FTA HIGHLIGHTS OF A DECADE
2011-2021

CGIAR

RESEARCH PROGRAM ON
Forests, Trees and
Agroforestry

10 YEARS OF FTA RESEARCH FOR PEOPLE AND THE PLANET

Effective Tree Seed Systems

**Flagship 1: Tree genetic resources
to bridge production gaps and promote resilience**

10 YEARS OF FTA RESEARCH FOR PEOPLE AND THE PLANET

FTA HIGHLIGHTS OF A DECADE
2011–2021

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry

CGIAR

THE RIGHT TREE FOR THE RIGHT PLACE FOR THE RIGHT PURPOSE

- **Safeguarding Diversity:** how best to conserve high value tree species (fast disappearing diversity)

- **Breeding/Improvement:** how best to develop quality germplasm

- **Seed Delivery Systems:** How to mobilize integrated seed and seedlings systems

- **Returns on Investments:** integrated approach to quality seed production and use

Soaring global ambitions and large scale initiatives to plant trees

- Bonn Challenge, AFR 100, 20 x 20, 1t.org, Trillion Trees and plethora of groups/bodies supporting tree planting.

- Hundreds of millions of hectares pledged by governments, corporates and civil society for tree-planting, reforestation, much for carbon.

- The UN Decade on Ecosystem Restoration 2021 to 2030

- At COP26 100 leaders promise to end and reverse deforestation by 2030

10 YEARS OF FTA RESEARCH FOR PEOPLE AND THE PLANET

FTA HIGHLIGHTS OF A DECADE
2011-2021

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry
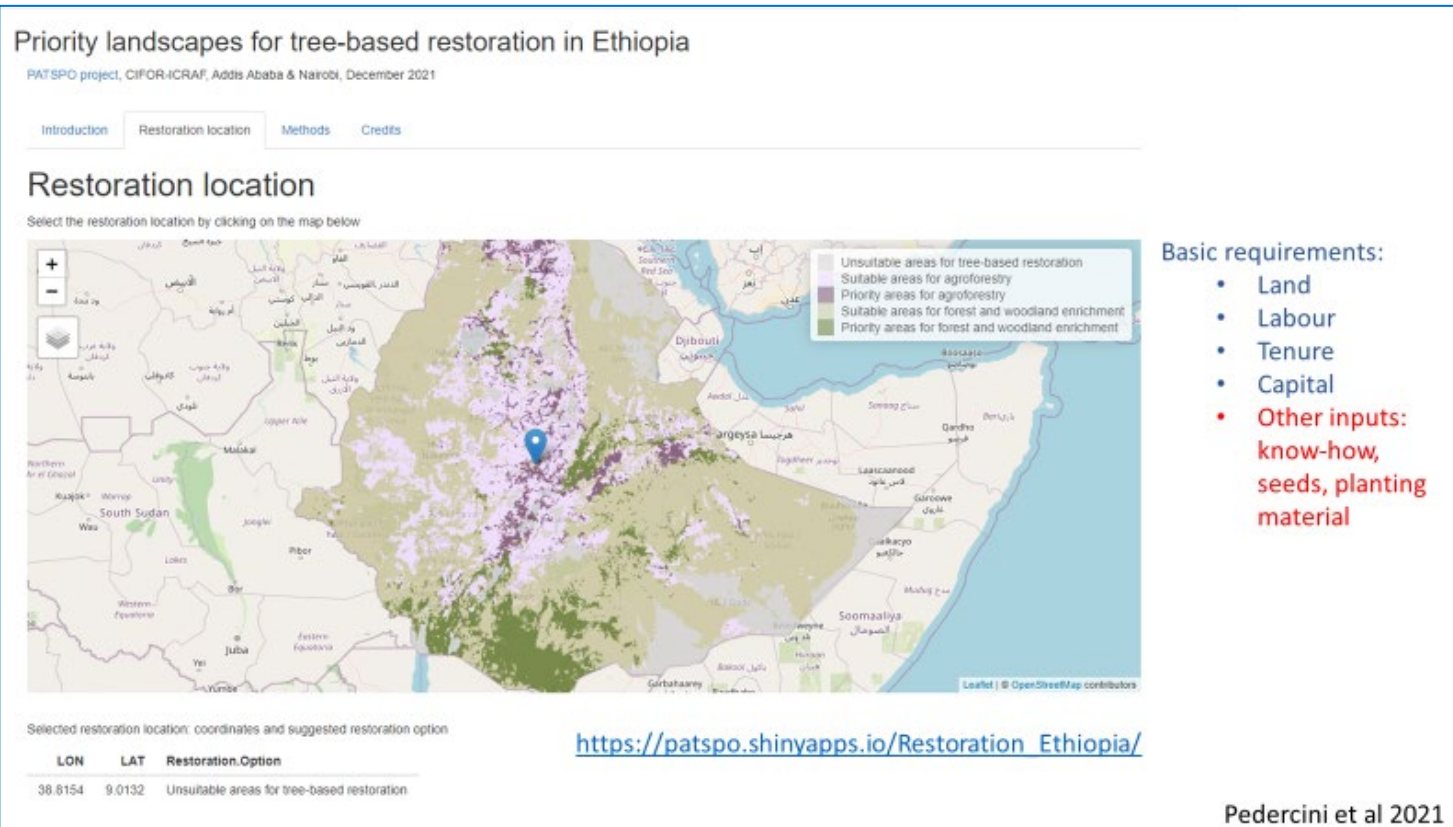CGIAR

Concern: massive scale and speed

- Lack of seeds for diverse species- quick way out- exotic species promoted- low diversity monocultures favoured over diverse portfolios

- Poorly designed projects

- Tree-planting platforms with limited skill and knowledge (especially tree genetics)

- Southern governments ill equipped to drive tree diversity agenda

- National seed centres in collapse

- Global and national decline in knowledge of botany and taxonomy

- Donors/Investors are generalists, do not ask "pointed" question

Provision of adequate tree seed portfolios in Ethiopia (PATSPO)
NICFI funded 'model tree seed systems'
Improving the availability of quality tree seed

https://www.worldagroforestry.org/project/provision-adequate-tree-seed-portfolio-ethiopia

Priority landscapes for tree-based restoration in Ethiopia
PATSPO project, CIFOR-ICRAF, Addis Ababa & Nairobi, December 2021
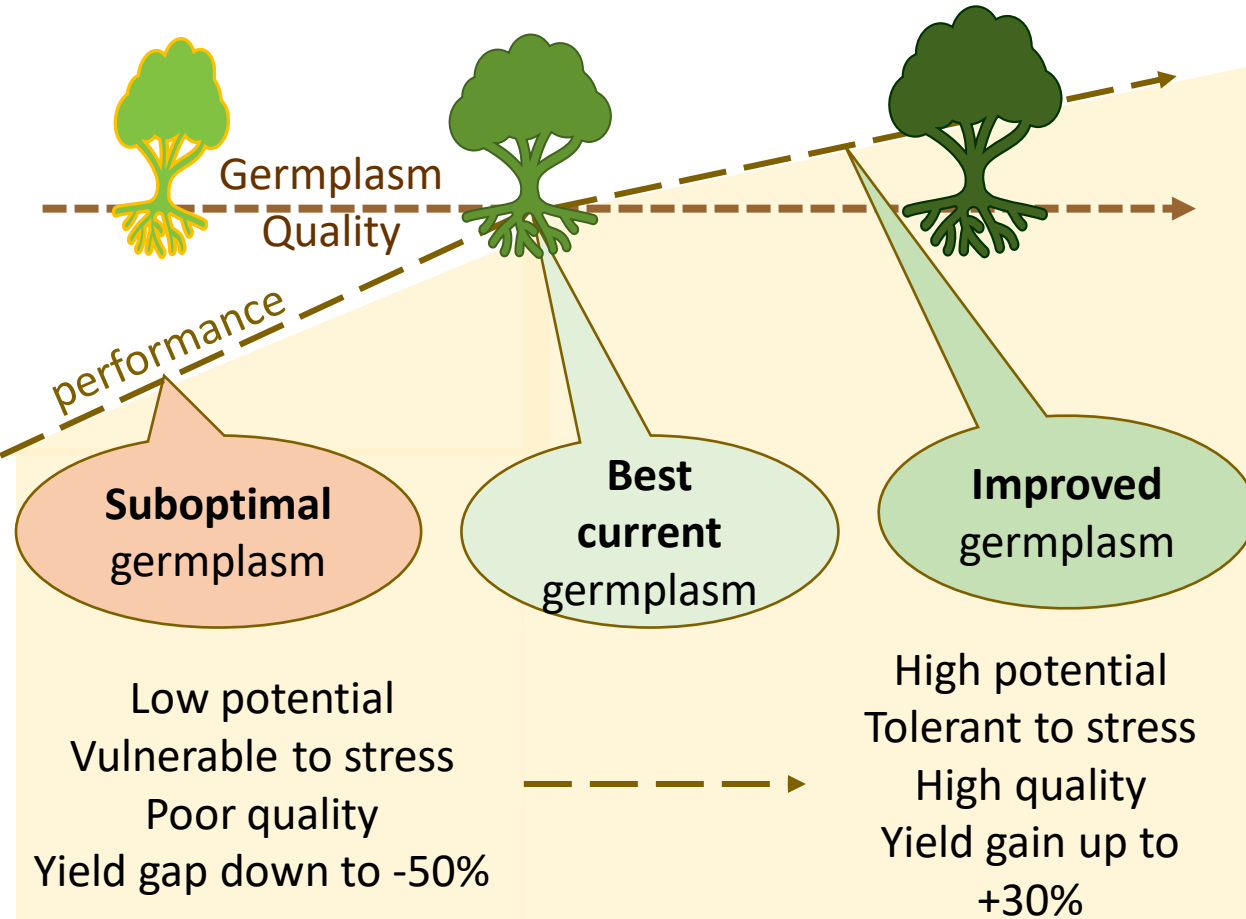
Pedercini et al 2021

Availability of profitable **climate appropriate portfolios of tree diversity** are being built in support of one of the globally largest national restoration programmes using an integrated approach to conservation, breeding and delivery supported by the CIFOR-ICRAF Genebank

Can be implemented everywhere

Based on half a century of experience and evidence from both tropical and temperate regions

5

Loss and gain – huge benefits at low cost

Germplasm Quality impacts Tree performance

Germplasm Quality

performance

Suboptimal germplasm

Best current germplasm

Improved germplasm

Low potential
Vulnerable to stress
Poor quality
Yield gap down to -50%

High potential
Tolerant to stress
High quality
Yield gain up to +30%

Societal and planetary benefits can be huge
Applied on the plans for Ethiopia over 30 years:

- *Net Present Value* will increase by USD 11 billion
- *Soil conservation* of 160 million t of soil per year
- *Carbon sequestration* of 178 million t CO_2-e per year
- Reaching 4 million rural households
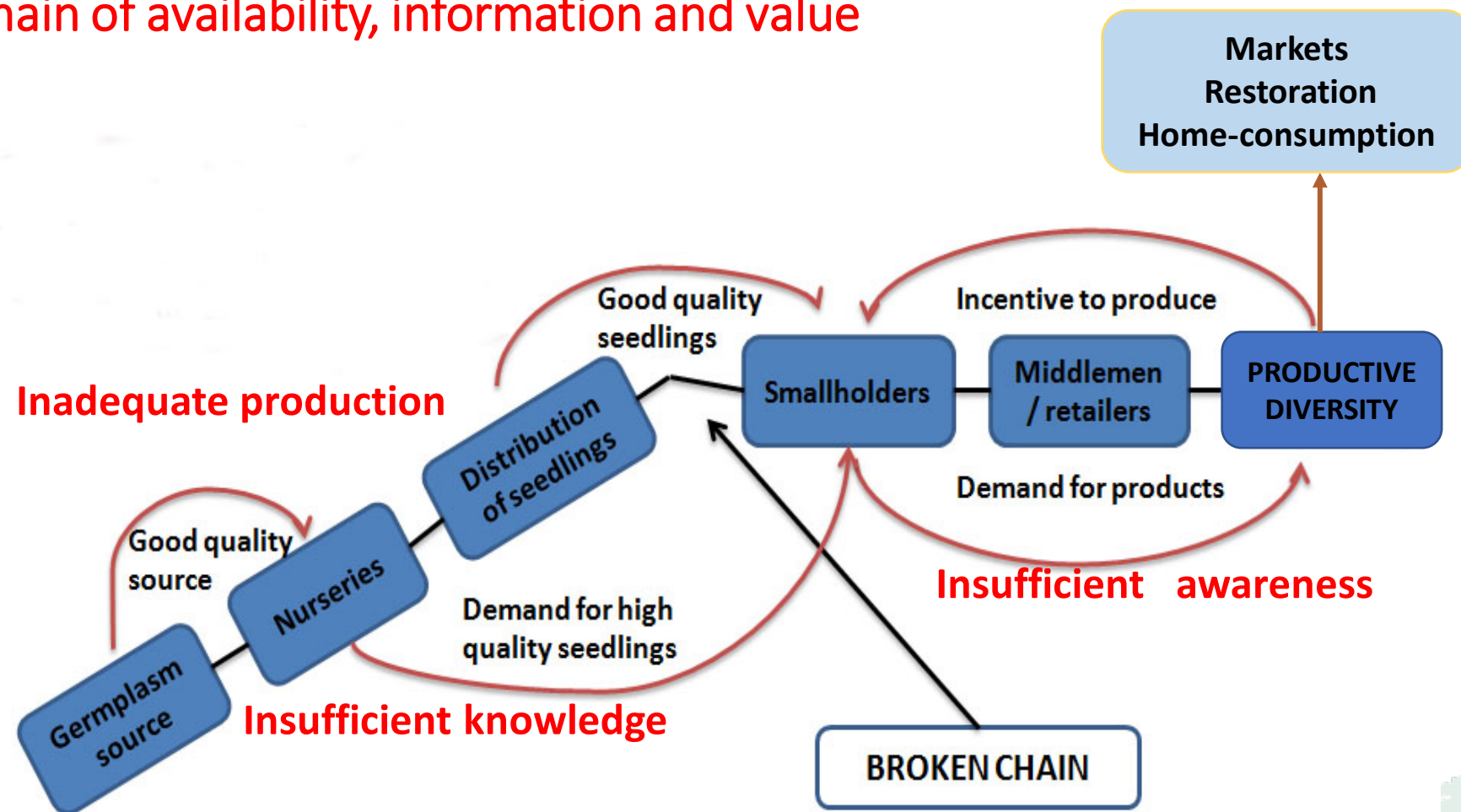
Benefits after processing (sawing, transporting, nutrition and health), on employment generation and on biodiversity not included

Major bottlenecks in input supply and demand with a broken chain of availability, information and value

Broken value-chain

Why does it not happen?

- Long life cycle of trees
- Insufficient knowledge
- Insufficient awareness
- Lack of investments

Markets
Restoration
Home-consumption

Inadequate production

Good quality seedlings

Incentive to produce

Smallholders

Middlemen / retailers

PRODUCTIVE DIVERSITY

Demand for products

Good quality source

Nurseries

Distribution of seedlings

Demand for high quality seedlings

Germplasm source

Insufficient awareness

Insufficient knowledge

BROKEN CHAIN

What to Plant Where in Ethiopia - version for practitioners 1.0

Kindt et al 2021

Apps and Maps: **Africa Tree Finder** and **Vegetationmap4Africa**

(contributed to Ecoregions 2017)

DIVERSITY *for* RESTORATION

Alliance

Bioversity International

CIAT — International Center for Tropical Agriculture

User input:
Restoration site conditions | Location | Restoration objectives

Output: Different recommended species combinations | Recommended seed zones and seed sources | Propagation info | Monitoring recommendations

Apps and Maps

Useful Tree Species for Africa

Google Earth KML overlay
ShinyApp (2021)

Climate Change Atlas for Central America

Global Tree Knowledge Platform:
https://www.worldagroforestry.org/tree-knowledge

(all links from there – not repeated here)

Tree Databases
includes the **Agroforestree Database** which explores the uses and ecologies of over 600 tree species used in agroforestry systems globally and has been accessed > 300,000 times.

Apps and Maps
includes interactive maps such as the **vegetationmap4Africa** that helps development practitioners, growers and scientists to understand what tree species grow where in the region. Documentation has been downloaded > 40,000 times.

Guidelines
These include the **Tree Domestication Primer** and **Good Tree Nursery Practices** which guide scientists and practitioners. Downloaded > 50,000 times.

Analysis packages
These include **BiodiversityR** and **vegan** which provide a range of methods for ecologists to statistically analyse tree species diversity data. Together, these have been installed by users > 2,600,000 times.

https://www.worldagroforestry.org/tree-knowledge

10 YEARS OF FTA RESEARCH FOR PEOPLE AND THE PLANET

FTA HIGHLIGHTS OF A DECADE
2011–2021

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry

CGIAR

Guidelines

The Resources for Tree Planting Platform
https://www.worldagroforestry.org/output/resources-tree-planting-platform

Tree databases

Agroforestree Database

Agroforestry Species Switchboard

Tree Functional Attributes and Ecological Database

Priority Food Tree and Crop Food Composition Database

TREE DATABASES
These include the **Agroforestree Database**, which explores the uses and ecologies of over 600 tree species used in agroforestry systems globally. It has been accessed > 300,000 times.

Tree Seeds for Farmers

Mama Wangari Maathai at CIFOR-ICRAF seed lab

CIFOR

World Agroforestry

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry
CGIAR

Global Landscapes Forum

Resilient Landscapes

Offers for business and development corporation
for any larger planting programme

Quality tree germplasm and effective tree planting/growing actions:

- Mobilize prioritized species collections, conserve, develop and deliver on the global public good of the CIFOR-ICRAF Tree Genebank

- Build national capacity and infrastructure

- For deployment, establish diversity breeding programmes - breeding seed orchards &, multiplication gardens, optimized nursery operations

- Research outcomes in open access decision support tools and information platforms

- Establish a partnership platform to scale up tropical tree conservation and quality planting

- Innovative business approaches to sustainably establish, fund and monitor community tree conservation and use

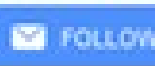# FTA HIGHLIGHTS OF A DECADE
2011–2021

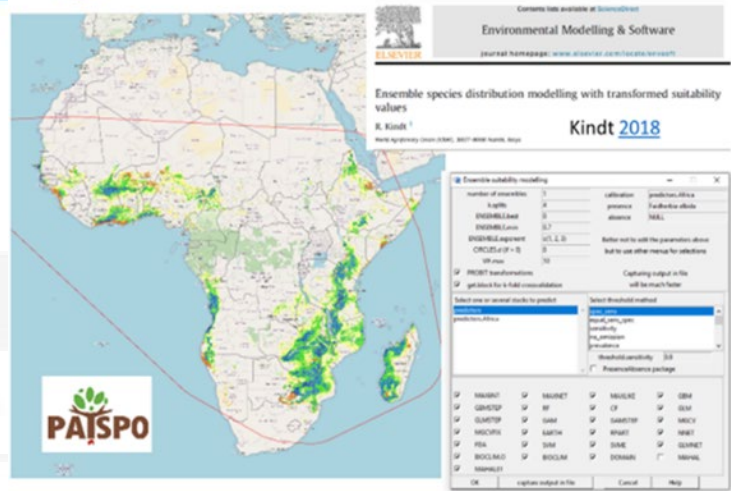RESEARCH PROGRAM ON Forests, Trees and Agroforestry

CGIAR

Kindt, Roeland

FOLLOW

senior scientist, World Agroforestry CIFOR-ICRAF, Kenya; Forests, Trees and Agroforestry (CGIAR)
Verified email at CGIAR.org - Homepage

agroforestry ecology biogeography biodiversity climate change

ARTICLES   CITED BY   PUBLIC ACCESS

	All	Since 2016
Citations	52952	39931
h-index	51	43
i10-index	210	163

Climate change atlas for Africa – ensemble modelling with *BiodiversityR*

Environmental Modelling & Software

Ensemble species distribution modelling with transformed suitability values
R. Kindt

Kindt 2018

- Ensemble modelling based on 25 algorithms (maximum entropy, boosted regression trees, random forests, artificial neural networks, support vector machines, (stepwise) GLM, (stepwise) GAM, BIOCLIM, DOMAIN, ...)
- Unique features such as tuning of ensemble weights, 'environmental thinning' of presence observations, transformation of suitability values, count suitability maps...
- Baseline and future (2050s) modelling for various sets of species
  - 150+ useful tree species selected by PATSPO Ethiopia restoration project
  - 126 vegetable species important in Africa (in collaboration with World Vegetable Centre, van Zonneveld et al. 2020)
  - 100 species identified by the African Orphan Crops Consortium
  - 23 priority species for Gambia GCF
- *BiodiversityR* has already been installed > 180,000 times in RStudio
- Graphical User Interface and manuals

PATSPO

https://www.worldagroforestry.org/tree-knowledge

Package	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOTAL
AlleleShift	0	0	0	0	0	0	0	0	0	5,940	**5,940**
RcmdrPlugin.WorldFlora	0	0	0	0	0	0	0	0	4,130	7,887	**12,017**
WorldFlora	0	0	0	0	0	0	0	373	8,168	9,046	**17,587**
vegan3d *	0	0	841	5,852	6,016	8,023	9,089	21,206	29,409	13,983	**94,419**
maxlike *	141	1,914	4,553	9,753	10,340	22,389	17,383	25,279	28,364	24,862	**144,978**
BiodiversityR	341	5,642	9,690	15,007	15,998	32,048	27,292	35,772	37,238	36,474	**215,502**
vegan *	1,961	40,461	75,683	138,587	233,016	337,982	474,135	542,132	526,778	542,839	**2,913,574**
TOTAL	**2,443**	**48,017**	**90,767**	**169,199**	**265,370**	**400,442**	**527,899**	**624,762**	**634,087**	**641,031**	**3,404,017**

12

QUALITY SEEDS have 'PLANETARY AND SOCIETAL' benefits
It's absolutely WICKED and CRIMINAL not using good seed

- There is science behind use of integrated seed systems so if you are involved in any kind of tree planting talk to the experts in the field; work at the project design stage of tree planting initiatives

- 30% of tree species are threatened –conservation *ex situ, in situ* and *circa situ* is an urgent priority

- Public and private investors in tree planting : Integrated tree seed systems have been neglected long enough so require long term investment investments urgently

- Scientists – reach out and scale out existing experience and knowledge to support the burgeoning forest landscape restoration and broader tree planting initiatives.

10 YEARS OF FTA RESEARCH FOR PEOPLE AND THE PLANET

FTA HIGHLIGHTS OF A DECADE
2011–2021

RESEARCH PROGRAM ON
Forests, Trees and Agroforestry
CGIAR

A MIGHTY TREE STARTS FROM A SEED
Integrated Tree Seed System EXPERTS of FTA- Flagship 1

Lars Graudal, Jens-Peter B Lillesø, Ian K Dawson, Abrham Abiyu, James M Roshetko, Isaac Nyoka, Alain Tsobeng, Roeland Kindt, Fabio Pedercini, Soren Moestrup, Riina Jalonen, Evert Thomas, Stepha McMullin, Sammy Carsan, Prasad Hendre, Chris J Kettle, Li Yanxia, Ramni Jamnadass

Thank you so very much for all your excellent work

Hope to work with you again and soon in FTA PHASE 3 perhaps?

CIFOR · World Agroforestry · Alliance Bioversity International · CIAT International Center for Tropical Agriculture · CATIE Solutions for environment and development · cirad LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT · INBAR INTERNATIONAL BAMBOO AND RATTAN ORGANISATION · TROPENBOS INTERNATIONAL