



Australian Government

Australian Centre for
International Agricultural Research



RESEARCH
PROGRAM ON
Forests, Trees and
Agroforestry

TREES FOR FOOD SECURITY- 2 PROJECT

OVERVIEW AND ACHIEVEMENTS



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Ethiopian Environment and Forest Research Institute





About T4FS-2

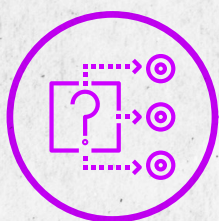
Where: Rwanda, Ethiopia and Uganda

Project budget: AU\$ 5.26M

Funded by: Australian Centre for International Agricultural Research (ACIAR)

Duration: Four years and six months, January 2017 – June 2021

Lead Institution: World Agroforestry (ICRAF)



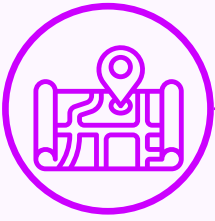
Why T4FS-2?

The 'Trees for Food Security phase 2 (T4FS-2) project stemmed from the successful completion of phase one's four-year term project. Learnings obtained from the first phase showed that for enhanced food security and improved livelihoods, establishment of a greater diversity of trees on farms was essential. During the first phase, project stakeholders testified on the benefits obtained from the project. They also emphasized the need for project to reach more farmers in different sites or contexts. It is against this back drop that the second phase of the project was conceived with the aim of improving food security and smallholder livelihoods through the widespread adoption of appropriate locally adapted agroforestry practices in key agricultural landscapes in Ethiopia, Rwanda and Uganda.



Project objectives

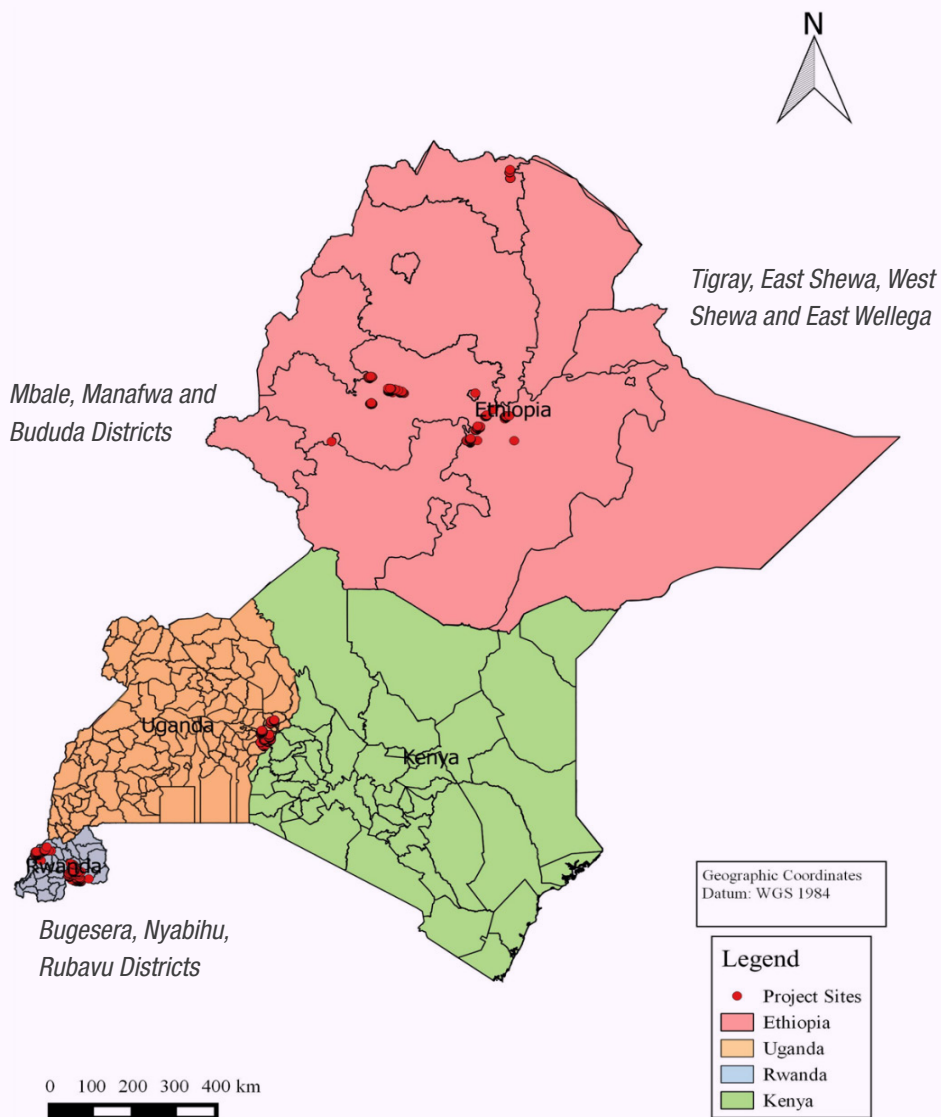
1. To enhance knowledge of the impact of tree cover change on crop productivity, water, nutrients and livelihoods.
2. To integrate appropriate water management technologies and sustainable grazing options with promotion of agroforestry.
3. To establish communities of practice in the promotion of locally adaptable agroforestry options supported by appropriate inputs systems.
4. To strengthen smallholders and other market actor's ability to participate effectively and profitably in tree product value chains.
5. To strengthen capacity of academic institutions in developing and implementing innovative agroforestry curricula.



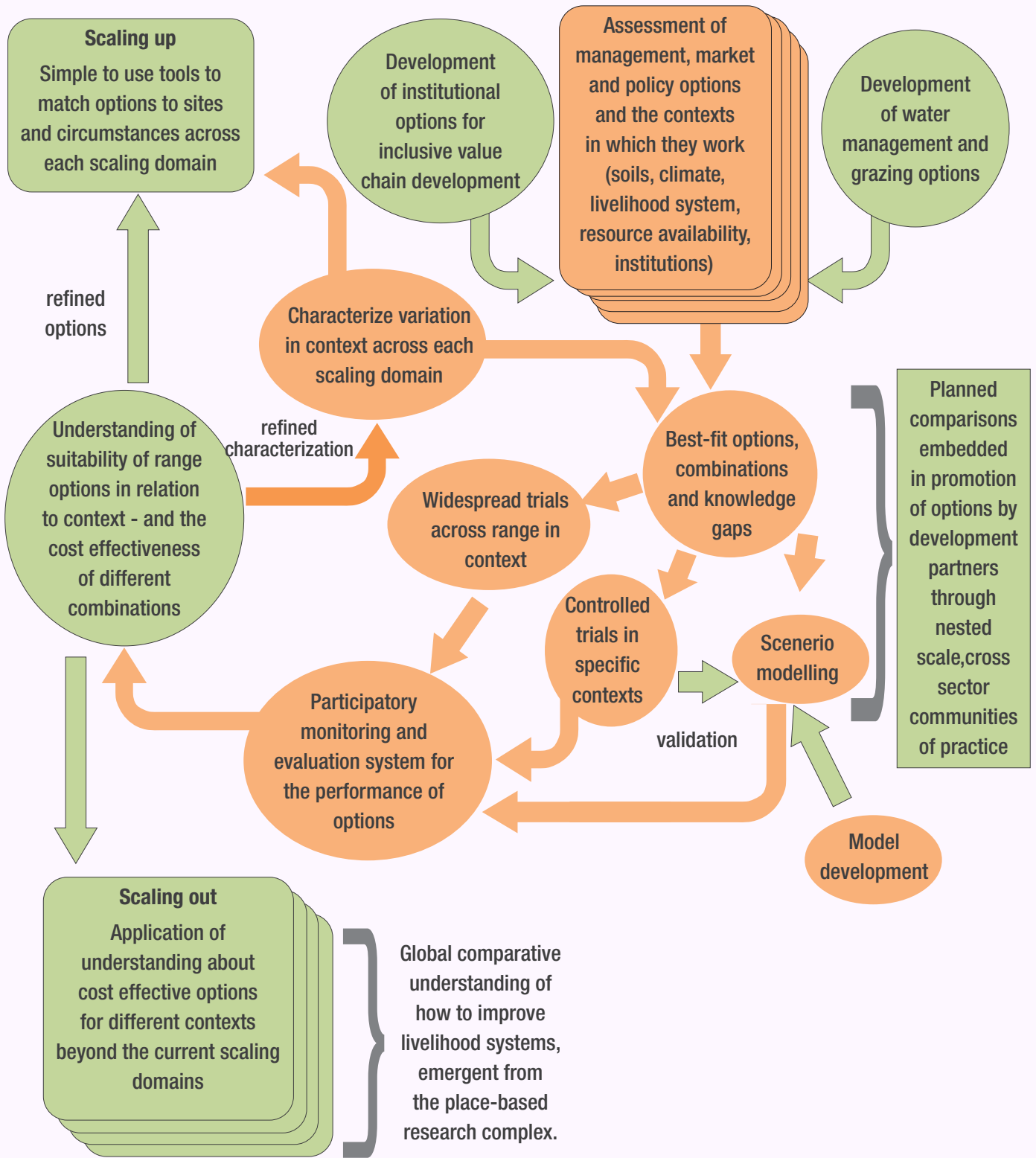
Project sites

The project sites include: three districts in Rwanda- Bugesera, Nyabihu and Rubavu; seven districts in Ethiopia, six in Oromia region- Adami Tulu Jido Kombolcha, Dugda, Lume, and Bora in East

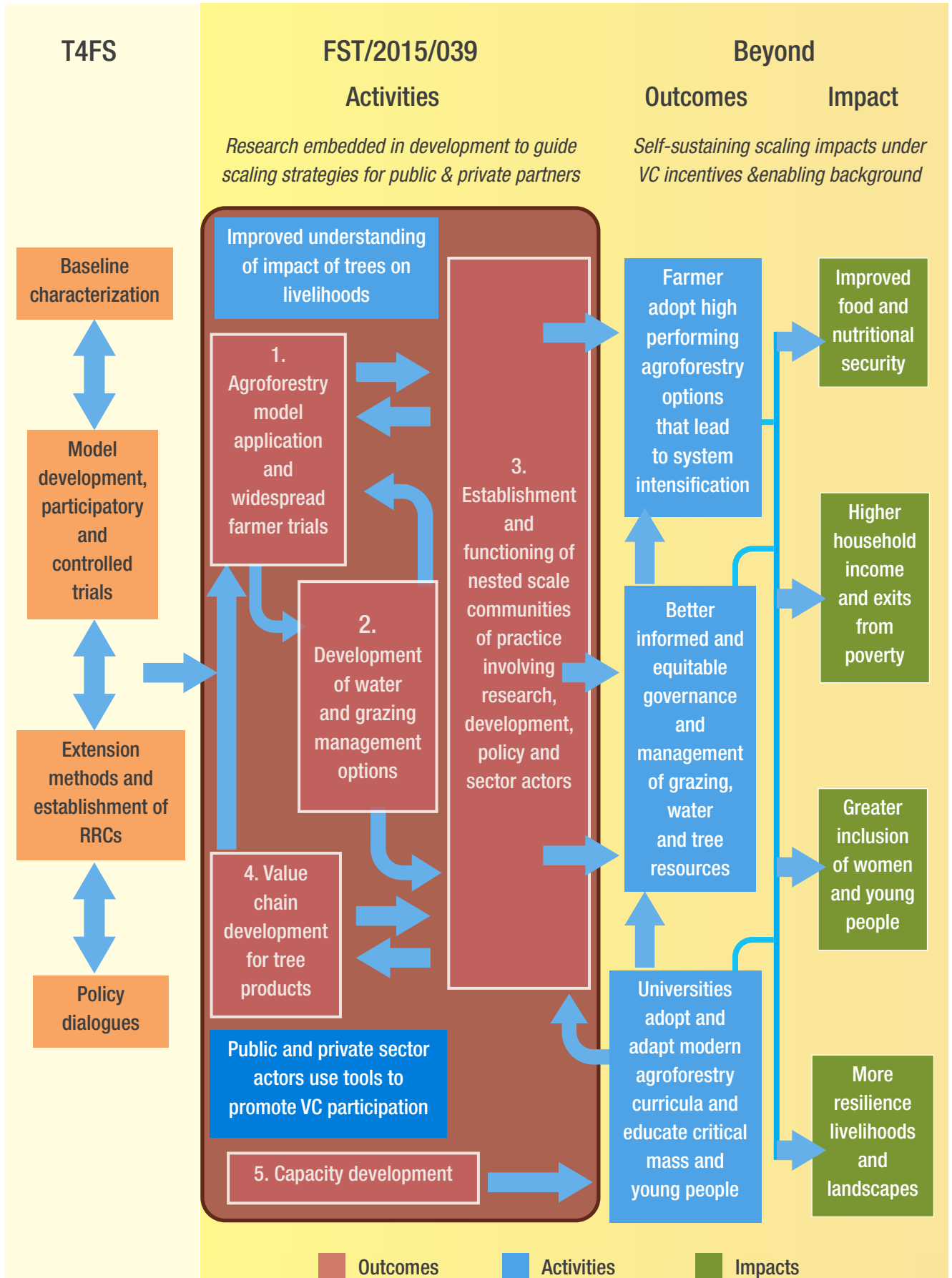
Shewa, Guto Gida and Jima Arjo in East Wollega and Bako Tibe in West Shewa and one district in Tigray region: Tsaeda Emba; and three districts in Uganda- Manafwa, Bududa and Mbale.



Comprehensive research strategy / approach



Theory of change



Why the project worked well



Monitoring and Evaluation plan and Communications Strategy for T4FS-2 Project



What ACIAR Forestry Research Program Manager Dr. Nora Devoe said during the Midterm review: *“Partnerships are absolutely critical to the delivery of outcomes and achievements to date. ACIAR funding, while substantial, is highly leveraged with contributions from the partners. The project leader and collaborators have built a superb network of appropriate partners with a shared vision of desired outcomes*



Reviewers and the T4FS-2 project team pay a courtesy visit to RAB Director General- Dr. Patrick Karangwa (center)

What RAB DG said *“RAB, which is in-charge of agricultural research and extension, intends to build 10 more RRCs in addition to those established by the T4FS-2 project.*





Key achievements

1. Project reach

More than 48,000 households have been reached directly translating to more than 145,000 direct beneficiaries through the various scaling out strategies including participatory trials, capacity development activities, sensitization meetings, tree distribution, training and demonstration in Rural Resource Centres (RRCs) among others (Table 1)

Table 1: Summary of people reached by the project

Country	Actual households	Total participants
Rwanda	32,452	81,125 ^a
Uganda	11,299	46,323 ^b
Ethiopia	4,482	17,913 ^c
Total	48,233	145,361

^a multiplied by 2.5, ^b multiplied by 4.1, ^c multiplied by 4: average number of people in a household

2. Impact through Research in Development strategy and Approaches: Systems, participatory and options by context approaches

The project applied the systems approach in its research and development initiatives with all the work packages being inter-related and interdependent. This allowed feedback loops and cross-learning to occur across different objectives, thus further refining the agroforestry-based solutions developed in the project. For instance, trees survival is dependent on water availability, good seedling supply systems, management (and controlled grazing in Ethiopia) while the uptake/

scaling up of the same is affected by markets, financial options and capacity building amongst others. On the other hand, using the options by context approach different options/ solutions are provided based on the prevailing contexts to ensure suitability and enhance level of success of the interventions. This is done in a participatory way where key stakeholders especially farmers using farmer led approaches¹ actively participate from planning, design and implementation phases so as to ensure ownership and sustainability of the interventions.

i. Farmer-led participatory trials: Key to adoption and sustainability of technologies

Enhanced understanding of farmer-led agroforestry options in the three countries was achieved through establishment of 5,036 farmer participatory trials. The types of trials were agreed upon during the project's planning meeting after a careful analysis of farmer contexts and circumstances. These trials comprised:

- Stakes for climbing beans, fruits for nutrition and income (tree tomatoes, mango, avocado and papaya), biomass incorporation and soil conservation and erosion control adding up to 2290 in Rwanda.
- In Uganda, a total of 813 trials on trees on farm, soil conservation, river bank stabilization, fodder banks, fruit orchards and woodlots

¹ Derero, A., Coe, R., Muthuri, C. et al. Farmer-led approaches to increasing tree diversity in fields and farmed landscapes in Ethiopia. *Agroforest Syst* (2020). <https://doi.org/10.1007/s10457-020-00520-7>



- In Ethiopia, a total of 1933 trials that focused on fruit trees, multipurpose tree planting, apple root stock, sustainable grazing options, multipurpose trees with rainwater harvesting.

Through the trials, all stakeholders observe the results and have an objective view of the

performance of the various technologies. The trials are also a learning platform for other farmers who observe and learn about the new technologies and eventually try them on their own farms.

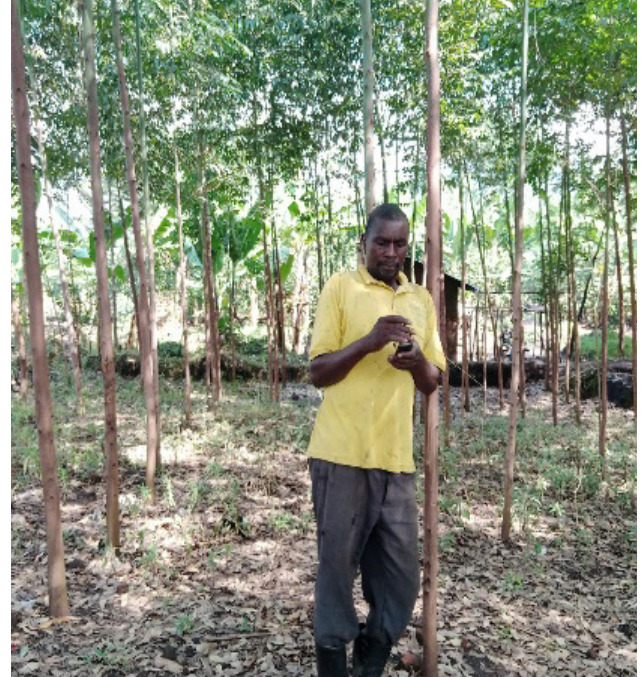


Athanase Mukuralinda, discusses with Mr. Diogene on the success of climbing beans trial on his farm planted for the first time in Musenyi, Rwanda (left) Green manure incorporation in Rwanda (right)



Calliandra calothyrsus for fodder trials in Uganda (left) Tree tomato trial in Rwanda (center) Apple trial in Tigray, Northern Ethiopia (right)





Edushe Guye, Model farmer from Gerbi Village, Batu Area stands by his newly dug well (left) Tree plantation for timber production in Uganda (right)

ii. Through the project, an improved understanding of **tree-crop interactions of different species** and contexts has been achieved through establishment of five long-term trials. Tree-water-crop interactions of different tree species as

interacting components in agroforestry systems were assessed through sap flow meters in the three countries. The trials will continue to be used as experimental sites for further agroforestry research after the project phases out and will be managed by the national research partners.



Long term trial in Rwanda (left) Joel Buyinza, collecting Sap flow data at an experiment in Uganda (right)






Variation in performance of maize under different tree species *Acacia tortilis* (Highly competitive), *Cordia Africana* (Slightly competitive) and *Faidhebia albida* (enhanced growth), - in Melkassa long term trial – Ethiopia in October 2018

iii. Enhanced tree-crop modelling capability including agroforestry layout, species and functionality options and several tree and crop model options was achieved through completion

of the Agricultural Production Systems sIMulator (APSIM) Next Generation framework, www.apsim.info.² The model is fully available and functional for public use.



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APSIM Agroforestry Proxy released

Please note that the APSIM Agroforestry Model that uses a tree proxy has been released for public use. It is automatically included as an example whenever anyone downloads or upgrades APSIM Next Generation at www.apsim.info.

This is quite a significant step for agroforestry modelling, as we already know it has been useful for simulating food production in several combinations of sites and climates (temperate to tropical), crops (maize, wheat, and soybean), and trees (Gliricidia, Faidherbia, Acacia, and Eucalyptus). The trees are user-defined proxies in the Singles Tree Example and the Tree Belt Example that are downloaded. An active tree option is being developed as well.

If you have any questions about this development, please forward them apsim@cisro.au

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Recent Posts

- [The State of the Art in Modeling Waterlogging Impacts on Plants: What Do We Know and What Do We Need to Know](#)
- [Plant & Food Research – Perennial Systems Crop Modeller](#)
- [Plantation Forestry and Agroforestry Modelling](#)
- [Guidelines for Development of APSIM](#)

The Agricultural Production Systems sIMulator (APSIM) website

² <https://www.apsim.info/>



Through the project, an “Interactive Suitable Tree Species Selection and Management Tool for East Africa” was developed. This is a web-based tool that aids in understanding tree diversity and its contribution to livelihoods and landscape health and promotes the right tree for the right place for the right purpose. The tool was developed for Ethiopia³ consisting of 209 (147 native and 62 exotic), Rwanda⁴ consisting 115 (54 native and 61 exotic) tree species in Rwanda; and for Uganda⁵ consisting of 58 (31 native and 27 exotic) tree species. The tools include a collation of tree species encountered through the various study approaches employed by the project.

iv. Recommendation of cost-effective water management practices suitable for the various sites was achieved through completion of site-specific land and water management mapping processes. 184 maps depicting land types and suitable interventions were completed and shared with partners and stakeholders during ‘Training of Trainers’ sessions. The maps have been integrated in the partners’ plans as guidelines towards future establishment of land and water management related technologies.



Training and demonstration session on water management options in Rwanda

³ <http://apps.worldagroforestry.org/suitable-tree/ethiopia>

⁴ <http://apps.worldagroforestry.org/suitable-tree/rwanda>

⁵ <http://apps.worldagroforestry.org/suitable-tree/>



v. Discussions on existing policies and strategies on grazing management were held and appropriate recommendations given to policy makers, research organizations and other relevant actors to enable them to integrate sustainable grazing management options within agroforestry at local and national levels.

This resulted to the formation of a Sustainable Grazing Platform and development of a policy brief highlighting sustainable grazing policy recommendations which will continue to be applied towards the promotion of sustainable grazing management options.



Discussions with different faith leaders on sustainable grazing management in Oromia ad Tigray

vi. Country-specific tree value chains were identified as follows: Tree tomato-Rwanda, Avocado-Ethiopia, Timber and avocado-Uganda,

value chain actors and financing options were also identified for possible future engagement.



Dr. Peter Horne, General Manager - Country Programs- ACIAR joins Emmanuel Tuyizere on his tree tomato farm in Bugesera, Rwanda. Production of improved avocado seedlings in Batu RRC Ethiopia (right)



vii. A regional agroforestry curriculum guide was developed after a comprehensive assessment of agroforestry curricula and extension training involving Universities/Colleges, Integrated Polytechnic and Technical and Vocational Education and Training (TVET) institutions offering forestry and/or agroforestry courses in all countries. Validation workshops were held and skill gaps on pertinent agroforestry components identified,

which will act as entry points for incorporation of agroforestry aspects in the institutions' curriculum. The reviewed curriculum guide will be applied in academic institutions. This will ensure that unlike the past when agroforestry was either offered as a course embedded on other content, topic or chapter, it will be offered as a comprehensive course integrating all the relevant components.



Participants during the Regional Agroforestry Curriculum Review workshop in Nairobi, Kenya

3. Rural Resource Centers' model- could this be one of the innovative solutions to scaling of agroforestry interventions?

The five Rural Resource Centers (RRCs) and five satellite nurseries established by the project in Ethiopia⁶, Rwanda⁷ and Uganda⁸ have been

instrumental in production and distribution of quality germplasm, training and demonstration of agroforestry technologies. They have also provided opportunities for farmers to share their experiences with their peers as well as receive technical guidance and other services from public and private extension services. More than 4.2 million quality tree germplasm have been produced with more than 75% distribution rate

⁶ Mekuria A, Carsan S, Kiptot E et al. 2016. Batu Rural Resource Centre: A community-based approach to deliver agroforestry technologies to rural farmers. Factsheet. Addis Ababa, Ethiopia: *World Agroforestry (ICRAF)* <https://www.worldagroforestry.org/publication/batu-rural-resource-centre-community-based-approach-deliver-agroforestry-technologies>

⁷ Mukuralinda A, Carsan S, Muthuri CW et al. 2016. Karama and Karago Rural Resources Centre: A new approach to delivery of Agroforestry technology in Rwanda. Factsheet. Nairobi, Kenya: *World Agroforestry (ICRAF)*. <https://www.worldagroforestry.org/publication/karama-and-karago-rural-resource-centres-new-approach-delivery-agroforestry-technology>

⁸ 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>

across the countries. This notwithstanding, there has been creation of job opportunities to women and youths working at the RRCs in Ethiopia. As a result, the model has attracted interest across different institutions with more than 16 RRCs being established in different sites in Ethiopia and 10 more RRCs in Rwanda. Moreover, farmers and farmer groups were observed to have started their own private nurseries after acquiring training from

the RRCs. This indicates that through the RRCs, the communities are able to acquire quality tree planting materials which have better survival rates and receive technical assistance on tree planting and management. This coupled with the potential for income generation from the tree-related practices undoubtedly makes agroforestry technologies attractive to the communities.



Karago RRC in Rwanda (left) T4FS project team field visit at a tree seedlings nursery in Mbale, Uganda (right)



Potting activities in Karama RRC, Rwanda (left) and grafting at Batu RRC nursery, Ethiopia (right)

4. Project contribution to policy influence

The project has contributed to policy influence through engagement in policy formulation in all the countries. In Ethiopia, a National Agroforestry

Platform (NAP) which contributed to achievement of Ethiopia's agricultural transformation agenda was formed. The platform has been chaired by the Ministry of Agriculture (MoA) and ICRAF has been serving as permanent secretariat. This further led to formation of a National Watershed and



Agroforestry Multi-Stakeholder Platform (NWAMP) with various government ministries and NGOs. In Rwanda, ICRAF was engaged by the Food and Agriculture Organization (FAO) in the development of a Rwandan National Agroforestry Strategy and Action Plan while in Uganda, the project through ICRAF contributed to the formation of

a National Forestry Consultative Forum (NFCF), platform through the Ministry of Water and Environment (MWE) in 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.



Official launch of the National Watershed and Agroforestry Multi-stakeholders Platform in Ethiopia



Scaling up Agroforestry impacts through Policy, Innovations and Partnerships 4th National Agroforestry Conference





The former Australian Ambassador to Kenya, Burundi, Rwanda, Somalia, Tanzania and Uganda (in the middle), RAB Director General (far right) and other stakeholders during visit to Rwanda

5. Capacity Building on Agroforestry Technologies

T4FS-2 project implementation approaches are gender responsive as we endeavor to ensure women and girls benefit from our interventions

A total of 10,347 members benefited through capacity development activities including training and demonstrations, at least a third comprised women and youth. In addition, the project supported 8 PhD and 2 MSc students.



ODK training in Rwanda (left) farmer training session in Uganda (right)





Water management training session in Uganda (left), training and demonstration at Bako RRC (right)

6. Scaling up and out of Agroforestry Interventions

Following the successful completion of the first phase of the Trees for Food Security project, that saw the award and support of the second phase

by ACIAR, successes and lessons learnt during the first phase of the project were scaled out to additional sites during the second phase. Scaling-out was achieved through development of a comprehensive scaling strategy that was adapted for the various countries.




World Agroforestry Centre

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SCALING UP AND OUT STRATEGY FOR THE TREES FOR FOOD SECURITY PROJECT PHASE TWO 2018



Introduction

Scaling out is defined as the geographical spread of a technology, practice or systems change over time while scaling up refers to expanding beneficial institutional and capacity building

Scaling Up and Out Strategy for T4FS-2 Project

Examples of successes in scaling include introduction of two agroforestry options (tree tomatoes and climbing beans including promoting appropriate stakes for supporting the beans) which were very successful in sub-humid areas of Gishwati and adapting them to the semi-arid areas of Bugesera, Rwanda, introduction of

apple production in Tigray, Ethiopia and fodder production in Manafwa, Uganda. In Ethiopia, the participatory trials approach was adopted by the Integrated Watershed Development and Productive Safety Nets Program financed by the World Bank in implementation of its activities. In addition, the RRC approach was picked up by the Packard



Foundation financed project to create women and youth centered green jobs. In Rwanda, more than ten RRCs have been established through Rwanda Agriculture and Animal Resources Development Board (RAB) as hubs for quality germplasm production as well as training and demonstration of agroforestry technologies. In Uganda, an

additional RRC has been established in Arua. The project has had significant spillover effect, with agroforestry best practices being continually adopted by non-project farmers. As such, it is expected that there will be continuous adoption of the technologies even beyond project life.

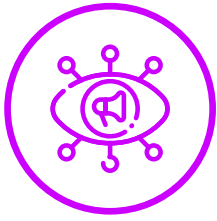


ACIAR Chief Executive Officer, Professor Andrew Campbell during his visit to Batu Rural Resource Centre in Ziway, Ethiopia



Community work 'Umuganda' has been used as an approach to distribute seedlings and promote tree planting efforts for soil conservation and erosion control in Rwanda





Project recognition and visibility

In Uganda, the project was accredited to the Queen's Commonwealth Canopy⁹ (QCC) initiative. The title of the project is 'The Mount Elgon Trees for Food Security Project' under this initiative. This has provided great opportunity, visibility and profile to project activities in Uganda.

An approval of the Launch event fund application totaling A\$52,837 to attend the World Congress on Agroforestry in Montpellier, France, from 19th to 23rd May 2019 was done. The fund enabled 17 researchers from five ACIAR projects including 9 from T4FS to attend. One keynote, two oral and ten posters were presented at the congress. The researchers also participated in the ACIAR side

event. Presentation of project findings was done through conferences where up to six abstracts submitted to conferences such as International Tropical Agriculture Conference (TropAg) 2019, Forests, Trees and Agroforestry (FTA) in September 2020 and the 3rd joint National Agricultural Research Organisation and Makerere University Scientific Conference (NARO-MAK) that is yet to be held.

Communication products packaged for different audiences were produced and disseminated to the wider public through various channels including online platforms. The project web page serves as a repository and great source of information.

The screenshot shows the 'News' section of the T4FS-2 project web page. The navigation menu includes Home, Phase 1 Outcomes, Activities, Outputs, Staff, News (highlighted), and Publications. The news grid contains the following articles:

- Catherine Muthuri on women's leadership and COVID-19**: A group of people, including Catherine Muthuri, are gathered outdoors.
- Q+A: How women and girls can succeed in science**: A group of women and girls are standing in a field, possibly engaged in a Q&A session.
- New pruning techniques in Uganda are showing farmers that trees are more valuable in the ground than on the woodpile**: A man is pruning a tree in a field.
- Women and youth turning to tree-based enterprises for livelihoods in Mount Elgon, Uganda**: A man is working on a tree in a field.
- More stakes, more climbing beans, less malnutrition: Rwanda finds a solution in agroforestry**: A man is working in a field with climbing beans.
- Announcement: Catherine Muthuri appointed Regional Coordinator for Eastern and Southern Africa region**: A portrait of Catherine Muthuri smiling.
- Tree tomato growing paying-off for a smallholder farmer in Rwanda**: A close-up of several red tree tomatoes.
- Trees for Food Security Project bearing fruit in Ethiopia**: A man is standing next to a tree in a field.

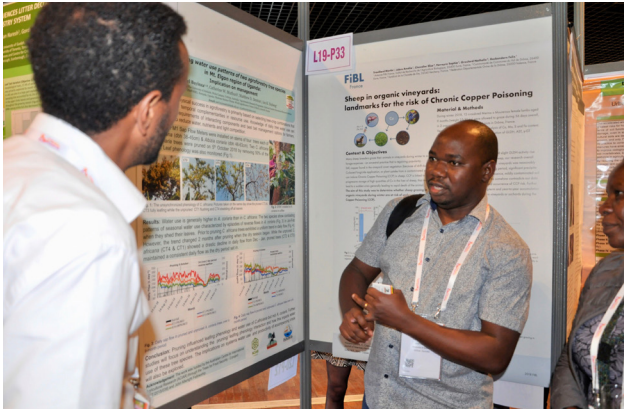
Some of the stories found in the T4FS-2 project web page on ICRAF website

T4FS-2 Project findings have been published in 12 journal articles, five technical manuals, and over

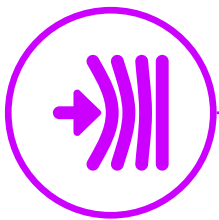
100 technical outputs including reports, theses/ dissertations, posters, tools and databases.

⁹ <https://queenscommonwealthcanopy.org/projects/mount-elgon/>





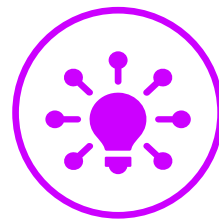
Joel Buyinza, making a poster presentation (left) and John Nyaga making an oral presentation (right) during the 2019 World Congress on Agroforestry in Montpellier France



Challenges encountered: Adapting and resilience

Despite the T4FS-2 project facing challenges, it has remained resilient and managed to achieve its objectives in terms of reaching large number of beneficiaries with appropriate agroforestry technologies. Some of the challenges are highlighted below:

- Political unrest in Ethiopia experienced on various occasions including the currently ongoing war in Tigray, one of T4FS project sites
- COVID-19 pandemic that has not only resulted in reduced field work activities but also delays in the finalization of a few deliverables
- Prolonged drought in the three countries that challenged the optimal survival of trees
- A third phase of the project not been approved to consolidate the gains from the project to achieve greater impact at scale.



Opportunities exist!

- The long-term trials will continue to be used as experimental sites for agroforestry research in the respective countries
- Through the participatory trials, all stakeholders will continue testing and implementing best-fit options in the specific sites. Communities will be able to innovate the technologies to suit their needs hence making the technologies more relevant and sustainable. We recommend facilitating development of linkages with the context-relevant private sectors to provide the necessary investment and expertise
- The APSIM model that is available for public use will be utilized further for agroforestry trees-crop modelling. There is therefore need for continued collaboration on this with CSIRO to maximize on project data
- The RRCs will continue to benefit the women and youths working therein as well as the communities through income generation for the former and acquisition of quality germplasm, training and demonstrations for the latter



- Buy-in on agroforestry initiatives by the national projects that was fostered by the project as well as influence on national policies will enable integration of agroforestry agenda in the national priorities and plans
- The strong network of partnerships created through the project will ensure that the project technologies continue to be implemented by the partners. It is also important also as we look ahead, to enhance participatory M&E processes at the community level
- Contribution to scientific knowledge through publications will go on through the comprehensive data base created by the project through Open data Kit (ODK) collection and data management
- Gaps in research and development that were identified in the course of project implementation will inform areas to focus on in resource mobilization going forward.

In pictures



Inception workshop in Rwanda



Steering committee meeting at ICRAF Headquarters



ACIAR Regional Director visit in Rwanda



ACIAR CEO visit in Ethiopia





The former Australian High Commissioner visit in Rwanda



The former Australian High Commissioner with TF4S-2 project team and Senior Leadership Team at ICRAF Headquarters



Mid-term review in Uganda



ACIAR side event at the 2019 World Congress on Agroforestry in Montpellier, France





Catherine Muthuri giving a keynote speech during the WCA

Useful resources and links

Project website

<https://www.worldagroforestry.org/project/trees-food-security-2-developing-integrated-options-and-accelerating-scaling-agroforestry>

Dataverse

<https://dataverse.harvard.edu/dataverse/T4FS>

Project videos on You tube

<https://www.youtube.com/watch?v=XE2S6XGV8Pg>

https://www.youtube.com/watch?v=nA46C_1GvhM

<https://www.youtube.com/watch?v=Pamgbg6IOYQ>

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