Beneficiaries		
	Male	Female	Total
ODK Training in Mbale	7	2	9
Regional multi-stakeholder workshop on institutional governance, co-operation and scaling up agroforestry	30	25	55
4th National Agroforestry Workshop	73	41	114
TOT workshop for women in agroforestry and gender analysis	40	280	320
Training of NARO and Makerere University Scientists in Agroforestry	8	12	20
Training of farmers on tree-crop management practices	15	10	25
Training of farmers on nursery bed establishment and management	15	21	36
Training of farmers to identify motivations for integrating trees in the farming systems	103	96	199
Sensitization of smallholder farmers on agroforestry options	320	80	400
TOTworkshop on soil and Water management options	22	8	30
TOT workshop on sourcing quality tree seed/germplasm & Mgt.	27	18	45

Capacity development activity	Total Beneficiaries		
	Male	Female	Total
Farmers trained on appropriate water harvesting, management and conservation agriculture	265	135	400
Women and youth farmers on agroforestry practices for increased soil productivity, food security, product marketing and value chain	199	251	450
Refresher training on sap flow facilitated by PhD Student (Joel) in Nairobi	4	3	7
Empowerment of Women and Youth in Climate Smart Agroforestry for Increased Food and Income Security	252	364	616
Agroforestry approaches, benefits, challenges and strategies for promoting agroforestry	100	70	170
Training of farmers on tree planting and environmental conservation	420	501	921
Local government officials and timber dealers were sensitized on nature, ways and means of obtaining processing and marketing tree products	66	20	86
Tree farmers and nursery operators were trained on collection and tracking criteria for tree propagation materials.	60	40	100
Local government officials and timber dealers were sensitized on nature, ways and means of obtaining processing and marketing tree products	16	20	36
Training on Water use monitoring in higher plants (for IITA and NaCORRI staff) in Mbale	5	01	6
Total	**2381**	**2228**	**4609**
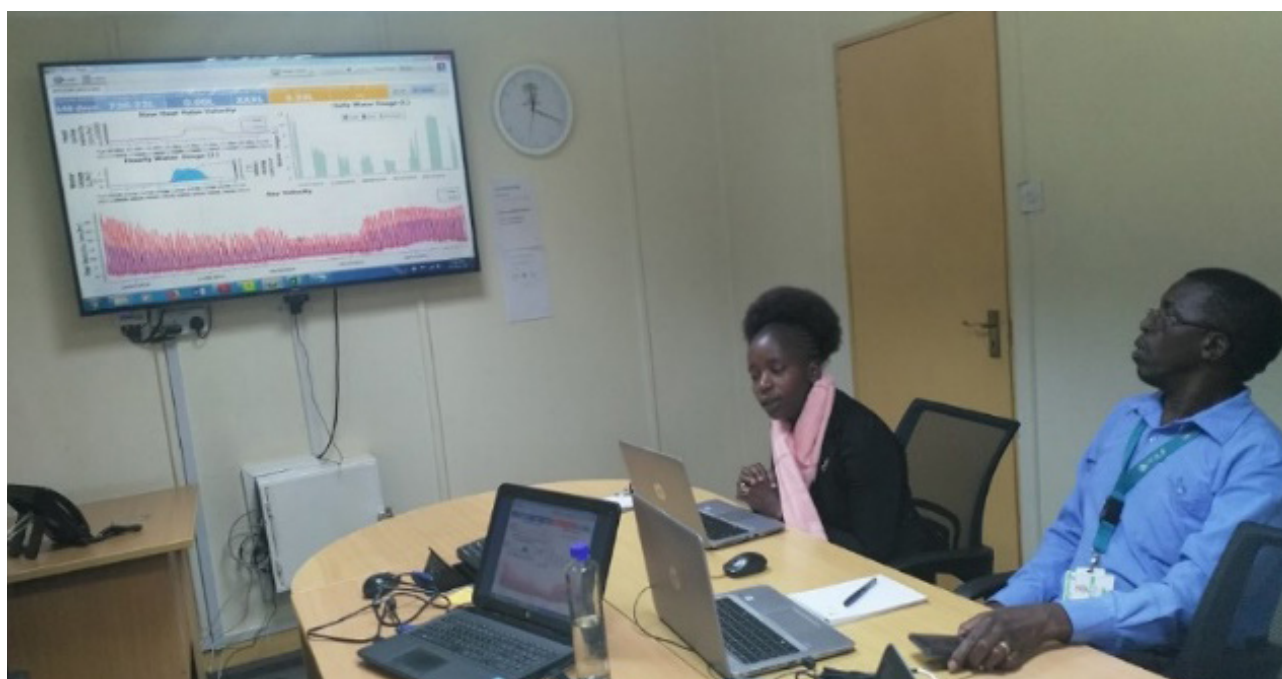
A section of participants during a refresher training on Sapflow at the ICRAF HQ, Nairobi © Joel Buyinza.
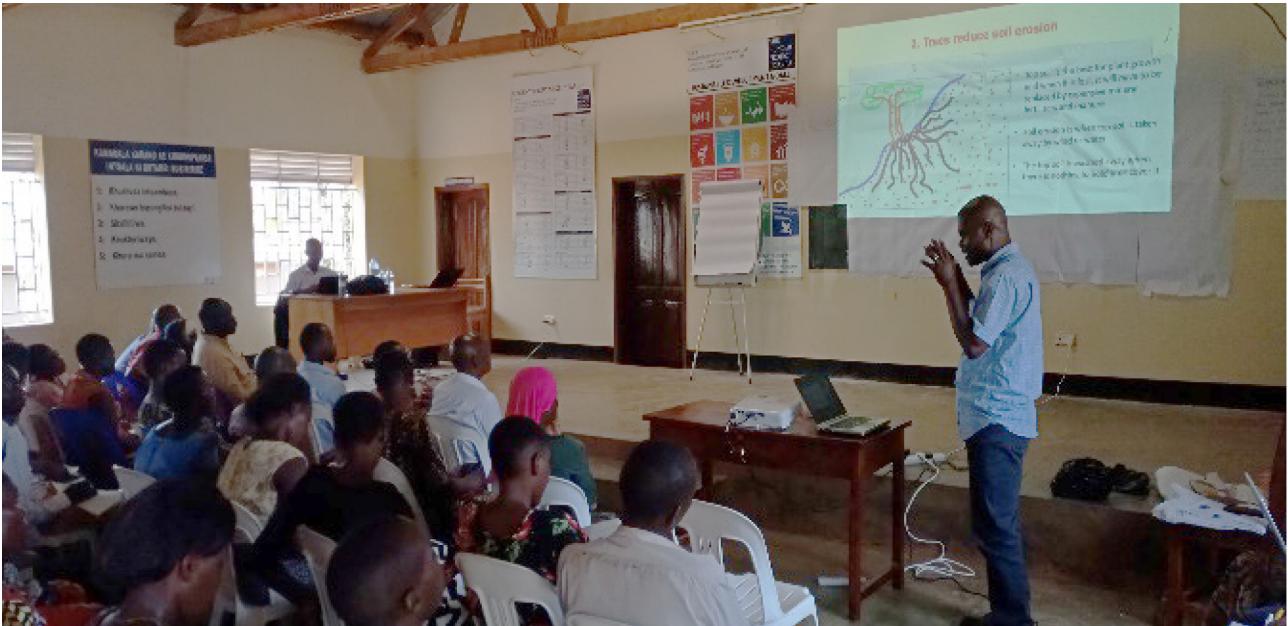
Bernard Fungo facilitating on fertilizer tree/shrub management technologies to participants during the second training of women and youth trainers' workshop at Epicenter conference hall, Busooba sub-county

Success story

Stakes from fast-growing trees boost tomato and bean production

Beans and tomatoes are two commonly grown crops by farmers in Mount Elgon region. Both crops require staking for support during their growing period and for better yields. However, lack of stakes has hindered production and high post-harvest losses in the case of beans. To help smallholder farmers overcome the staking challenge, the TF4S-2 project has provided seedlings of fast-growing tree species such as *Calliandra calothyrsus*, *Neolamarckia cadamba*; *Grevillea robusta*, *Alnus* sp; *Gliricidia sepium,*

Eucalyptus sp. *Maesopsi eminii*, and *Melia volkensii* to help. Stakes are obtained by pruning and thinning the trees woodlots respectively. These thinnings and prunings also offer other benefits such as soil fertility improvement, livestock fodder and fuelwood. Some farmers like Yoweri Waringa and Richard Namunyu have turned to selling stakes from trees planted on their farms. "*I don't just prune my trees but with demand of branches from farmers who pay for them to stake their tomato crops for higher yielding and quality fruits at harvest*." Richard Namunyu, a farmer based in Butta Sub County, Manafwa District.

Staked tomato

Neolamarckia cadamba useful during post-harvest drying of beans © Geoffrey Kimenya

Yoweri Waringa, a model farmer based in Butta Nakatsi sub-county in Bududa District pose in his well managed two years old Grevellia robusta, a multipurpose fast-growing species used to obtain stakes, for timber and firewood in the region © Charles Galabuzi

Other highlights in Uganda

Project activities in Uganda have been instrumental in contributing to scientific knowledge. Three peer reviewed articles have been published in various journals. In addition, project activities in Uganda have been featured in various events both internationally and nationally. In May 2019, the project supported one scientist to present his work in the World Congress on Agroforestry held in Montpellier, France. The project results presented at the congress were on Contrasting water use patterns of two agroforestry tree species in Mt. Elgon region of Uganda: Implication on management.[7] Project observations, experiences and lessons from Uganda[8] were presented at a side event organized by ACIAR. In addition, three papers were presented during the Forest Trees and Agroforestry (FTA) conference held in September, 2020. Another abstract was submitted to the joint National Agricultural Research Organization and Makerere University (NARO-MAK) Scientific Conference that is yet to be held. Project activities were also featured in the Tree farmers' magazine.[9]
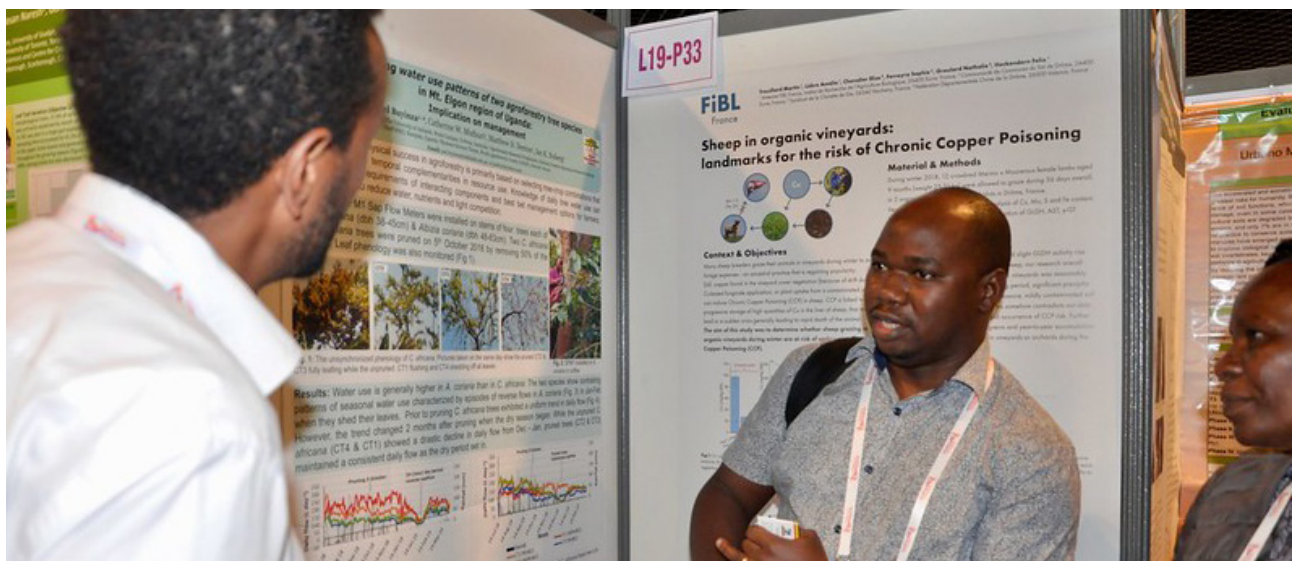
Joel Buyinza, one of the PhD students under the project, presenting part of his work during the 2019 World Congress on Agroforestry in France © World Agroforestry

[7] Buyinza J, Muthuri CW, Denton MD, Nuberg IK. 2019. Contrasting water use patterns of two agroforestry tree species in Mt. Elgon region of Uganda: Implication and Management. Poster, World Agroforestry Congress, Montpellier, France *https://www.worldagroforestry.org/publication/contrasting-water-use-patterns-two-agroforestry-tree-species-mt-elgon-region-uganda-0*

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A web-based tool "Interactive Suitable Tree Species Selection and Management Tool for East Africa" has been developed for Uganda[10] consisting of 58 tree species encountered in the T4FS study sites in both phase 1 and 2 of the project. It demonstrates a systems approach to research in development and is a collation of tree species encountered through various studies namely: tree diversity, baseline studies, seed and seedling systems surveys, local knowledge and Land Degradation Surveillance Framework. The database enables the user to easily access information either based on tree species, their agro-ecological zone suitability, products, environmental services, origin (native or exotic) and niche. The tool also provides specific details on the trees' biophysical growth conditions and management requirements as well as links to other agroforestry databases.

TF4S-2 project is among the initiatives recognized under the Queen's Commonwealth Canopy Initiative[11] for its efforts to provide sustainable solutions to the pressing environmental and livelihood challenges in Mount Elgon region.

Project recommendations

- There is need to promote partnerships and collaboration among stakeholders on quantification and dissemination of agroforestry or trees on farms in the region and their contribution to livelihoods. This will harmonies efforts, views and strategies towards scaling up and development of agroforestry.

- To help in championing the integration of indigenous tree species in community forests as a mechanism for broader forest and tree restoration efforts in the region, there is a need to develop and promote appropriate and adequate incentives for on-farm tree planting and protection of forests on private land.

- Local governments should register and certify all individuals and organizations involved in tree germplasm production and distribution including tree seed collectors' processors, tree nursery operators and tree farmers.

- Local government in collaboration with Civil Society should engage stakeholders to develop and enforce bylaws on tree germplasm, production, collection and movement. The bylaws should promote tree farmer and nursery operator networking and information sharing as well as sanction and discipline errant actors.

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[10] Interactive Suitable Tree Species Selection and Management Tool for East Africa. *http://apps.worldagroforestry.org/suitable-tree/*

[11] *https://queenscommonwealthcanopy.org/projects/mount-elgon/*

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