

Outcome Assessment and Impact Estimation: FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

An Integrative Study of the Forests, Trees and
Agroforestry Research Program (2010-2020)



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Agroforestry



Alliance



Cover photo: Women in Jepara's teak forest area harvest ground nuts, Central Java, Indonesia. Photo: Murdani Usman/CIFOR

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Acknowledgements

This study was supported by the CGIAR Research Program on Forests, Trees and Agroforestry. The MELIA teams at CIFOR, ICRAF, Bioversity International, and the Sustainability Research Effectiveness Program at Royal Roads University thank all interview respondents who participated in the assessment. We thank Dang Thi Thanh Thuong for her support in the deep dive case study in Vietnam. We thank Sufiet Erlita for her support in compiling the research metric data. We extend thanks to members of FTA's Independent Steering Committee (Anne-Marie Izac, Florencia Montagnini, Susan Braatz, Linda Colette, Robert Nasi, Richard Stanislaus Muyungi, René Boot, Vincent Gitz, Stephan Weise), FTA's Flagship Leaders (Ramni Jamnadass, Fergus Sinclair, Michael Allen Brady, Peter A. Minang, Christopher Martius), as well as representatives from FTA partner organizations (Yanxia Li, La Nguyen, Mita M. Sambo, Anja Gassner, Patricia Masikati, Beria Leimona, Joyce Njoloma, Valentina Robiglio, Martin Reyes, Betha Lusiana, Anne Larson, Phosiso Sola, Niguse Hagazi, Andrew Wardell, Guillaume Lescuyer, Paolo Cerutti, Herry Purnomo, Pham Thu Thuy, Ani Adiwinata, Rachmat Mulia, James Roshetko, Laura Snook) for their inputs to the assessment. We extend special thanks to Anne-Marie Izac, Florencia Montagnini, Vincent Gitz, and Alexandre Meybeck as peer reviewers of the Challenge 4 report.

Led by

Sustainability Research Effectiveness Program, Royal Roads University (Daniela Pinto, Rachel Davel, Rachel Claus, Brian Belcher).

Supported by

CIFOR (Jean-Charles Rouge, Stephanie Jones, Tobias Thuerer, Pasha Rachman, George Wakesho), ICRAF (Yoshiko Saigenji, Karl Hughes, Kai Mausch, Ravic Nijbroek), Bioversity International (Elisabetta Gotor, Marta Kozicka, Gabriela Wiederkehr, Tsega Wolday), FTA MELIA (Federica Coccia).

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This evaluation was carried out as part of the as part of the [CGIAR Research Program on Forests, Trees and Agroforestry](#) (FTA). FTA is the world's largest research for development program to enhance the role of forests, trees and agroforestry in sustainable development and food security and to address climate change. CIFOR leads FTA in partnership with ICRAF, the Alliance of Bioversity International and CIAT, CATIE, CIRAD, INBAR and TBI.

FTA's work is supported by the [CGIAR Trust Fund](#).

Table of Contents

List of Tables	iii
List of Figures	iii
List of Boxes	iii
List of Acronyms	iv
1. Executive Summary	x
2. Introduction	1
3. Methods	2
4. Limitations	8
5. Challenge 4 Theory of Change	9
6. Results	14
6.1 Outcome Assessment	14
6.1.1 FLEGT (Congo Basin) Cluster Results.....	15
6.1.2. Timber Markets (Central Africa) Cluster Results.....	19
6.1.3. Diversification of Agroforestry-based Income in Sub-Saharan Africa Cluster Results.....	20
6.1.4. Sustainable Forest Enterprises in Cameroon Cluster Results.....	29
6.1.5. Agroforestry Concessions (Peru) Cluster Results.....	30
6.1.6. Forestry and Tree Value Chains in Latin America Cluster Results	32
6.1.7. Gender Issues in the Oil Palm Sector in Indonesia Cluster Results.....	35
6.1.8. Furniture Value Chains in Indonesia Cluster Results	35
6.1.9. Diversification of Agroforestry-based Income in Asia Cluster Results	37
6.1.10. Payment for Environmental Services in Asia Cluster Results.....	46
6.1.11. Climate-resilient Livelihoods in Asia Cluster Results	49
6.1.12. Tenure Mechanisms (Global) Cluster Results	50
6.1.13. Forest-based Livelihoods (Global) Cluster Results	54
6.1.14. Bioenergy (Global) Cluster Results	56
6.2 Discussion of Outcomes Achieved Per Actor Group	67
6.3 Impact Estimation	69
6.4 Assumptions	71
7. Conclusions	73
7.1 Lessons Learned and Recommendations	74
7.2 Challenges to Overcome and Recommendations for Enhanced MELIA	78
8. References	82
Appendix 1. Challenge 4 Cluster-level ToC Models and Narratives	83
Appendix 2. Disaggregated Cluster Appraisal of Existing and Available Evaluation Evidence (by Project)	113

List of Tables

Table 1. Summary of FTA's realized outcomes across Africa, Asia, and Latin America for Challenge 4	xiii
Table 2. FTA's Expected Results (as noted in FTA's Phase II Proposal).....	1
Table 3. FLEGT (Congo Basin) Cluster: Key results	18
Table 4. Timber Markets (Central Africa) Cluster: Key results	19
Table 5. Diversification of Agroforestry-based Income (Sub-Saharan Africa) Cluster: Key results	20
Table 6. Sustainable Forest Enterprises (Cameroon) Cluster: Key results.....	29
Table 7. Agroforestry Concessions (Peru) Cluster: Key results	30
Table 8. Forestry and Tree Value Chains (Latin America) Cluster: Key results	32
Table 9. Gender Issues in the Oil Palm Sector (Indonesia) Cluster: Key results.....	35
Table 10. Furniture Value Chains (Indonesia) Cluster: Key results	35
Table 11. Diversification of Agroforestry-based Income (Asia) Cluster: Key results	44
Table 12. Payment for Environmental Services (Asia) Cluster: Key results	48
Table 13. Climate-resilient Livelihoods (Asia) Cluster: Key results	50
Table 14. Tenure Mechanism Cluster: Key results.....	53
Table 15. Forest-based Livelihoods (Global) Cluster: Key results.....	55
Table 16. Bioenergy (Global) Cluster Results: Key results.....	64
Table 17. Estimations of total impact for Challenge 4.....	70
Table 18. Assessment of Assumptions for Challenge 4.....	71
Table 19. Cluster Details: FLEGT (Congo Basin).....	83
Table 20. Cluster Details: Timber Markets (Central Africa).....	85
Table 21. Cluster Details: Diversification of Agroforestry-based Income in Sub-Saharan Africa	87
Table 22. Cluster Details: Sustainable Forest Enterprises in Central Africa	90
Table 23. Cluster Details: Agroforestry Concessions in Peru	92
Table 24. Cluster Details: Forestry and Tree Value Chains in Latin America	94
Table 25. Cluster Details: Gender Issues in the Oil Palm Sector in Indonesia	96
Table 26. Cluster Details: Furniture Value Chains in Indonesia	98
Table 27. Cluster Details: Diversification of Agroforestry-based Income in Asia	100
Table 28. Cluster Details: Payment for Environmental Services (Asia)	103
Table 29. Cluster Details: Climate-resilient Livelihoods (Asia).....	105
Table 30. Cluster Details: Tenure Mechanisms (Global).....	107
Table 31. Cluster Details: Forest-based Livelihoods (Global)	109
Table 32. Cluster Details: Bioenergy (Global).....	111

List of Figures

Figure 1. Summary overarching ToC outlining expected FTA's contributions to Challenge 4.	13
Figure 2. Countries where FTA carried out research on topics mapped to Challenge 4.	14
Figure 3. Cluster ToC for FTA research on FLEGT (Congo Basin)	84
Figure 4. Cluster ToC for FTA research on Timber Markets (Central Africa).....	86
Figure 5. Cluster ToC for FTA research on Diversification of AF-based Income in Sub-Saharan Africa.....	89
Figure 6. Cluster ToC for FTA research on Sustainable Forest Enterprises in Central Africa.....	91
Figure 7. Cluster ToC for FTA research on Agroforestry Concessions in Peru	93
Figure 8. Cluster ToC for FTA research on Forestry and Tree Value Chains in Latin America	95
Figure 9. Cluster ToC for FTA research on Gender Issues in the Oil Palm Sector in Indonesia.....	97
Figure 10. Cluster ToC for FTA research on Furniture Value Chains in Indonesia	99
Figure 11. Cluster ToC for FTA research on Diversification of Agroforestry-based Income in Asia	102
Figure 12. Cluster ToC for FTA research on Payment for Environmental Services (Asia)	104
Figure 13. ClusterToC for FTA research on Climate-resilient Livelihoods (Asia)	106
Figure 14. Cluster ToC for FTA research on Tenure Mechanisms (Global).....	108
Figure 15. Cluster ToC for FTA research on Forest-based Livelihoods (Global)	110
Figure 16. ClusterToC for FTA research on Bioenergy (Global).....	112

List of Boxes

Box 1. FTA Showcase: Assisting the Development of an Agroforestry Policy in India	39
Box 2: Agroforestry in Vietnam, a deep dive	43
Box 3: Diversified Bamboo Value-chain in Uganda, a deep dive.....	57

List of Acronyms

ACIAR	Australian Centre for International Agricultural Research
ACM	Adaptive Collaborative Management
ACOFOP	<i>Asociación de Comunidades Forestales de Petén</i> (Association of Forest Communities of Petén, Guatemala)
ADB	Asian Development Bank
AFSP	Agroforestry Food Security Programme
AEDC	Agricultural extension development coordinator
AEDO	Agricultural extension development officer
AFC	Agroforestry concessions
AFLI	Agroforestry for livelihoods of smallholder farmers in Northwest Vietnam Project
AFS	Agroforestry system
AgFor	Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action Project
AGRENES	Agriculture, Environment and Ecosystem
AgroFor	Peru's Agroforestry Concessions Scheme: Collaborative Action to secure Multi-level Readiness for Implementation of an Innovative, Transformative Policy Project
ANCOVA	<i>Association nationale du collectif des vendeurs et assimilés de bois</i> (National Association of Wood Sellers and Related Workers)
APKJ	<i>Asosiasi Pengrajin Kayu Jepara</i> (Jepara Wood Crafts Association)
ASEAN	Association of South East Asian Nations
BAK	Bamboo Association of Kenya
BARADEP	Bamboo and Rattan Development Programme (Ghana)
BBC	British Broadcasting Corporation
BICU	Bluefields Indian and Caribbean University
BoARD	Bureau of Agriculture and Rural Development (Ethiopia)
BPS	<i>Badan Pusat Statistik</i> (National Statistics Bureau, Indonesia)
CAR	Central African Republic
CARE	Cooperative for Assistance and Relief Everywhere
CaSAVA	Capacity Strengthening Approach to Vulnerability Assessment method
CATIE	<i>Centro Agronómico Tropical de Investigación y Enseñanza</i> (Tropical Agricultural Research and Higher Education Center)
CATS	Community Agroforestry Tree Seed
CBA	Cost Benefit Analysis
CBO	Community-based organization
CERSGIS	Centre for Remote Sensing and Geographical Information Services (Ghana)
CFE	Community forest enterprise
CFM	Community forest management
CFR	Central Forest Reserve of Uganda
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency
CIDCA	China International Development Cooperation Agency
CIFOR	Center for International Forestry Research
CIRAD	<i>Centre de Coopération Internationale en Recherche Agronomique pour le Développement</i> (French Agricultural Research Centre for International Development)
COCOBOD	National Cocoa Board (Ghana)
ColFM	Collaborative forest management
COMIFAC	<i>Commission des Forêts d'Afrique Centrale</i> (Central African Forest Commission)

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

CONAP	Consejo Nacional de Areas Protegidas (National Council of Protected Areas, Guatemala)
COP	Conference of Parties
CORPOICA	Colombian Corporation for Agricultural Research
CO ₂	Carbon dioxide
CPFK	Charcoal Producers Federation of Kenya
CPTC	Common Production and Treatment Centers
CRP	Consortium Research Program
CRVC	<i>Chily Révolution Verte du Cameroun</i> (Chily Green Revolution of Cameroon company)
CSO	Civil society organization
DENR	Department of Environment and Natural Resources (The Philippines)
DEVCO	European Commission for International Cooperation and Development
DFID	Department for International Development (United Kingdom)
DIDA	Danish International Development Agency
DTI	Department of Trade and Industry (The Philippines)
DRC	Democratic Republic of Congo
DRYAD	Improving Livelihoods and Land Use in Congo Basin Forests – Financing Sustainable Community Forest Enterprises in Cameroon Project
DryDev	Drylands Development Programme
EADD	East Africa Dairy Development Project
EC	European Commission
EEFCCC	Ethiopian Environment, Forestry and Climate Change Commission
EL	Exemplar landscapes
EU	European Union
FAO	Food and Agriculture Organization
FBE	Forest-based enterprise
FCC	Farm Forestry Consortium
FDT	Farm demonstration trials
FFS	Farmer field school
FGD	Focus group discussion
FLARE	Forests & Livelihoods: Assessment, Research, and Engagement Conference
FLEGT	Forest Law Enforcement, Governance and Trade
FMNR	Farmer-managed natural regeneration
FMS	Field Monitoring System
FMU	Forest management units
FMV	Fundación Madera Verde (Green Wood Institute)
FO	Farmers organization
FODER	<i>Forêts et Développement Rurale</i> (Forests and Rural Development NGO)
FORIG	Forestry Research Institute of Ghana
FP	Flagship program
FPDF	Forest protection and development funds
FPDR	<i>Forum Peduli Daerah Aliran Sungai Rejoso</i> (Rejoso Watershed Care Forum, Indonesia)
FSC	Forest Stewardship Council
FSSD	Forest Sector Support Department (Uganda)
FTA	Forests, Trees and Agroforestry
FTS	Fertilizer Tree Systems
F2F	Farmer-to-Farmer

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

GAP	Good agricultural practice
GCS	Global comparative study
GDP	Gross domestic product
GEF	Global Environment Fund
GGGI	Global Green Growth Institute
GHG	Greenhouse gas emissions
GIS	Geographic information system
GIZ	<i>Deutsche Gesellschaft für Internationale Zusammenarbeit</i> (German Society for International Cooperation)
GML	Governing Multifunctional Landscapes in Sub-Saharan Africa: Managing Trade-Offs between Social and Ecological Impacts Project
GNA	Good Nature Agro
GSD	Grand Strategy documents
ha	hectare
HKH	Hindu Kush Himalayan
IASC	International Association for the Study of the Commons
ICIMOD	International Center for Integrated Mountain Development
ICRAF	World Agroforestry
IDO	Intermediate Development Outcome
IFAD	International Fund for Agricultural Development
INBAR	International Network for Bamboo and Rattan
INDC	Intended Nationally Determined Contributions
INIA	Instituto Nacional de Innovación Agraria (National Institute of Agrarian Innovation, Nicaragua)
INREMP	Integrated Natural Resource and Environmental Management Program
IPB	Institut Pertanian Bogor (Bogor Agricultural Institute)
ISFM	Integrated soil fertility management
ISO/TC 296	International Organization for Standardization Technical Committee for Bamboo and Rattan
ISPO	Indonesian Sustainable Palm Oil
IUFRO	International Union of Forest Research Organizations
JKUAT	Jomo Kenyatta University of Agriculture and Technology (Kenya)
KANOPPI	Development of timber and non-timber forest products' production and market strategies for improvement of smallholders' livelihoods in Indonesia Project
KASEGA	Kum'mawa Agroforestry and Seed Growers Association
KDWDA	Katete District Women's Development Association
KES	Kenyan shilling
KHLK	<i>Kementerian Lingkungan Hidup dan Kehutanan</i> (Ministry of Environment and Forestry, Indonesia)
LSMS	Living Standard Measurement Survey
LVCD	Local Value Chain Development
MAAIF	Ministry of Agriculture Animal Industry and Fisheries (Uganda)
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MARLO	Managing Agricultural Research for Learning and Outcomes database
MDA	<i>Ministério do Desenvolvimento Agrário</i> (Ministry of Agrarian Development, Brazil)
MEF	<i>Ministerio de Economía y Finanzas</i> (Ministry of Economy and Finance, Peru)
MEEF	Ministry of Environment Ecology and Forests (Madagascar)
MELIA	Monitoring, Evaluation, Learning and Impact Assessment
MINAGRI	<i>Ministerio de Desarrollo Agrario y Riego</i> (Ministry of Agriculture and Irrigation, Peru)
MINEF	<i>Ministère des Eaux et Forêts</i> (Ministry of Water and Forests, Gabon)

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

MINEPDED	<i>Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable</i> (Ministry of Environment Nature Protection and Sustainable Development, Cameroon)
MINFOF	<i>Ministère des Forêts et de la Faune</i> (Ministry of Forestry and Wildlife, Cameroon)
MINMAP	<i>Ministère des Marchés Publics</i> (Ministry of Public Contracts, Cameroon)
MINPMEESA	<i>Ministère des Petites Moyenne Entreprises, de l'Economie Sociale et de l'Artisanal</i> (Ministry of Small and Medium Size Enterprises, Social Economy and Handicrafts, Cameroon)
MINTP	<i>Ministère des Travaux Publics</i> (Ministry of Public Works, Cameroon)
MoANR	Ministry of Agriculture and Natural Resources (Ethiopia)
MOFCOM	Ministry of Commerce of the People's Republic of China
MoU	Memorandum of Understanding
MWE	Ministry of Water and Environment (Uganda)
M&E	Monitoring and evaluation
NABARD	National Bank for Agriculture and Rural Development
NAP	National Agroforestry Policy (India, Nepal)
NAPI	National Agroforestry Platform (Ethiopia)
NASFAM	National Smallholder Farmers' Association of Malawi
NCPP	NGO-Community-Public-Private approach
NFA	National Forestry Authority (Uganda)
NGO	Non-governmental organization
NIMM	National Institute for Medicinal Materials (Vietnam)
NPV	Net Present Values
NRM	Natural resource management
NTFP	Non-timber forest product
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
NWAMP	National Watershed and Agroforestry Multi-stakeholders Platform (Ethiopia)
ODA	Overseas Development Assistance
OICR	Outcome impact case report
OP	Oil palm
OSINFOR	<i>Organismo de Supervisión de los Recursos Forestales y de Fauna Silvestre</i> (Supervisory Agency of Forest Resources and Wild Fauna, Peru)
OWC	Operation Wealth Creation (Uganda)
OxC	Options-by-context
PAR	Participatory action research
PARA	Piloting approaches to rural advisory services in support of scaling of the Agroforestry Concessions scheme in Peru Project
PDRC	<i>Plan de Desarrollo Regional Concertado</i> (Concerted Regional Development Plan, Peru)
PEN	Poverty Environment Network
PERDA	Peraturan Daerah (Provincial Regulation, Indonesia)
PFES	Payment for Environmental Services
PNPB	<i>Programa Nacional de Produção e Uso de Biodiesel</i> (National Biodiesel Production and Use Programme, Brazil)
PPA	Prospective Participatory Analysis
PROFEAAC	<i>Promouvoir et Formaliser l'Exploitation Artisanale du bois en Afrique Centrale</i> (Promote and Formalize Artisanal Logging in Central Africa Project)
PROSPERER	Support Programme for Rural Microenterprise Poles and Regional Economies – IFAD Project
PRO-FORMAL	Policy and regulatory options to recognise and better integrate the domestic timber sector in tropical countries Project

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

PRUNSAR	Food Trees for Diversified Diets, Improved Nutrition, and better Livelihoods for Smallholders in East Africa under the Programme: Putting Research into Use for Nutrition, Sustainable Agriculture and Resilience Project
PSM	Propensity Score Matching
PSNP	Productive Safety Net Programme (Ethiopia)
PWG	Policy working groups
P&C	Principles and criteria
QCC	Queen's Commonwealth Canopy initiative (Uganda)
QPM	Quality planting materials
RAAN	<i>Región Autónoma del Atlántico Norte</i> (North Atlantic Autonomous Region, Nicaragua)
RaTA AGATA	Rapid Land Tenure Assessment Analisis Gaya Bersengketa (Rapid Land Tenure Assessment Dispute Analysis)
RECOFTC	Regional Community Forestry Training Center (Indonesia)
RENJA BPSKL	<i>Rencana Kerja Balai Perhutanan Sosial dan Kemitraan Lingkungan</i> (Work Plan for the Social Forestry and Environmental Partnership Center, Indonesia)
RENSTRA DKP	<i>Rencana Strategis Dinas Kehutanan Provinsi</i> (Provincial Forestry Service Strategic Plan, Indonesia)
RES	Rewards for environmental services
RPHJP	<i>Rencana Pengelolaan Hutan Jangka Panjang</i> (Long-term Forest Management Plan, Indonesia)
RPJMD	<i>Rencana Pembangunan Jangka Menengah Daerah</i> (Regional Midterm Development Plan, Indonesia)
RRI	Rights and Resources Initiative
RSPO	Roundtable for Sustainable Palm Oil
RUPES 2	Rewards for, use of and shared investment in pro-poor environmental services Project (phase 2)
RWH	Rainwater harvesting
SACCO	Savings and Credit Cooperative Organizations
SAIRLA	Bringing Evidence to Bear on Negotiating Ecosystem Service and Livelihood Trade-Offs in Sustainable Agricultural Intensification Project
SCU	Southern Cross University (Australia)
SERFOR	<i>Servicio Nacional Forestal y de Fauna Silvestre</i> (National Forest and Wildlife Service, Peru)
SFM	Sustainable forest management
SHARED	Stakeholder Approach to Risk Informed and Evidence-based Decision-making
SILMS	Sustainable Integrated Land Management Solutions for agricultural value chains in Zambia Project
SLO	System-level outcome
SLU	Swedish University of Agricultural Sciences
SME	Small and medium enterprises
SPDA	Sociedad Peruana de Derecho Ambiental (Peruvian Society of Environmental Law, NGO)
SPE	Service Providers Entrepreneurs
SRE	Sustainability Research Effectiveness
STI	Climate-smart, Tree-based, Co-investment in Adaptation and Mitigation in Asia Project
SUCCESS	Support to the Development of Agroforestry Concessions in Peru Project
SVLK	<i>Sistem Verifikasi Legalitas Kayu</i> (Timber Legality Verification System, Indonesia)
SVO	Straight vegetable oil
SWC	Soil and water conservation
SWOT	Strengths, weaknesses, opportunities, threats analysis
TBU	Tay Bac University (Vietnam)
TFB4RE	Taskforce on Bamboo for Renewable Energy
TFS	Tanzania Forest Service
TFSBM	Taskforce on Sustainable Bamboo Management
TNC	The Nature Conservancy

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

ToC	Theory of Change
ToT	Trainers of Trainers
TOTEM	Transfer of Technology Models
TSP	Tillage Service Provision
TTS	Timor Tengah Selatan (South Central Timor)
TVET-CDACC	Technical and Vocational Education and Training Curriculum Development Assessment and Certification Council (Kenya)
T4FS	Developing Integrated Options and Accelerating Scaling up of Agroforestry for Improved Food Security and Resilient Livelihoods in Eastern Africa - Trees for Food Security Project
UASB	University of Agricultural Sciences, Bangalore
UBA	Uganda Bamboo Association
UI	<i>Universitas Indonesia</i> (University of Indonesia)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNILA	<i>Universitas Lampung</i> (University of Lampung)
UNPATTI	<i>Universitas Pattimura</i> (Pattimura University)
URB	Upper river basins
USAID	United States Agency for International Development
USD	United States dollar
VFA	Village forest area
VGS	Voluntary Guideline Standards
VFT	Volunteer farmer trainer
VND	Vietnamese đồng
VNUA	Vietnam National University of Agriculture
VPA	Voluntary Partnership Agreements
WPU	Wood processing units
WWF	World Wildlife Fund
XAF	Central African franc
ZARI	Zambia Agriculture Research Institute

1. Executive Summary

1.1 Introduction

The study “Outcome Assessment and Impact Estimation: FTA’s Research Contributions Addressing Persistent Rural Poverty with Increasing Levels of Vulnerability” is part of a series of integrative studies assessing the contributions of the Forests, Trees and Agroforestry (FTA) CGIAR Research Program (CRP) since the program’s inception in 2011. This evaluation features research undertaken as part of the FTA program, led by FTA partner institutions (Center for International Forestry Research (CIFOR), World Agroforestry (ICRAF), Bioversity International, the French Agricultural Research Centre for International Development (CIRAD), the Tropical Agricultural Research and Higher Education Center (CATIE), the International Network for Bamboo and Rattan (INBAR), and Tropenbos International) and/or other international and national partners.

689 million people live in extreme poverty worldwide, surviving on less than \$1.90 per day (World Bank, 2020). Many rural people experiencing poverty often rely on forests and tree-based systems, such as agroforestry, suggesting the existence of links between such systems and poverty outcomes (Razafindratsima et al., 2021). These systems play a significant role in sustainable food production, ecosystem services, economic benefits for rural development and forest-based communities’ livelihoods (Miller et al., 2020). The climate crises, deforestation, and land degradation have been increasing the vulnerability of rural, natural resource-based communities in particular. COVID-19 has caused further economic turmoil, pushing millions of workers into underemployment, unemployment, and working poverty. ‘Sustainable Development Goal 1: No poverty’, reflects the global commitment to addressing this complex challenge. The Forests, Trees and Agroforestry (FTA) CGIAR Research Program (CRP) represents a substantial investment of close to 850 million USD over the past ten years. Its research agenda aimed at developing solutions to key global challenges, including rural poverty and vulnerabilities, to contribute to developmental and environmental benefits and impacts.

The purpose of this report is to provide an account of FTA’s research, and the extent and nature of its contributions to outcomes and impacts on alleviating rural poverty and vulnerability, according to the following target set in FTA’s Phase II proposal:

- 19 million people, of which 50% are women, are helped to exit poverty

1.2 Methods

FTA’s contributions to address persistent rural poverty with increasing levels of vulnerability were assessed by:

- Comprehensive mapping of projects and initiatives corresponding to the challenge.
- Documenting composite Theories of Change (ToC) from all available information from 58 projects and initiatives led by FTA partner institutions (i.e., CIFOR, ICRAF, Bioversity International, CIRAD, CATIE, INBAR, and Tropenbos International) mapped to the challenge.
- Collating existing evidence by cluster to identify gaps.
- Assessing outcomes for each cluster of research to test each element in the ToCs; Additional data were collected as needed to assess outcomes and the causal relationships between FTA outputs and outcomes.
- Deep dive selection and analyses: Two clusters, namely ‘Diversification of Agroforestry-based Income in Asia’ and ‘Bioenergy (Global),’ were selected for more detailed analysis in a “deep dive” case study to explore practice influence, policy contributions, and potential impact.
- Impact Estimation: Data collected through a review of project and program level documentation was summed to estimate plausible ranges of potential impact resulting from FTA’s research contributions.

1.3 Challenge 4 Theory of Change

Poverty alleviation is an important focal area of scientific and applied research for FTA. FTA’s research tackles several drivers, including land-tenure insecurity, lack of education and government support to communities, yield and income vulnerability to climate change and market conditions, and lack of jobs or livelihoods. To help alleviate poverty, FTA conducted research to enhance coordination among multiple sectors to support favourable cross-sectoral policies for tree-planting and agroforestry development, produced and disseminated climate-smart

and context-appropriate multi-species agroforestry systems to support optimal yields and livelihoods, and supported the realization of household's economic potential from trees and agroforestry via value-chain development. FTA's research also aims to address the compounding effects of unsustainable use of natural resources for livelihoods and cash income, such as climate change, damaged ecosystem services, land degradation, natural resource scarcity, food insecurity, and poor health. These drivers and effects serve as the entry points for FTA's work.

To address persistent rural poverty and increase resilience, FTA's research focused on management and conservation of forest and tree resources, landscape management for environmental services, biodiversity conservation, climate change adaptation and mitigation, smallholder production systems and markets, and impacts of trade and investment on forest and people. FTA aimed to tackle the challenge at different levels from on-the-ground farming to national and international level policies by providing knowledge that frames issues (e.g., challenges and opportunities for agroforestry concession mechanisms, contributions of Small and Medium Enterprises (SMEs) to sustainable timber management, market opportunities for timber and non-timber forest products (NTFP) value chains, etc.), generating data on socio-economic status and priorities of rural and vulnerable populations to understand current conditions and trends over time, developing tools and methods (e.g., maps and catalogue of priority species, community forest enterprises (CFEs) performance assessment and monitoring, informal timber trade assessments, etc.), proposing policy solutions (e.g., integrating gender considerations into governance frameworks, agroforestry concession (AFC) zoning, governments recognition of CFEs as social enterprise, etc.) and innovations (e.g., NTFP genetic gain, tree sustainable harvest, low cost processing techniques, etc.), as well as offering guidance and support for policy operationalization and implementation (e.g., input delivery systems, guidance for adoption and scaling up agroforestry, training on AFS management, development of equitable SMEs business plans, support CFEs access to financial inputs & markets, etc.). FTA also made social process contributions via strategic and targeted engagements with stakeholders throughout the research process and provides training to support capacity-building. FTA's research and engagement efforts aimed to contribute to (i) advancing the research agenda on forest and trees' contributions to livelihoods and poverty alleviation; (ii) increase NGOs, partners and allies' capacities for enhanced advocacy for integration of agroforestry in cross-sectoral policy frameworks and practices as well as to support tree-planting, agroforestry implementation, and corporate accountability; (iii) influence multiple levels of governments to create a conducive policy environment and incentives for tree-planting and agroforestry development at scale; (iv) build capacities of practitioners for provision of enhanced extension services and advice to smallholders and producers; (v) support and build capacities of community-based organizations for equitable natural resource management, use, and market; (vi) influence private sector compliance with national regulations and encourage investments in pro-poor value chains; (vii) and support smallholders' sustainable livelihoods and increased household income via sale of sustainable timber, NTFP, and/or agroforestry products. A conducive policy environment would provide individuals and communities legal framework and incentives for secure access and sustainable use of natural resources for livelihoods and income. Private companies would have a clear policy framework and regulations to influence corporate accountability and investments in pro-poor environmental protection schemes. With a clear and conducive policy environment and public and private incentives, individuals would be better equipped for decision-making on tree-planting and agroforestry adoption. With enhanced knowledge and access to inputs and enhanced extension services, farmers and community groups would be better equipped for realizing optimal yield of high-quality products to have enough production for consumption and sale for cash income through community based organizations or SMEs contributing to poverty alleviation for forest-dependent communities, smallholders, and their households.

1.4 Results: Outcome Evaluation

The assessment indicates that FTA made notable achievements to influence policies, practices, and research contributing to poverty alleviation and increased resilience across Africa and Asia, and to a lesser extent in Latin America. Some examples include: new FTA-informed agroforestry policies enabled a conducive policy environment for uptake of FTA solutions and innovations at scale; integration of agroforestry practices in rural development and renewable energy policies, strategies, and action plans; development of large-scale supply of

genetically superior quality planting material (QPM) in resource-poor remote regions; enhanced cross-sector coordination among multiple stakeholders for pro-poor value chains development; and capacity-building of several thousand local stakeholders (e.g., extensionists, communities, farmers and producers) influencing integration of tree-planting and agroforestry into local practices for livelihoods and household income.

FTA's influence on governments was achieved through the provision of new tools and data to inform revisions or enactment of national and subnational cross-sectoral policies, strategies, and action plans; provision of technical expertise and advice in multi-stakeholder fora supporting science-based decision-making; guidance and recommendations for implementation of policy and incentive mechanisms; and building capacities of government staff for provision of enhanced governance and services to communities. FTA's influence on practitioners' practices (e.g., extension agents) was achieved through capacity-building on co-created and context-appropriate tree-based and agroforestry systems for the provision of enhanced extension services to farmers and producers.

Influence on NGOs, partners, and allies was achieved through the provision of evidence-based data supporting enhanced advocacy for policy and practice change, and wider dissemination of tree-planting and enhanced management practices to communities.

FTA's influence on farmers' practices was achieved through the introduction of resilient and context-adapted species, the implementation of demonstration trials, support to seed system infrastructure, nursery establishment, and building capacities for participatory management of communities' natural resources, smallholders' on-farm practices, and market development which enhanced the necessary capacities for the adoption of tree-planting and improved practices at the local level for livelihoods and cash income.

FTA also influenced community-based organizations via enhanced local stakeholders' capacity to formalize, access inputs, participate in tree- and agroforestry-based income-generating activities, and development of pro-poor and equitable value chain models.

Influence on private sector was achieved through provision of evidence-based data informing the revision of international commitments to support more equitable business practices, technical guidance supporting implementation of certification and incentive schemes, as well as building capacities for SMEs establishment and/or enhanced market links for pro-poor value chains.

FTA influenced the research pathway by building the capacities of researchers and developing new methods to better assess forests' and trees' contributions for livelihoods and household income. These both served to advance the global research agenda on forests and poverty and influence change in multi-lateral organizations' practices.

The majority of FTA's contributions to intended outcomes for each research cluster were either partially or fully realized. Yet, the assessment highlights that additional data collection is required to get a more complete picture and more robust assessment for what has been achieved to date to address the challenge and better estimate impacts. For outcomes that have not yet been realized, it is likely that many will be realized in the future though others may remain unrealized because of political, regulatory, economic, or social barriers. Government, NGOs partners and allies, community-based organizations, private sector, and smallholder pathways were the most prevalent and strongest impact pathways through which FTA influenced change. FTA did succeed in influencing some research, international organizations, and practitioner pathways in different countries, but to a lesser degree. Evidence suggests that FTA's contributions to outcomes have the potential to continue post-FTA, contingent on local stakeholders' capacities to advance progress on intended outcomes and impacts. Table 1 presents the extent to which FTA's end-of-program outcomes were realized via the projects mapped to the challenge across Africa, Asia, and Latin America.

Table 1. Extent to which FTA's End-of-Program Outcomes were realized across Africa, Asia, and Latin America

End-of-Program Outcome #1	
25 countries improve governance mechanisms, institutions & tools for a) safeguarding forests/tree diversity and b) equitably managing forests & trees within mosaic landscapes	
Evidence of Outcomes	Global
	<ul style="list-style-type: none"> • Advanced global debate on gender issues in forest tenure reform • Advanced global research agenda on environmental income for livelihoods • Enhanced multi-stakeholder collaboration for bamboo sustainable management and development of bamboo for renewable bioenergy production and livelihoods in several African countries and Indonesia • Established south-to-south knowledge exchange platforms for tenure reform (Peru, Uganda, Indonesia) • Influenced multilateral strategies on environmental income for livelihoods (World Bank, UNEP, IFAD, FAO) • Included forests' contributions to livelihoods into multi-lateral policy and practice (World Bank)
	Latin America (3 countries)
	<ul style="list-style-type: none"> • Revised technical norms for community forest concession renewal (Guatemala) • Enhanced participation of women in natural resource governance and management (Nicaragua) • Enhanced institutional capacity for agroforestry concession implementation (Peru) • Supported tenure reform processes at sub-national level (Loreto and Madre de Diós, Peru)
Evidence of Outcomes	Africa (11 countries)
	<ul style="list-style-type: none"> • Influenced regulation and integration of domestic timber sector into the formal economy (Cameroon) • Informed FLEGT-VPA negotiations with European Commission (Cameroon) • Included CFEs into the national definition of social enterprise (Cameroon) • Influenced inter-ministerial decree imposing use of legal timber in public contracts (Cameroon) • Influenced MINEPDED support to CFEs obtain environmental impact notice certificates (Cameroon) • Supported establishment of the National Agroforestry Platform (NAP) by Ministry of Agriculture and Natural Resources (MoANR) (Ethiopia) • Established National Watershed and Agroforestry Multi-Stakeholder Platform (NWAMP) to support agroforestry adoption and management at national level (Ethiopia) • Supported establishment of Sustainable Grazing Platform for integration of sustainable grazing management options within agroforestry policies at local and national levels (Ethiopia) • Included bamboo into 3 cross-sectoral national policies (e.g., National Development Strategy and Action Plan 2019-2030; Ethiopian Energy Policy; National Policy on Growth and Transformation) (Ethiopia) • Informed regulations for bamboo charcoal trade (Ethiopia) • Enhanced Forest Control Strategy to prevent illegal logging and monitor domestic timber market (Gabon) • Enhanced multi-stakeholder collaboration for tree-crop sustainability through National Cocoa Replanting and Agroforestry Program (Ghana) • Influenced integration of wood-fuel value chains into national climate change strategy and the Cocoa-Forest REDD+ Programme (Ghana) • Influenced integration of bamboo-based charcoal into National Renewable Energy Policy (Ghana) • Included bamboo in the Forest and Wildlife Policy (Ghana) • Informed Bamboo and Rattan Development Strategic Plan- 2020-2024 adopted by the Forestry Commission (Ghana) • Enhanced multi-stakeholder collaboration on the bamboo sector development via Bamboo and Rattan Development Programme (BARADEP) (Ghana) • Integrated bamboo into sustainable development programs of Forestry Research Institute of Ghana (FORIG) (Ghana) • Enhanced participation of SMEs into national revisions of charcoal regulations (Kenya) • Integrated sustainable wood-fuel value chain options into district level environmental management plans (Kenya) • Informed 2019 Irrigation Act for livelihoods and on-farm income-generating activities (Kenya) • Informed National Bamboo Policy for development of bamboo industry for livelihoods and trade (Kenya) • Influenced Kenya Bioenergy Strategy 2020-2027 integration of bamboo for bioenergy production (Kenya) • Informed National Bamboo Policy and Strategy for land restoration and national socio-economic development (Madagascar) • Influenced district councils' by-laws to curb bushfires and reduce livestock damage to the agroforestry trees (Malawi) • Informed 120 community-based management plans for sustainable natural resources use and shared accountability (Malawi) • Informed National Agroforestry Strategy (2018–2027) (Rwanda) • Influenced political commitment to scale up agroforestry nationally (Uganda) • Influenced Ministry of Agriculture Animal Industry and Fisheries (MAAIF) commitment for provision of enhanced extension

<p>services for smallholders (Uganda)</p> <ul style="list-style-type: none"> • Supported tenure reform processes (Uganda) • Enhanced participation of women in and at leadership positions of forest user groups (Uganda) • Informed ten-year National Bamboo Strategy and Action Plan (Ministry of Water and Environment) (Uganda) • Influenced inclusion of forest contributions to livelihoods on national bureau of statistics' new forestry survey (Tanzania) • Influenced Forest Service supports establishment of diversified bamboo value chains (Kibaha, Tanzania) • 2013 National Charcoal Indaba guide identification of policy options on charcoal production and trade (Zambia)
<p>Asia (6 countries)</p> <ul style="list-style-type: none"> • Influenced integration of PFES in several bilateral projects (Indonesia, Philippines, and Vietnam) • Local government integrate RES scheme into ecological land-use plans (Xishuangbanna, China) • Supported development of National Agroforestry Policy (India) • Subnational government supports AF adoption by smallholders (Odisha, India) • Provincial government integrate economic incentives for environmental conservation for wetlands' management (Loktak, India) • National Bank for Agriculture and Rural Development (NABARD) and the Working Group on Biofuels at the Ministry of Petroleum and Natural Gas support scaling of food-energy agroforestry models into Maharashtra and other states (India) • Integrated NTFP and timber production on district- and provincial policy agendas (Indonesia) • Informed priority-setting of national Grand Strategy and 9 local strategies for integrated NTFP management (Indonesia) • Supported gender mainstreaming into Reward for Ecosystem Services (RES) protocol (Indonesia) • 19 sites have participatory governance models, land access/tenure agreements, and environmental services schemes (Indonesia) • Local government adopt co-investment schemes in district regulation and budget (Buol, Indonesia) • Supported tenure reform processes and establishment of a working group on social forestry (Indonesia) • National Bureau of Statistics revised forestry survey module to include forest contributions to livelihoods (Indonesia) • Social forestry programme became priority for provincial development planning (Maluku, Indonesia) • Enhanced promotion of gender issues in social forestry regulation and practice (Indonesia) • Integrate PFES in policy (Nepal) • Local government implements Incentive-Based Policy Program (Philippines) • Provincial government set up co-investment schemes (Lantapan, Philippines) • Integrated NTFP and timber sustainable production and trade into provincial and district levels policy, strategies, and budget (Vietnam) • Integrated Green Growth orientations in provincial environmental and economic priorities (Lam Dong, Vietnam) • Integrated agroforestry in the National Action Plan Framework for Adaptation and Mitigation of Climate Change of the Agriculture and Rural Development Sector (2008-2020) (Vietnam) • Revised national guideline for PFES financial management (Vietnam) • Implemented PFES at national level (Vietnam) • Established forest protection and development funds at provincial level (Quang Nam and Dak Nong, Vietnam) • Integrated climate-smart pro-poor initiatives in PFES regulation at provincial level (Ha Tinh and Quang Binh, Vietnam) • Integrated PFES into National Rural Development policy (Vietnam) • Integrated home-garden and sloping-land management practices into district and provincial level decisions (Ha Tinh and Quang Binh Provinces, Vietnam) • Integrated climate-smart approach on Green Agricultural Development plan at national level (Vietnam)

End-of-Program Outcome #2	
About 20 multinational companies and 500 private sector actors pursue models & investments for a) improved mgt. & safeguarding of forest & tree resources and b) enhancement of inclusive landscape-based livelihoods & ecosystem services	
Evidence of Outcomes	Global
	• Integrated gender considerations in RSPO Principles and Criteria (implications for all RSPO-certified companies)
	Latin America (1 country)
	• 1 CBO upscale macaúba value chain (Brazil)
	Africa (12 countries)
	• CBOs support equitable & sustainable bioenergy production (Cameroon, Ghana, Kenya, Uganda)
	• SMEs diversify production, developed, and improved industrial bioenergy value chains (Ethiopia, Ghana, Uganda)
	• 503 community enterprises established (Cameroon, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Tanzania, Uganda, Zambia)
	• Established/strengthened 1,566 farmer cooperatives/associations formalized (Burkina Faso, Ethiopia, Ghana, Kenya, Mali, Niger, Tanzania, Uganda, Zambia)
	• 43 value chains developed to varying levels of success (Burkina Faso, Ethiopia, Kenya, Mali, Niger)
	• 2 SMEs uptake technology for energy-saving stoves (Ethiopia, Ghana)
	• ISO TC 296 membership supports bamboo products trade to EU (Kenya, Uganda)
	• FLEGT-VPA negotiation with the European Commission informed by FTA (Cameroon)
	• 2 private company adapted traceability contracts to include smallholders and SMEs in formal supply chain (Cameroon)
	• SME supported smallholder logger's formalization in 15 urban markets of Yaoundé (Cameroon)
	• 34 new Community Forest Enterprises adopted cost-efficient community-based FMS (Cameroon)
	• 1 private company supported QPM supply (Assosa, Ethiopia)
	• 2 private companies supported scale up bamboo value chains (Ethiopia)
	• 3 Private companies pilot tested novel business models and independent monitoring and traceability systems (Ghana)
	• SMEs supported community bamboo bioenergy value-chain (Ghana)
	• Enhanced charcoal SMEs' capacity and value chains (Kenya)
	• 1 SME supported bioenergy production and value-chains (Kenya)
	• 1 Private company supported off-grid pro-poor bioenergy production (Tongaviro, Madagascar)
	• 1 Private company adopted production of industrial charcoal from invasive species (Zambia)
	• Enhanced charcoal producer's capacity to comply with regulations (Zambia)
	• 2 private cotton companies provided enhanced extension services to farmers (Zambia)
	POTENTIAL
	• Several sellers in 14 urban markets sensitized on commercialization of legally-sourced sawnwood products (Cameroon)
	• 3 private companies expressed intent to voluntarily adopt legal sawnwood purchase constraint (Cameroon)
	• 14 private companies sensitized on social and environmental commitments for FLEGT compliance (Cameroon)
	• 84 CFEs business cases prepared for investment (Cameroon)
	• Scaling of CFEs in 260 community forests (Cameroon)
	• 2 entrepreneurs and 3 private companies interested in developing bamboo bioenergy enterprises (Madagascar)
	Asia (4 countries with potential for 1 additional country)
	• 114 agroforestry enterprises established (Indonesia)
	• 348 group or individual nurseries established with market links (Sulawesi, Indonesia)
	• 133 agroforestry-based value chains established through farmer-trader partnerships (Indonesia)
	• 1 private company co-invested in PFES scheme at district level (Buol, Indonesia)
	• >200 SMEs adopted SVLK certification in Jepara (Indonesia)
	• 6 multi-national oil palm companies support equitable supply chain initiatives & establish gender committees (Indonesia)
	• Private companies and financial institutions sensitized to support AF value-chains (Indonesia)
	• Private companies co-invested in RES (Philippines)
	• National Power Corporation co-invested in PFES (Philippines)
	• 1 community-based enterprise adopted new business practices (Philippines)
	• Royalties from hydro power sector supported PFES implementation (Nepal)
	• 1 private company adopted processing technologies for agroforestry produce (Vietnam)
	• Private sector co-invested in pro-poor PFES schemes (Vietnam)
	POTENTIAL
	• 1 Private company expressed interest purchase agroforestry products (India)
	• 2 private companies expressed interest in supporting pro-poor value chains (Vietnam)
	• Private companies influenced by local governments to co-invest in smallholder tree farming (Indonesia, Philippines)

End-of-Program Outcome #3 National and sub-national public & private sector actors in 25 countries deliver more effective & equitable tree related breeding, delivery, extension & pedagogical services	
Evidence of Outcomes	Latin America (1 country) <ul style="list-style-type: none"> Enhanced climate-smart extension services for cocoa farmers (Colombia)
	Africa (14 countries) <ul style="list-style-type: none"> Extension agents (including farmer-to-farmer extension workers) better equipped for provision of enhanced extension services to farmers (Burkina Faso, Ethiopia, Kenya, Mali, Malawi, Niger, Tanzania, Uganda, Zambia) Enhanced collaboration with government extension agents for scaling-up locally relevant regreening options (Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, Somalia) Supported development and implementation of national roadmaps to regreening at multiple levels (Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal) Established tree nursery infrastructure (Rwanda, Kenya, Ethiopia, Niger) Established nurseries, Farmer Field Schools and Common Production and Treatment Centers (Cameroon, Ethiopia, Ghana, Kenya, Madagascar, Tanzania, Uganda) 3,384 micro-nurseries established by women households (Ethiopia, Madagascar, Tanzania) Implemented sensitization campaigns for legal timber (Cameroon) Influenced MINFOF's reforestation campaign targeting at local level (Okola and Evodoula, Cameroon) NGO uptake integrated agroforestry and nutrition programme approach in schools (Kenya) Established 243 Community Agroforestry Tree Seed (CATS) Banks (Malawi) Influenced Operation Wealth Creation (OWC) program support for large scale fodder production and conservation in South Western region (Uganda) Charcoal producers built capacities to produce green charcoal and abide by regulations (Zambia) 3 district governments supported AF plantations for environmental conservation (Mbeya, Iringa, and Kyela, Tanzania)
	Asia (4 countries) <ul style="list-style-type: none"> Extension agents (including farmer-to-farmer extension workers) better equipped for provision of enhanced extension services to farmers (India, Indonesia, Vietnam) Established 26 nutri-gardens (India) Established 348 group or individual nurseries (~1,392 individuals) (Indonesia) Enhanced capacities of 2,800 farmers and extension agents on AFS and market (Indonesia) Established 562 farm demonstration trials for agroforestry development (Sulawesi, Indonesia) Established 139 farmers' groups for knowledge exchange (Indonesia) Established 36 farmer managed natural regeneration and farmer demonstration sites for skills development (Indonesia) 307 community groups established 321 initiatives for improved use of natural resources for livelihoods and income (Philippines) Established 6 farmer demonstration trials and exemplar landscapes for knowledge exchange (Vietnam)
	End-of-Program Outcome #4 At least 40 million smallholders & other users access more productive tree planting material & uptake higher performing, context appropriate & inclusive AF & small-scale forestry mgt. option
Evidence of Outcomes	Latin America Low-end estimate: 1,949 people across 2 countries of those, 413 people directly and 1,536 people indirectly High-end estimate: Potential to benefit 617,231 people across 4 countries of those, 169,700 people directly and 445,707 people indirectly
	<ul style="list-style-type: none"> Supported 33 households with concession contracts (San Martin, Peru) (~125 individuals) Early adopter farmers incorporated climate-smart management in their practices (Peru) 380 households adopted forestry management at Carmelita concession (Guatemala) (~1,824 individuals) POTENTIAL <ul style="list-style-type: none"> 500 farmers participate in macaúba value chains (Brazil) (~1,650 individuals) 35,000 farmers access improved climate-smart planting material (Colombia) (~122,500 individuals) 10,500 households adopt agroforestry management at 8 concessions (Guatemala) (~50,400 individuals) 123,799 households beneficiary of AFC renewals adopt forestry management practices (Peru) (~440,857 individuals)

<div> <h2>Africa</h2> </div> <div> <h3>Low-end estimate: 1,906,547 people</h3> </div> <div> <p>of those, 465,492 people directly and 1,441,055 people indirectly across 14 countries</p> </div> <div> <h3>High-end estimate: 11,148,269 people</h3> </div> <div> <p>of those, 2,754,553 people directly and 8,393,716 people indirectly across 14 countries</p> </div> <div> <ul style="list-style-type: none"> • 150 charcoal producers enhanced skills for efficient carbonization (Cameroon, DRC, Kenya, Zambia) • 133,938 farmers adopted crop residues technologies (Ethiopia, Kenya, Tanzania, Uganda) (~535,752 individuals) • 5,196 farmers adopted enhanced silage conservation (Ethiopia, Kenya, Tanzania, Uganda) (~20,784 individuals) • 453 households adopted food tree portfolios (Kenya, Uganda) (~1,812 individuals) • 143,067 farmers (29% women) adopted AFS and enhanced management practices (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~572,268 individuals) • 53,779 farmers (24% women) adopted irrigation practices (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~215,116 individuals) • 873 households adopted agroforestry in FTA trials (Kenya, Ghana, Niger, Rwanda) (~3,492 individuals) • 2,686 households adopted bamboo plants for feed and biomass (Cameroon, Ghana, Ethiopia, Madagascar) (~10,744 individuals) • 3,384 household adopted micro-nurseries (Ethiopia, Madagascar, Tanzania) (~13,536 individuals) • 4,000 individuals participated in bamboo charcoal value chains (Ethiopia, Ghana) (~16,000 individuals) • 686 individuals (45% women) participated in bioenergy value chains through SMEs associations (Ethiopia, Ghana, Kenya, Uganda) (~2,744 individuals) • 52,570 (53% women) sold commodities to local markets (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~210,280 individuals) • 1,363 youth secured employment through 49 forestry enterprises (Ethiopia, Tanzania, Madagascar) (~5,452 individuals) • 16 people participated in CRVC timber and Njangsang enterprises (Cameroon) (~83 individuals) • 487 households have stable income opportunities (Cameroon) (~2,532 individuals) • 5,000 croton collectors participated in biofuel value chains (Kenya) (~19,500 individuals) • 173 rural households access reliable energy with bamboo gasifiers (Madagascar) (~813 individuals) • 11,524 farmers adopted improved AF practices (Malawi) (~51,858 individuals) • 4,233 households adopted Fertilizer Tree Systems (Malawi) (~19,049 individuals) • 717 farmers enhanced market links for agroforestry seed trade (Malawi) (~3,227 individuals) • 1,358 households participated in forest-based enterprises (Malawi) (~6,111 individuals) • 1,000 women participated in bamboo charcoal value chain (Tanzania) (~4,900 individuals) • 19,190 farmers adopted enhanced fodder production and conservation practices (Uganda) (~90,193 individuals) • 424 smallholders adopted RWH for enhanced livestock production (Uganda) (~1,993 individuals) • 980 households adopted shallow wells and dam-lined tanks (Uganda) (~4,606 individuals) • 279 people (54% women) in six community groups increased participation in tenure governance (Uganda) • 250 community members enhanced capacity to participate in and lead forest user groups (Uganda) • 18,116 farmers adopted AF and enhanced management practices (Zambia) (~92,392 individuals) <div> <h2>POTENTIAL</h2> </div> <div> <ul style="list-style-type: none"> • 144,181 households informed on FMNR land other restoration practices (Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, Somalia) (~576,724 individuals) • 40,850 farmers learned improved feeds and fodder technologies (Ethiopia, Kenya, Tanzania, Uganda) (~163,400 individuals) • 8,500 smallholders trained on cultivation of prioritized food tree and crop species and varieties, and nurseries (Kenya, Uganda) (~34,000 individuals) • 219,694 farmers (49% women) learned about AFS and enhanced management practices (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~878,776 individuals) • 10,000 households use bamboo for fuel (Ethiopia, Ghana) (~40,000 individuals) • 5,000 individuals built capacities on bamboo cultivation and community nurseries (Cameroon, Ghana, Kenya, Madagascar, Tanzania, Uganda) (~20,000 individuals) • 17,100 individuals enhanced capacities for bamboo planting and use for bioenergy (Ethiopia, Ghana, Madagascar, Tanzania) (~68,400 individuals) • 5,072 women developed skills to produce high-quality bamboo-based charcoal for clean household energy (Cameroon, Ghana) (~20,288 individuals) • 43,682 farmers have enhanced market links (Ethiopia, Kenya, Tanzania, Uganda) (~174,728 individuals) • 179,000 farming families have enhanced market links via dairy associations (Ethiopia, Kenya, Tanzania, Uganda) (~716,000 individuals) </div> </div>
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<ul style="list-style-type: none"> • 71,000 informal timber operators involved in small-scale logging and milling in Central Africa benefit from policy change (~300,000 individuals) • 185 individuals (67% women) enhanced capacities for enterprise development (Kenya, Uganda) (~740 individuals) • 81,750 farmers (45% women) enhanced market links (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~327,000 individuals) • 63,156 individuals (41% women) increased linkages to microfinance institutions for income-generating activities (Burkina Faso, Ethiopia, Kenya, Mali, Niger) (~252,624 individuals) • Scaling of CFEs in 260 community forests (Cameroon) • 1,955 individuals (51% women) have potential to participate in sustainable forest enterprises (Cameroon) (~10,166 individuals) • 4,800 households around adopted bamboo planting via BoARD (Amhara) project (Ethiopia) (~22,080 individuals) • 100,000 individuals with employment opportunities in SMEs and large-scale bamboo industry from policy change (Ethiopia) (~460,000 individuals) • 500,000 green jobs created as a result of policy change (Ethiopia) (~2,300,000 individuals) • 400 individuals trained in alternative livelihood activities by SMEs (Ghana) (~1,400 individuals) • 10,000 farmers trained in bamboo cultivation, management, and primary processing by SMEs (Ghana) (~35,000 individuals) • 191,839 individuals built capacities in tree seedlings production and management (Malawi) (~863,276 individuals) • 21,815 households equipped to operate forest-based enterprises (Malawi) (~98,168 individuals) • 56,000 households in 280 forest-dependent communities built capacities in FBEs (Malawi) (~252,000 individuals) • 23,068 farmers learned RWH techniques for livestock production (Uganda) (~108,420 individuals) • 2,486 household members participate in tenure concessions (Uganda) • 700,000 individuals with full-time jobs in a diversified bamboo value-chain from policy enacted (National Bamboo Strategy and Action Plan) (Uganda) (~3,290,000 individuals) • 26,256 farmers built capacities in ISFM (Zambia) (~133,906 individuals)
<p>Asia</p> <p>Low-end estimate: 2,239,290 people across 6 countries of those, 1,046,951 people directly and 1,192,339 people indirectly</p> <p>High-end estimate: 4,932,598 people of those, 2,172,434 people directly and 2,760,164 people indirectly</p>
<ul style="list-style-type: none"> • 1,108 individuals participated in PFES/RES schemes (China, India, Indonesia, Nepal, Philippines, Vietnam) (~4,432 individuals) • 400 households (34% women) adopted enhanced management (Indonesia, Vietnam, the Philippines) (~1,600 individuals) • 1,200 rural households access reliable energy from bamboo power plant (Indonesia) (~4,800 individuals) • 120 households adopted sustainable forestry mgt. to comply with SVLK certification (Indonesia) (~480 individuals) • 348 group or individual nurseries generated household income from sales revenue (Indonesia) (~1,392 individuals) • 1,470 people participated in agroforestry enterprises (Indonesia) (~5,880 individuals) • 120 household participate in Trigona honey market (Indonesia) (~480 individuals) • 9,830 individuals participate in agroforestry products value-chains (Indonesia) (~39,320 individuals) • 90 households adopted tree farming post-project (Indonesia) (~360 individuals) • 148 farmers (44% women) adopted GAP practices (Indonesia) (~592 individuals) • 636,972 people (52% women) are estimated to have benefited from improved incomes from agroforestry and forestry systems and related enterprises (Sulawesi, Indonesia) • 29,583 households adopted AF practices to diversify agricultural production (India) (~141,998 individuals) • 6,000 farmers received high-quality planting material of native or locally adapted oilseed trees (India) (~28,800 individuals) • 80 women participate in oilseed value chain (India) (~384 individuals) • 10,000 households benefited from additional income, access to clean energy products and other valuable co-products (India) (~48,000 individuals) • 428 CBOs established 1,281 natural regeneration management projects in forests or public lands (Philippines) • 476 individuals adopt processing techniques moving up in the value chain (Philippines) (~2,237 individuals) • 163 households adopted AFS for on-farm savings and diversification of cash income (Vietnam) (~619 individuals) • 348,715 households participated in forestry value chains (Vietnam) (~1,325,117 individuals) • 178 households adopted agroforestry (Vietnam) (~676 individuals) <p>POTENTIAL</p> <ul style="list-style-type: none"> • 1,867 individuals (42% women) indirect benefit from PFES/RES across China, India, Indonesia, Nepal, Philippines, Vietnam (~7,468 individuals) • 6,000 furniture producers in Jepara have the potential to adopt sustainable forestry mgt. to comply with SVLK certification

	<p>(Indonesia) (~24,000 individuals)</p> <ul style="list-style-type: none"> • 2,800 farmers, voluntary and governmental extension agents across seven villages in three districts have enhanced capacity in AF practices (Indonesia) (~11,200 individuals) • 15,300 individuals have enhanced capacity to generate income through nurseries (Indonesia) (~61,200 individuals) • 13,300 individuals (35% women) learned about AFS for income generation (Indonesia) (~53,200 individuals) • 5,135 households estimated to increase incomes after adopting FTA-promoted technologies (Indonesia) (~20,540 individuals) • 1,618 farmers (40% women) built capacities in GAP for enhanced on-farm production (Indonesia) (~6,472 individuals) • 1,470 people have sustainable employment opportunities in agroforestry enterprises (Indonesia) (~5,880 individuals) • 9,830 individuals participate in value-chains of AF products (Indonesia) (~39,320 individuals) • 1.5 million people working in small-scale wood and handcraft enterprises adopt SVLK certification (Indonesia) • 373,214 household adopt nutri-gardens (India) (~1,791,427 individuals) • 5,000 households from 140 villages in two districts (e.g., Bolangir and Nuapada, Odisha) adopt market-oriented agroforestry (India) (~24,000 individuals) • Potential adoption of AF practices by 247,000 households through policy incentives (Vietnam) (~938,600 individuals) • Green Growth Action Plan have the potential to indirectly benefit 485,131 individuals in the agriculture sector (including agroforestry, forestry, livestock and fishery) by 2030 in Lam Dong Province (Vietnam) • 1,200 households built capacities in AFS, tree nursery and value chains (Vietnam) (~4,560 individuals)
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1.5 Impact Estimations

We estimate that between **5.1 million people** (1.3 million people directly and 3.8 million household members indirectly) and **19 million people** (5.7 million people directly and 13.3 million household members indirectly) have directly or indirectly benefited, or have the potential to benefit from additional means to exit poverty or have increased resilience to impoverishment as a result of FTA's research and engagement.

Most of FTA's impact contributions within Challenge 4 were localized in Africa and Asia, and to a lesser extent in Latin America. **In Africa**, FTA contributed with increased means to exit poverty or reduced vulnerabilities to impoverishment of a range of nearly **1.9 million people** (of those ~465,500 people directly and ~1.4 million household members indirectly) **to 11.1 million people** (~2.7 million people directly and ~8.4 million household members indirectly), in particular in Malawi via the practice pathway and Ethiopia and Uganda via the practice and policy pathways. **In Asia**, FTA's contribution to poverty alleviation ranges from **3.2 million people** (~814,000 people directly and ~2.4 million household members indirectly) **to 7.2 million people** (~2.8 million people directly and 4.4 million household members indirectly) with increased means to exit poverty or increased resilience to impoverishment, in particular in Indonesia and Vietnam through the policy pathway and in India through the practice pathway. **In Latin America**, FTA had the weakest contribution to the potential impact estimates, supporting a range from **1.900 people** (~400 people directly and ~1.500 household members indirectly) **to 615.400 people** (169.700 people directly and 445.700 household members indirectly) through policy pathway, mostly in Peru and Guatemala.

The realization of estimated impacts depends upon the effective adoption and scale of FTA solutions and innovations by local stakeholders (e.g., smallholders, communities, practitioners, private companies, governments) and the perfect implementation and enforcement of FTA-influenced policies, which are largely outside of FTA's sphere of control.

1.6 Limitations

Several factors limited the analysis and interpretation of results:

1. Data availability and project representation:

- Data availability of implemented projects varied among FTA centres' information databases. Therefore, the impact estimates do not reflect FTA's entire contribution to the challenge, but rather a selection of better-documented research initiatives. Furthermore, the ways in which FTA projects report on their contributions and achievements were inconsistent; this was particularly apparent in reporting for multi-country projects and programmes, where often reported evidence is not disaggregated by study sites, let alone by country. At times, this limited testing of the ToC logic, increasing the potential for misinterpretation or misattribution.

- Some projects reported gender-disaggregated data thus limiting the assessment of FTA's contributions towards gender targets for the challenge.
- Few projects presented impact targets or reported on expected or potential impacts. The varied level in reporting against established targets and in the appropriate units also introduced possible over- and under-reporting.

2. Supplementary data collection:

- Accessing further qualitative evidence (e.g., interviews, site visits) during the COVID-19 pandemic limited the depth of the deep dive analysis. Informant's recall of details of older (Phase I) projects may have been reduced because of the time that has passed.

3. Time lags to impacts:

- Short project timelines and time lags before FTA's research potential impacts can be observed (e.g., changes in state or flow in people's income) at scale limited the reporting of actual impact achievement and assessing potential for future impact. Many of FTA's reported potential impact estimates rely on the realization of context-specific conditions and require time to observe concrete effects on-the-ground.

1.7 Conclusions

Multiple FTA initiatives contributed to the realization of the intended outcomes, with variable levels of success across different countries. Policy and practice changes to which FTA contributed have manifested at the local level over the last decade. We assessed that FTA's interventions have contributed in equipping people reached with better means to exit poverty; for example, acquiring new procurement skills, access to inputs, management and processing techniques and market links to enhance or diversify productivity for livelihoods and household income. Table 1 lists achieved policy and practice influence and shows the extent to which FTA's intended end-of-program outcomes were realized across Africa, Asia and Latin America through concentrated efforts to poverty alleviation and increased resilience.

Within Challenge 4 mapped projects, FTA fell short in its first end-of-program outcome target, contributing to several policies, strategies, action plans and governance arrangements at multiple levels (i.e., international, regional, national, sub-national, and local) to support poverty alleviation and increased resilience across 20 countries. FTA's technical inputs, data and tools, evidence-based recommendations, and involvement in working groups supported context-appropriate decision-making, improved governance mechanisms, and strengthened institutional capacities for policy revision, enactment and implementation to contribute to poverty alleviation and increased resilience outcomes.

FTA exceeded its second end-of-program outcome target, contributing to the establishment of over 650 SMEs across Africa and Asia. FTA also influenced the formalization of over 1,500 farmer/producer cooperatives/associations, mainly in Africa, to support knowledge-sharing, capacity-building, and marketing of sustainable timber or agroforestry products. Moreover, FTA helped establish market links among input providers, financial institutions, private companies, and over 170 agroforestry-based value chains through farmer-trader partnerships in Africa and Asia. FTA influenced private companies' uptake of technology for rural energy production, climate-smart technology for more sustainable household bioenergy consumption, and investments in pro-poor value chains and climate change-related incentive frameworks. At the international level, FTA influenced practice change in at least 6 multinational companies and is expected to influence several others through private sector certification bodies (e.g., RSPO) for more equitable and sustainable business models.

FTA also fell short in its third end-of project outcome target to equip public and private sector actors to deliver more effective extension and pedagogical services to support poverty alleviation and increased resilience. Through capacity-building and technical support in 19 countries, FTA supported the establishment of several community nurseries, thousands of micro-nurseries at the household level, close to 250 community agroforestry-seed banks, and over 500 farmer demonstration trials and exemplar landscapes to enhance practice and extension delivery.

FTA did not meet its fourth end-of-program outcome through projects mapped to Challenge 4. Evidence suggests that FTA influenced approximately 1.3 million smallholders and other users with additional means to exit poverty or increased resilience to impoverishment, such as securing access to natural resources for income-generating activities and livelihoods, uptake of FTA solutions or innovations (e.g., tree-planting, agroforestry systems, enhanced management practices, processing techniques etc.), and direct participation in tree- or agroforestry-based value chains. This contributed to an estimated total of **5.1 million people (directly and indirectly)** with additional means to exit poverty or reduced vulnerability of falling into poverty across 22 countries. Through capacity-building activities and policy targets, there is an estimated potential for a total of 5.7 million smallholders and other users to adopt tree-based or agroforestry systems, enhance their management practices, and/or participate in tree-based value chains to benefit an estimated **19 million individuals (directly and indirectly)** across Africa, Asia and Latin America.

1.8 Lessons Learned on Research on Forest- and Agroforestry-based Livelihoods and Resilience

Government pathway:

- Aligning research on rural poverty and vulnerability issues with cross-sector environmentally-focused issues raised the profile of forest and trees' contributions to rural livelihoods and resilience to climate change. This alignment also supported the uptake of research outputs by policy-makers in environmental and rural development political agendas.

Donors/Investors Pathway

- FTA's influence on donors supported additional funding for new or follow-up projects. There is scope to more actively involve national and local financial institutions to reduce economic barriers and risks, and support adoption and scaling of FTA's solutions by smallholders and communities.

NGO and Allies Pathway

- Influencing NGOs was a reinforcing pathway to stimulate changes in other pathways, particularly governmental decision-making, private sector practice, smallholder and producers' practice, and advocacy to the general public.

Practitioner Pathway

- FTA did succeed in influencing practitioners' knowledge and practices. However, provision of on-going extension services to farmers was relatively weak. Adequate and frequent provision of extension services, including farmer-to-farmer approaches, increased the likelihood of smallholders' adoption of FTA's solutions and positive yield outcomes.
- There is scope for increased collaboration across governmental institutions (e.g., forestry, agricultural and fishery, etc.), with private and voluntary extension institutions, and increased participation of women in extension activities to support service provision to farmers.

Community-based Organizations Pathway

- Enhanced and transparent dialogue between communities and local governments enabled all parties to identify mutual benefits and shared understanding, while limiting conflicts over natural resource access and use for social-forestry development.
- FTA's activities and outputs should consider communities' expectations and needs to support successful establishment of community-led business enterprises. There is scope to leverage multi-stakeholder support to off-set initial capital investments for establishment of pro-poor SMEs.

Smallholders and Producers Pathway

- Very poor farmers prioritize food security and the ability to increase household income in the short-term, though many economic benefits from tree-planting activities take time to manifest. Availability of disposable income from on- and off-farm activities increases the likelihood of farmer's adoption of timber and fruit-tree planting and management practices. Hence, subsidies and other long-term cross-

sectoral financial incentives should be integrated in tree-planting design to effectively support benefit-sharing and contribute to poverty alleviation outcomes in both the short- and long-term and at scale.

- Fruit tree-crop diversification trials demonstrated potential to reduce farmers' risks from market price fluctuations in agriculture commodities. However, links to local markets for fruit produce need to be developed.
- Farmer-to-farmer knowledge sharing was a successful approach to disseminate FTA technologies, support agroforestry adoption, and increase productivity where governmental extension services were limited.

Gender and Youth

- Women, men, and youth have different needs, abilities, and interests in handling natural resources. Tree establishment and management plans should integrate culturally specific aspects of adopting market-based agroforestry including differential preferences according to gender and age.

Private Sector Pathway

- The poorest farmers face challenges to participate in markets through aggregation (e.g., cooperatives) due to immediate income needs to cover household expenses in the short-term, limiting their abilities to realize higher cash income from agroforestry products. Hence, alternative business strategies should be developed to support farmers' market links not only with large commodity buyers.
- Capacity-building in processing techniques and business management supported outcomes for SME development. However, lack of sustainable demand for products, limited human resources, and limited institutional capacity among members influenced the sustainability of some FTA-supported SMEs.

Public Pathway

- The public pathway was relatively weak. Targeted dissemination through local and national media, sensitization campaigns, and NGO advocacy garnered public attention on specific issues on sustainability and markets. Changes in consumer behaviour may take time to realize and is dependent upon external and contextual factors. There may be more scope to leverage the public to influence change in other pathways.

1.9 Recommendations for Enhanced MELIA

1. *Aim for consistent documentation of projects and influence across centres.* Implement a well-functioning, gender-disaggregated results-based data management system to support documentation, monitoring, and reporting for both the project- and program-level indicators and collate information in ways to support MELIA processes. MELIA should be embedded into the research process from the outset. Remove the siloes between researchers and MELIA (e.g., integrate research and MELIA teams together, invest in MELIA capacity-building, build appropriate organizational structures for reflection and learning).
2. *Strive for consistency in the application of monitoring and evaluation concepts.* We recommend enhanced capacity-building for FTA researchers on MELIA definitions and gender-mainstream in integrated tree-food systems, to ensure consistent understanding, use, and application of these concepts.
3. *Use nested ToCs to support challenge-centric program and strategy design and target-setting.* Researchers and programme managers should fully utilize ToC as a core element of strategic project planning, adaptive management, and monitoring. Nested ToCs – with cross-comparability at the organizational level – are a useful tool to guide strategic program management and alignment of research initiatives. More explicit target-setting would require researchers to design research for impact. Future research-for-development programmes should be guided by the value offer of purpose-driven central coordination for impact, which can be informed by explicit and well-developed ToCs.

2. Introduction

This study, “Outcome Assessment and Impact Estimation: FTA’s Research Contributions to Address Persistent Rural Poverty with Increasing Levels of Vulnerability (Challenge 4)”, is one of a series of integrative studies that aim to assess the extent to which the Forests, Trees and Agroforestry (FTA) CGIAR Research Program (CRP) has contributed to solving key global challenges since the program’s inception in 2011.

FTA represents an investment of approximately USD 850 million over the past ten years. Its research agenda aimed to develop solutions to major societal and environmental problems and to contribute to developmental and environmental impacts on a large scale. FTA is an umbrella for a wide range of inter-related research initiatives. Over the last decade, hundreds of research projects have been implemented in diverse country contexts, policy environments, geographies, landscapes, and socioeconomic conditions of local communities, to address pressing issues related to forests, trees, and agroforestry.

As an integrated program, FTA comprises five distinct research themes (i.e., Flagship Programs (FP)), and each FP comprises multiple projects, most of which are funded bilaterally. Moreover, the funding from Windows 1 and 2 targeted a set of 25 demand-driven operational priorities focusing on different areas of the program. In 2016, at the beginning of FTA’s Phase II, CGIAR set aspirational and ambitious impact targets which the program is expected to deliver by 2022 (Table 2)¹:

- 31 million more farm households have adopted improved varieties, breeds or trees, and/or improved management practices
- 19 million people, of which 50% are women, helped to exit poverty
- Improve the rate of yield increase for major food staples by 0.1845%/year
- 17 million more people, of which 50% are women, meeting minimum dietary energy requirements
- 0.225% increase in water and nutrient (inorganic, biological) use efficiency in agroecosystems, including through recycling and reuse (same target)
- Reduce agricultural-related greenhouse gas emissions by 0.2 Gt CO₂e yr compared with business-as-usual scenario in 2022
- 30 million ha degraded land area restored
- 2.5 million ha of forest saved from deforestation

Nearing the end of the program, this study seeks to assess the extent and understand the nature of FTA’s contributions and estimate the impacts that can potentially be realized over time.

Table 2 . FTA’s Expected Results (as noted in FTA’s Phase II Proposal (FTA, 2016))

End-of-Program Outcomes	Intermediary Development Outcomes (IDOs)	System-level Outcome (SLO) Target	FTA Target Contribution
1. 25 countries improve governance mechanisms, institutions & tools for a) safeguarding forests/tree diversity and b) equitably managing forests & trees within mosaic landscapes	1. Improved ecological integrity, equitable mgt. & protection of forests & non-forest-based tree resources (IDOs 3.1 & 3.3)	1. 100 million more farm households have adopted improved varieties, breeds or trees, and/or improved management practices	1. 31 million
2. About 20 multinational companies and 500 private sector actors pursue models & investments for a) improved mgt. & safeguarding of forest & tree resources and b) enhancement of inclusive landscape-based livelihoods & ecosystem services	2. Enhanced ecosystem service provision (e.g., carbon storage, nutrient cycling, water filtration & soil health) (IDOs 2.3 & 3.2)	2. 30 million people, of which 50% are women, helped to exit poverty 3. Improve the rate of yield increase for major food staples from current <1% to 1.2-1.5% per year 4. 30 million more people, of which 50% are women, meet minimum	2. 19 million 3. 0.1845% 4. 17 million

¹ Original targets were crafted by the CGIAR in a top-down manner for the whole portfolio, and then distributed to different CRPs, but without a clear quantitative approach and method.

3. National and sub-national public & private sector actors in 25 countries deliver more effective & equitable tree related breeding, delivery, extension & pedagogical services	3. Increased resilience of female, male & poor smallholders & other forest/tree users to climate change & other shocks (IDO 1.1)	5. 5% increase in water and nutrient (inorganic, biological) use efficiency in agroecosystems, including through recycling and reuse (target same)	5. 0.225%
4. At least 40 million smallholders & other users access more productive tree planting material & uptake higher performing, context appropriate & inclusive AF & small-scale forestry mgt. option	4. Productivity, food & nutritional security & incomes for female, male & poor smallholders & other forest/tree users (IDOs 1.2-1.4, 2.1)	6. Reduce agricultural-related GHG emissions by 0.2 Gt CO ₂ -e yr ⁻¹ (5%) compared with business-as-usual scenario in 2022	6. 0.2 Gt CO ₂ -e yr ⁻¹
		7. 55 million ha degraded land area restored	7. 30 million
		8. 2.5 million ha of forest saved from deforestation	8. 2.5 million

The causal links between research and impact are long and complex, making it difficult to precisely measure FTA's contribution to the above targets. To generate evidence of FTA's contributions to these targets, an integrated impact estimation strategy was developed. This strategy considers that FTA addresses five challenges:

- Challenge 1: Accelerating rates of deforestation and forest degradation;
- Challenge 2: High prevalence of degraded land and ecosystem services;
- Challenge 3: Widespread unsustainable land use practices;
- Challenge 4: Persistent rural poverty with increasing levels of vulnerability; and
- Challenge 5: Rising demand and need for nutritious food for both current and future generations.

To address each of these challenges, multiple strands of research are being spearheaded by various global, regional, and country research teams. The evaluation supports two objectives: i) the generation of coherent and scientifically credible 'impact narratives' on what FTA and its partner institutions (i.e., CIFOR, ICRAF, Bioversity International, CIRAD, CATIE, INBAR and Tropenbos International) have done and are doing to address some of the most pressing challenges of our times; and ii) the assessment of realized end of project (EoP) outcomes and make a plausible case that higher-level outcomes and estimated impacts will be realized.

This report focuses on the assessment of progress made to date on outcome realization and impact estimation for Challenge 4. In this study, poverty is conceptualized not only in terms of monetary values, but also as an obstacle that keeps people from attaining a certain level of well-being (including health, safety, food and education, amongst others) and participating fully in society (World Bank, 2001; Miller et al, 2020; UNDP & OPHI, 2020). We begin by describing the methods and process for outcome assessment and impact estimation. We then present the overarching ToC for Challenge 4, report on results in terms of outcomes realized and estimate impacts for each cluster of work under Challenge 4. The section that follows concludes with lessons for future research on poverty alleviation and resilience and Monitoring, Evaluation, Learning and Impact Assessment (MELIA).

3. Methods

This study examined whether and how FTA contributed to changes in governmental (subnational, national, and international) and organizational policy and development practice that would influence social and environmental change in the contexts where FTA's research operates and beyond. The assessment uses a theory-based evaluation approach (Belcher, Davel, & Claus, 2020) to model activities undertaken by FTA and local partners and outputs as well as intended outcomes and impacts. We tested the theoretical frameworks (i.e., ToCs) by assessing evidence of FTA's contributions to outcomes, its realization, and estimate (potential) contributions to FTA's impact targets (Table 1).

The assessment investigates how FTA generated new knowledge, attitudes, skills, and relationships among key actors to give people means to alleviate or exit poverty. The objective of this report is to critically assess the portfolio of FTA research for Challenge 4 by collecting and analyzing information about its activities, outputs,

and outcomes to provide plausible impact estimations, as well as support learning for research effectiveness and impact.

The assessment is guided by the following questions:

Research Outcome Evaluation: To what extent and how did FTA's research portfolio realize outcomes in each of the five challenges?

- i. *What is the evidence that outcomes have been realized?*
- ii. *Could the outcomes have been realized in the absence of FTA?*
- iii. *Were the ToC assumptions valid?*

Impact Estimation: What is the scope and scale of impacts to which FTA's research portfolio has contributed for each of the five challenges?

- i. *What is the spatial location and extent where impact is (likely to be) realized?*
- ii. *What plausible ranges of effects have and are likely to manifest (e.g., reduced carbon emissions per ha; increased income per household)?*
- iii. *What key assumptions are required to estimate the impact?*
- iv. *How sensitive is the estimation to varied assumptions?*

The assessment uses a set of composite ToCs as the main analytical framework. A ToC is a set of projected causal relations, hypotheses, and assumptions that describe and model how and why a project or program is expected to contribute to a change process. The ToC details the main activities and outputs, identifies key actors involved in the change process, specifies their actions as a sequence of steps or stages (i.e., outcomes) in the process, and exposes the theoretical reasoning for the expected changes (Earl, Carden, & Smutylo, 2001; Vogel et al., 2007). The ToC aims to explain who (i.e., individuals and organizations) is expected to do what differently and why as a result of FTA's research and engagement. Given that FTA's work is diverse and comprises numerous individual research-for-development projects, efforts were made to systematically document what work has and is being undertaken to meet each challenge. The iterative process for developing the overarching ToCs and cluster-level sub-ToCs is explained below.

Step 1. Mapping projects to frame FTA contributions to addressing the five challenges

As an overarching FTA-level ToC did not exist to guide FTA's programs to address the specific challenges, the first step was to map FTA projects and initiatives to the five challenges. This was, to some extent, facilitated by the use of the FTA operational priorities and list of contributing projects, complemented by interviews with some FP leaders and scientists. Owing to the integrative nature of the challenges, many projects relate to more than one challenge, so primary and secondary challenge categories were mapped by project when possible. This first step defined research clusters by theme and geography. 58 projects were mapped to Challenge 4.

Step 2. Explicating composite overarching and sub-ToCs per challenge – the case of Challenge 4

The evaluation team undertook a thorough desk review of project materials mapped to Challenge 4 and consulted with scientists and Flagship leaders to guide the development of the ToC models. Some projects had explicit ToCs documented, but most had only implicit or general ToCs available. Key ToC components were mapped in a database to identify key activities, outputs, outcomes, and impacts at the project-level. Population of the database and the mapping exercise enabled the evaluation team to first organize ToC components by project and then group similar projects by topic and/or geography into distinct clusters within the database. For example, clusters of projects addressing particular sub-challenges (e.g., timber markets, furniture value chains, tenure mechanisms, etc.) were identified through this process. Clusters could also be specified by the location of the research and engagement and by the intended application domain; that is, where the intended outcomes and impacts were expected to manifest (e.g., agroforestry concessions in Peru, gender issues in the oil palm sector in Indonesia, etc.).

Fourteen clusters were identified for Challenge 4. Following the clustering of projects, ToC components were aggregated to conceptualize the key activities, knowledge and social process contributions, outcomes, and impacts for each cluster, resulting in a cluster-level sub-ToC. Cluster-level sub-ToCs were sufficiently broad to convey the logic of the challenge, with specific project-level details mapped within each component (Challenge 4's cluster-level ToCs have been documented on an online platform² and can also be found in Appendix 1). By further aggregating the clusters' sub-ToCs, it was possible to derive a ToC and narrative for the challenge (see [Miro](#)). This was an iterative process, which enabled subsequent identification and integration of additional projects (and clusters) that could be mapped to the challenges. This analytical framework provided the structure for a review of available evaluation reports, project documents, and other data to both provide evidence to test the ToCs and identify gaps guide the subsequent data collection phase, as described in the following steps.

Step 3. Collating existing evidence by cluster, and to identify data gaps.

Over the last decade, FTA has commissioned theory-based evaluations and impact assessments of several of its projects, which provided an initial evidence base that could be built upon in this study. In order to identify where the existing evidence base was strong and where additional empirical evidence needed to be collected to fill gaps, we mapped the available evaluation evidence (i.e., use/uptake of outputs, outcomes, impacts) and systematically reviewed and appraised evidence for each project. In cases where external evaluations were not available, other documents were reviewed to collate available evidence or indications of potential evidence (e.g., external outcome evaluations, FTA and centre annual reports, outcome and performance stories, midterm reports, final reports, briefs, donor reports, presentations, peer-reviewed articles, internal and external press releases, project and external webpages, blogs, policies, etc.).

Evaluation evidence sources for Challenge 4 included:

- | | | |
|-------------------------|-------------------------------|------------------------------|
| • 14 evaluation reports | • 9 FTA annual reports | • 2 presentations |
| • 8 midterm reports | • 9 INBAR annual reports | • 3 project briefs |
| • 16 annual reports | • 5 CIFOR annual reports | • 16 project blogs |
| • 27 final reports | • 1 CIFOR-ICRAF annual report | • 5 external webpages |
| • 7 donor reports | • 2 ICRAF annual reports | • 1 donor blog |
| • 1 results summary | • 1 CGIAR performance report | • 11 external press releases |
| • 6 technical reports | • 1 Bioversity Annual report | • 1 internal press release |
| • 5 OICRs | • 5 peer-reviewed articles | • 2 videos |
| • 3 outcome stories | • 1 thesis | • 1 dataset |
| • 2 performance stories | | • 1 cost-extension agreement |
| • 1 adoption study | | • 2 manuscripts |

Evidence sources were then appraised for reliability and confidence³.

This appraisal exercise also highlighted gaps in evidence for outcomes (by pathway) and/or impacts for each cluster to guide further data collection and evidencing. Through this process, we were able to identify which clusters (and projects within those clusters) have: i) strong and likely sufficient evidence to make a reliable assessment of outcome realization; ii) key evidence gaps that could be filled at low-cost or be too time- and resource-intensive to fill. This enabled the evaluation team to select which clusters (and/or projects to represent the clusters) across the challenge for additional data collection and plan the next steps of the assessment process

² The Miro link can be found [here](#).

³ The reliability of evidence sources was determined by an assessment of whether the source was internally produced (lower reliability) or conducted by an external source (higher reliability). It was thought that external reports provide an additional level of quality control of the evidence. The confidence of evidence sources was determined by an assessment of the quality of the evidence source and its assessment (criteria included methodological approach (e.g., theory-based evaluation, quasi-experimental design), primary versus secondary/tertiary data collection, level of detail, indications versus clear realization, triangulation of evidence, etc.).

(i.e., a deep dive case study). A detailed project-level appraisal per cluster can be found in Appendix 2, which was used to guide the deep dive selection and methods to collect additional evidence of outcome realization and impact estimation.

Data availability, reliability and confidence vary markedly by cluster to support outcome assessments and impact estimations. Clusters with low to medium evidence availability, reliability, and confidence include those related to FLEGT in the Congo Basin, Timber markets in Central Africa, Forestry and Trees Value Chains in Latin America, Gender Issues in the Oil Palm sector in Indonesia, Furniture Value Chains in Indonesia, Payment for Environmental Services in Asia, Climate-resilient Livelihoods in Asia, Tenure Mechanisms (Global), Forest-based Livelihoods (Global). Clusters on Diversification of Agroforestry-based income in Sub-Saharan Africa, Sustainable Forest Enterprises in Cameroon, Agroforestry Concessions in Peru, contain a mid- to high-level of data availability, reliability, and confidence to assess outcomes and estimate impacts. Clusters on Diversification of Agroforestry-based Income in Asia and Bioenergy (Global) had high availability of reliable and recent data for outcome assessments. Most clusters contained quantitative data for estimating potential impacts.

Step 4. Assessing FTA's contributions to outcomes

The cluster ToCs, corresponding outcomes, and underlying assumptions were tested using data identified through the mapping process, further review of project documents and reporting, and follow-up discussions with project scientists. Scientists and project staff also provided insight on other sources of data to test the realization of cluster outcomes. Sources were reviewed for evidence of outcome realization by the MELIA team, and triangulated against all available project data as well as relevant policy documents to assess their reliability and confidence in the information and the likelihood of realization of estimated impacts. The analysis explicitly recognizes that the relative influence of a project or programme declines the further it moves from the project boundary and other actors and processes become relatively more influential (Belcher, Davel, & Claus, 2020). Therefore, the analysis explicitly considers alternative explanations in lieu of a true counterfactual. When possible, bibliometrics (i.e., number of citations, downloads, views) were collected to illustrate uptake and use of FTA's outputs to supplement evidence of outcomes in the research pathway.

Step 5. Impact estimation

This step used data from the preceding steps to estimate plausible ranges of FTA's impact vis-à-vis the intended targets for each challenge, as well as other potential impacts. We define impacts as a change in state or a change in flow resulting in whole or in part from a chain of events to which research (or another intervention) has contributed (Belcher, Davel, & Claus, 2020). Impacts can be social, economic, socio-cultural, institutional, environmental, or technological, among others.

Impacts were estimated based on the assessment of FTA's contributions to outcomes and the likelihood for potential impacts to be realized in the future. Further assumptions underpinning the documented impact targets and some preliminary projected impact figures surfaced and included in the analysis. The impact estimation exercise explicitly discusses the sensitivity and implications of the underlying assumptions as part of the reasoning and demonstration of likelihood for impact realization. The method of impact estimation explicitly recognizes that there are alternative explanations for potential impact, as multiple external actors are involved in the processes that contribute to changes in state. We therefore report these as contributions, rather than direct attribution. Impact estimates are derived from the review of the existing evidence base (± 170 documents) of the 58 projects mapped to Challenge 4. Thirty-one of these projects had quantifications available of low- and high-end impact potential, with varying degrees of reliability. FTA's policy influence was explored in greater detail to assess the extent of FTA's inputs and contributions to policy change and subsequent contributions to the realization of those policies' impact targets for incentive schemes, tree-based and NTFP value-chains development plans, among others.

The impact metrics for Challenge 4 were defined based on the first set of end-of-program outcome, intermediate development outcome (IDO), and system level outcome (SLO) targets identified in FTA's Phase II proposal

(Table 2). This evaluation aims to determine whether and to what extent FTA's target contribution of '19 million people, or which 50% are women, helped to exit poverty' was realized. In this study, poverty is conceptualized not only in terms of monetary values, but also as an obstacle that keeps people from attaining a certain level of well-being (including health, safety, food and education, amongst others) and participating fully in society (World Bank, 2001; Miller et al, 2020; UNDP & OPHI, 2020). Hence, impact estimates for Challenge 4 are reported in terms of number of people with additional means to exit poverty or reduced vulnerability of falling into poverty as a result of policy mechanisms, greater access to natural resources, increased income-generating knowledge and skills, and participation in agroforestry or tree-based value chains influenced by FTA.

Impact estimations are presented using a range between a 'lower-' and 'high-end' representing the number of people whose income-generating activities were influenced by FTA. In our review, available impact estimates for each project were classified as either a low- or high-end. The low-end is a conservative estimate of FTA's impact, based on number of people with evidence of behaviour change influenced by FTA projects or evidence of realized on-the-ground impacts. Examples of realized impacts included:

- i. Households with secured land tenure from FTA influence on policy
- ii. Smallholder households with an increased and/or diversified agricultural or forest-based production as result of access to inputs and/or enhanced extension services
- iii. People participating in sustainable and equitable tree or agroforestry-related value chains

The high-end is a more liberal estimate of potential impact, which is optimistic (and in some cases unrealistic), based on:

- i. Farmers reached via FTA and partner's capacity-building activities
- ii. Impact projections calculated by FTA projects
- iii. Policy targets of national and sub-national cross-sector policies influenced by FTA

Impact estimations are taken from aggregating project-level information (i.e., the sum of projects' lower- and high-end estimates)⁴ to derive the total estimated impact for the cluster. The lower and high-end estimates do not represent all FTA interventions, but only interventions where impact estimates were available, or quantification was possible. To note, in some countries, there is potential for double-counting in the number of people that participated in multiple capacity-building activities. We have tried to account for this where possible but have flagged potential double-counting which needs closer review.

Reported impacts were sometimes documented in different units (i.e., people, households). For consistency, we assumed that if one member of a household directly benefits from FTA research influence and engagement processes, all members of that individual's household benefit indirectly from opportunities to increase household income and other means to exit poverty. Hence, this evaluation reports the total number of people directly and indirectly influenced by FTA research. To calculate indirect impact estimates, we calculated the average number of people per household using national level census data of household composition (United Nations, 2017) by country when country-disaggregated data were available, or applied an average of four individuals per household when reported impact estimates represented multiple countries. To avoid double-counting the direct beneficiary in the projected total number of beneficiaries, we accounted for the overlap by reducing numbers accordingly.

All challenges shared a set of general assumptions that underpin the preliminary impact estimates. More detailed and challenge-specific assumptions for each impact estimate are documented in the appropriate cluster-level summary results table. As an overarching assumption, we assumed that the evidence sources consulted in our review contain accurate, reasonable, credibly-derived, and reliable impact estimates. We continuously interrogated these estimates and their corresponding supporting evidence to test this assumption.

⁴ It was not always possible to derive an upper-end estimate; in these cases, the lower-end estimate was used when adding the upper-end estimates together.

Within the sphere of control, we assumed that:

- FTA holds a credible position (i.e., viewed as a trusted partner), and is therefore able to exert influence over the way research agendas and policies advance (e.g., stimulate evidence-based decision-making);
- NGOs, partners, and organizations with sustainability objectives are actively seeking out evidence to support their campaigns and programs to continue to work with policy-makers, communities, and the private sector in efforts to enhance women and marginalized groups' participation in natural resources governance frameworks and adoption and scale up of pro-poor agroforestry and management practices;
- FTA's training and capacity-building efforts stimulated learning and built skills that are applied and scaled;
- FTA and partners deliver adequate support to smallholders and SMEs to gain access to natural and financial resources and markets.

Within the sphere of influence, in order to count the number of people with increased means to exit poverty or with reduced potential to fall into poverty influenced by FTA, we assumed that:

- All individuals of relevant actor groups who receive training from FTA interventions, either directly or from FTA-supported training programs, benefit and obtain new knowledge, skills, and relationships as a result, and are both motivated and capable of leveraging and applying these in their practices;
- Management practices and skills promoted by FTA projects have positive impact on plant survival rates and yields;
- Smallholders and SMEs gain access to natural and financial resources (i.e., tenure, PFES, etc.) via enabling policies that reduce barriers, and these groups are better equipped to comply with sustainability requirements, change practices, and access to financial inputs & markets;
- Boundary partners support capacity-building and scaling post-project.

In the sphere of interest, we assume that:

- The public is aware and informed of possible ways to support top-down and bottom-up equitable and sustainable market and value-chains, and is actively demanding change at policy, practice, and individual levels;
- Large companies uphold commitments to climate action and international certification standards as a result of policy, market pressures, and consumer demand;
- The policies to which the research has contributed are effectively implemented and enforced to reach intended targets (i.e., policy changes are sufficient to influence practice change and support smallholder's access to natural resources, financial inputs and co-financing schemes that enables access to income-generating opportunities);
- Funding capacity at national level for scaling of FTA-proposed solutions and innovations.

Step 6. Deep dive

Owing to the complexity of FTA's approach to address Challenge 4, and the variable range of available evidence for each of the clusters as identified in Appendix 2, it was decided that two clusters would be analyzed in greater detail within a 'deep dive study' to explore practice and policy contributions and potential impact. A thorough assessment was conducted to identify the most appropriate cluster candidate for an in-depth analysis of FTA's work on poverty alleviation and solutions to increase communities and farmer's resilience. A set of criteria⁵ was used to support the appraisal and selection of deep dive candidates. No cluster fully satisfied all criteria. Two

⁵ A set of criteria for this assessment were presented in the report "Outcome Evidencing and Impact Estimation: Progress on Challenges 1 & 5" (2020). Criteria included: potential overlap of cluster/project(s) for other challenges; geographic overlap and representation; centre representation; pathway overlap; proportion of FTA investment of cluster/project (i.e., prioritizing clusters/projects with larger budgets); likelihood for availability of outcome evidence; and likelihood for availability and/or feasibility to assess and quantify the scale of impact.

clusters 'Diversification of Agroforestry-based Income in Asia' (comprising 8 projects) and 'Bioenergy (Global)' (comprising 5 projects) met most criteria and were selected. For example, the Diversification of Agroforestry-based Income in Asia cluster illustrates well FTA's influence for developing tree-planting context-appropriate solutions to both alleviate farmers vulnerabilities regarding loss of productive land while adopting agroforestry with key indigenous species with market potential for cash income. This cluster of research overlaps with issues related to degradation (Challenge 2) and land management (Challenge 3), and one of the projects had impact estimates scientifically calculated in recent studies; however, additional data was necessary to assess agroforestry contributions to household income. The Bioenergy (Global) cluster illustrates alternative livelihoods and income generating activities using bamboo to reduce human pressure over forest resources (Challenge 1) while contributing to regeneration of degraded lands (Challenge 2). The selection of this cluster contributes to the assessment of INBAR's work, not assessed in other challenges. The overlaps indicate the cross-cutting nature of FTA's work to address these integrated challenges, and selection of these clusters for the deep dive was also considered to supplement data availability for other challenges.

4. Limitations

Several factors limited the analysis and the interpretation of findings. FTA centre- and partner-level project information databases vary in terms of completeness, which made the mapping exercise challenging. Many projects had no explicit ToC narratives or models documented⁶, hence substantial document review and a targeted series of interviews were required to model these projects in the composite ToCs. Therefore, not all of FTA's interventions could be captured; hence, the reported estimates do not reflect FTA's entire contribution that addresses the challenge, but rather a selection of relatively well-documented research initiatives. Developing the composite ToCs was also challenging because of the variable levels of project-level and MELIA reporting. Some connections and pathways between research efforts and outcomes were unclear, and the use of MELIA terms was inconsistent across reporting.

Accessing further qualitative evidence (e.g., scheduling interviews, site visits) during the COVID-19 pandemic limited the depth of the deep dive analysis. The deep dive analyses had low response rates as a result. Relying on FTA scientists to identify potential informants to test outcomes and impacts can introduce bias into data collection as informants may be identified by key scientists for their likelihood to reflect positively on FTA project results. Therefore, findings were triangulated with evidence within project documents as well as external evidence (e.g., government documents, press releases, academic articles, case studies) to ensure the reliability and credibility of data and cross-check information received. Respondents' recollections of project details and events (e.g., research activities and potential outcomes) that happened some time ago were limited (particularly as many projects were launched during Phase I); therefore, triangulation with available documentation and further review of external evidence was undertaken. Moreover, the discrepancy in short project timelines and the reality of time lags before FTA's impacts can be observed also provided severe challenges in reporting impact achievement and anticipating the potential for future impact at an aggregate level. Such nuance is provided at the cluster level, and all reported impacts expected to be realized as a result of FTA's contributions should be considered in terms of potential, as many rely on context-specific conditions and require time to observe concrete effects on-the-ground. The availability of reporting against relevant SLO targets may have resulted in under-reporting in some cases. This also has likely led to under-reporting of FTA's impacts (particularly for the low-end estimates/potential), hence the provision of high-end estimate potentials and ranges for the estimates.

⁶ For bilateral projects, these were devised and inserted into the program following a dialogue between the lead investigator, Flagship leader, and program leadership (n.b., a key requirement for this process in Phase II was the contribution of the bilateral project to one of the 25 operational priorities of the program and their linkages with the operational priorities 3-year workplans). However, specific ToC requirements and sometimes even the existence of a project ToC were primarily dependent on conditions imposed by the bilateral grant. FTA did not seek to superpose or impose specific ToC requirements to bilateral projects (as this would have been too costly or even difficult to negotiate).

Furthermore, the ways in which FTA projects report on their contributions and achievements are inconsistent, making the review and analysis of available evidence an arduous task. This was particularly apparent in reporting for multi-country projects and programmes, where often reported evidence is not disaggregated by study sites, let alone by country. At times, this made testing of the ToC logic difficult and prone to misinterpretation or misattribution. The impact estimation exercise was also challenging. Few projects presented impact targets or reported on expected or potential impacts. In cases where impacts were reported, the methodologies used to derive the impact figures were unclear and relied heavily on the realization of outcomes and assumptions underpinning the impact (see Appendix 2 for the discussion of document reliability assessment). Some projects reported gender-disaggregated data thus limiting the assessment of FTA's contributions towards gender target for the challenge. The disparities in reporting against established targets and in the appropriate units also introduced possible over- or under-reporting. For example, for Challenge 4, several evidence sources provided disaggregated details on capacity building activities per topic which a same individual could have benefited from multiple training opportunities. Moreover, there were difficulties in separating outcomes and impacts between the study's five challenges and among clusters where FTA's work on poverty alleviation was closely aligned and overlapped in terms of project topics, geography, actors engaged, and intended outcomes (e.g., Tenure Mechanisms (global) cluster overlap with Challenge 3), as well as the confluence of external dialogues and fora on inter-related issues and initiatives. For example, while 'PRO-FORMAL: Policy and regulatory options to recognise and better integrate the domestic timber sector in tropical countries' multi-country project was originally mapped within the FLEGT (Congo Basin) cluster, outcomes realized in Indonesia, one of the project's priority countries, were reflected in the Furniture Value Chains in Indonesia cluster. We have tried to account for these where possible.

5. Challenge 4 Theory of Change

Persistent rural poverty with increasing levels of vulnerability constitutes an important focal area of scientific and applied research for the FTA CRP. 689 million people live in extreme poverty worldwide, surviving on less than \$1.90 per day (World Bank, 2020). Many rural people experiencing poverty often rely on forests and tree-based systems, such as agroforestry, suggesting the existence of links between such systems and poverty outcomes (FAO & UNEP 2020, Razafindratsima et al., 2021). In this evaluation poverty is conceptualized not only in terms of monetary value, but also as an obstacle that keeps people from attaining a certain level of well-being and participating fully in society (World Bank, 2001; Miller et al., 2020). Considering the global Multidimensional Poverty Index⁷, about 84.3 percent of multidimensionally poor people live in Sub-Saharan Africa (558 million) and South Asia (530 million) (UNDP & OPHI, 2020). As of 2020, across developing countries, 1.2 billion people lack access to clean cooking fuel, 687 million lack electricity, and 1.03 billion have substandard housing materials (UNDP & OPHI, 2020). The climate crises, deforestation, and land degradation have been increasing the vulnerability of rural, natural resource-based communities in particular. COVID-19 has caused further economic turmoil, pushing millions of workers into underemployment, unemployment, and working poverty. Sustainable Development Goal 1: No poverty, reflects the global commitment to addressing this complex challenge. Interactions and tradeoffs among food systems, environmental services, and social welfare at different scales are important focal areas of scientific and applied research worldwide (Ericksen, 2007, Razafindratsima et al., 2021), and a key focus of FTA research over the last decade. Forests, trees and agroforestry have the potential to increase household income by increasing and diversifying productivity, and by reducing agricultural inputs and thus production costs. Integration of trees in food systems when practiced at scale, can enhance ecosystems through carbon storage, prevention of deforestation, biodiversity conservation,

⁷ The Multidimensional Poverty Index complements the international \$1.90 a day poverty rate by showing the nature and extent of overlapping deprivations for each person across 10 indicators in three equally weighted dimensions—health, education and standard of living (e.g., child mortality, nutrition, years of schooling, school attendance, cooking fuel, sanitation, drinking water, electricity, housing and assets)

cleaner water and erosion control, while enabling agricultural lands to withstand events such as floods, drought and climate change contributing to increased resilience of agricultural food systems.

FTA works globally, supporting research across Africa, Asia and Latin America. FTA's research addresses the following drivers of rural poverty and vulnerabilities:

- Land-tenure insecurity;
- Lack of education and government support to communities;
- Informal employment and low access to legal timber markets;
- Yield gap due to ineffective agricultural extension services;
- Monocropping and yield vulnerability to climate change and markets;
- Lack of knowledge and capacity on optimal management of forest and tree-based systems;
- Lack of knowledge and capacity on value addition technologies and markets;
- Limited community-led sustainable enterprise opportunities and access to supply chains.

FTA addresses these inter-related aspects of rural poverty and vulnerability by:

- (i) providing knowledge that frames issues (e.g., challenges and opportunities for agroforestry concession mechanisms, contributions of SMEs to sustainable timber management, market opportunities for timber and NTP value chains, etc.);
- (ii) generating data on socio-economic status and priorities of rural and vulnerable populations to understand current conditions and trends over time, developing tools and methods (e.g., maps and catalogue of priority species, CFEs performance assessment and monitoring, informal timber trade assessments, etc.);
- (iii) proposing policy options (e.g., integrating gender considerations into governance frameworks, AFC zoning, governments recognition of CFEs as social enterprise, etc.) and innovations (e.g., NTFP genetic gain, tree sustainable harvest, low cost processing techniques, etc.);
- (iv) offering guidance and support for policy operationalization and implementation (e.g., development of equitable SMEs business plans, support CFEs access to financial inputs & markets, input delivery systems, training on AFS management, guidance for scaling up tree planting, etc.);
- (v) supporting social process contributions via strategic and targeted engagements with stakeholders throughout the research process and providing training to support capacity-building.

Collectively, FTA's research and engagement efforts aimed to contribute to:

- (i) researchers advancing the research agenda on forest and trees contributions to livelihoods and poverty alleviation;
- (ii) NGOs, partners and allies enhanced advocacy for policy and practice change in support of integration of agroforestry (including provision of high-quality planting material and extension services at local level) in sustainable food production, ecosystem services, rural development strategies, and corporate accountability;
- (iii) international organizations and multiple levels of governments to develop or adapt evidence-informed policies and legal frameworks that create a conducive policy environment and incentives for tree-planting and agroforestry development at scale;
- (iv) practitioners' capacity to provide enhanced extension services and advice to smallholders for accessing inputs and services, and increased yields;
- (v) community based organizations' increased capacity for equitable management of natural resource and access incentive schemes and markets;
- (vi) private sector change practices to comply with national regulations for natural resource use and support equitable pro-poor market value chains and benefit sharing; and
- (vii) smallholders change practices and adoption of tree planting and agroforestry systems that enable sustainable livelihoods and access to cash income via participation in value-chains.

A conducive policy environment would provide the legal framework to and assurance for individuals and communities long-term access to land and natural resource use, and incentives for equitable management for livelihoods and income. Private companies would have a clear policy framework and regulations to influence corporate accountability and investments in pro-poor environmental protection schemes. With clear and conducive policy environment and public and private incentives, individuals and SMEs would be better equipped for decision-making, planning, and investments enabling tree-planting or adoption of agroforestry and/or other tree-based income generating alternatives for household income. Enhanced capacities on optimal context-appropriate tree-based and agroforestry systems, access to high-quality planting materials and enhanced extension services would support farmers and community groups realizing increased yield of high-quality fruits, timber, and NTFP to have enough production for consumption and be able to sell to domestic and/or international markets for cash income contributing for poverty alleviation for forest-dependent communities, smallholders and their households.

For FTA's outputs to contribute to the realization of outcomes described in Challenge 4's ToC (Figure 1), it is assumed that 1) a lack of knowledge about the role of forests and wild resources in rural incomes and alternatives for tree-based rural development is constraining good policy and practice at all levels; 2) policies and laws that regulate the planting, harvesting and sale of trees on private and state land enables individuals, communities, SMEs and large-scale private investments in tree-based businesses; 3) smallholders with a secured land tenure have enough incentives to leverage economic benefits from sustainable use of trees; 4) communities and farmers adopt management practices learned in training and plant received quality-planting material in their lands; 5) timber and fruit trees have generally high survival rates enabling households and smallholders to have enough production to sell, and income will continue to grow as trees reach maximum fruit production; and 6) selected priority species for tree-based and agroforestry systems have high market potential and product prices remain attractive, with risk mitigated by diversification of products.

There are multiple pathways to these goals, which involves the engagement of diverse actor groups and multiple processes. FTA's research and engagement aim to influence the following actors/action arenas (Figure 1):

1. Researchers (e.g., graduate students and National Research centres) to improve the knowledge base and advance research agendas on topics such as gender and traditional communities' issues, market-based and context appropriate agroforestry options, and technology development for value addition (via collective academic efforts, publishing, engaging in academic debates, engaging research funders, equipping the next generation of researchers);
2. Donors' and international organizations' governance frameworks, commitments, action plans, coordination, investments, oversight, and monitoring (via issue framing, empirical data, monitoring tools, proposed policy frameworks and recommendations, capacity-building, and operational guidance);
3. Government policy-makers developing and revising national and sub-national policy (via framing issues to garner attention for action, and improving data access and technical capacity) and equipping government agencies tasked with policy implementation for cross-sectoral alignment, better governance, monitoring, and management through integrated landscape approaches (via proposed governance frameworks, improved monitoring tools, capacity-building, and operational guidance and recommendations);
4. NGOs', (boundary) partners', and allies' advocacy for policy and practice change, promotion of evidence-based knowledge, and support in top-down and bottom-up equitable land and forest management processes (via framing issues, improving access to quality data, and capacity-building);
5. Practitioners' development and implementation of equitable and pro-poor action plans, value-chains monitoring and development, and technical and extension support to large-scale and small-scale practices (via tool and method development and training);

6. Corporate-scale private sector (i.e., large-scale companies) changing practices, via:
 - a. Compliance with national regulations and adherence to international commitments and certification schemes;
 - b. Co-investments in community-based business plans;
 - c. Capacity-building in benefit-sharing business models and practices;
 - d. Supply chain transparency and management;
7. Community based organizations and small-scale private sector (i.e., smallholders and SMEs) changing practices, via:
 - a. Capacity-building in sustainable natural resource use and agroforestry practices that are context-appropriate;
 - b. Awareness-building for available policy mechanisms and certification schemes;
 - c. Eligibility identification and support for compliance with available policy mechanisms and certification schemes;
 - d. Piloting and long-term compliance support with available policy mechanisms, rewards schemes, and certification schemes; and
 - e. Formalization and market access.

Through the realization of the above outcomes, it is expected that FTA's research will contribute to reduced rural poverty and vulnerabilities through:

- Improved smallholder's livelihood opportunities and income through secure land-tenure (Peru);
- Enhanced smallholder and communities' use of tree-genetic and non-timber forest products for resource sustainability and reduced vulnerabilities to climate change (Brazil, China, Colombia, Costa Rica, Guatemala, Indonesia, Laos, Myanmar, Nicaragua, Peru, Philippines, Thailand, Vietnam);
- Enhanced women and indigenous people participation in natural resources governance and access to benefits (Indonesia);
- Improved community access to domestic and international market opportunities through certification schemes (Indonesia);
- Increased employment opportunities and income through enhanced value chains (globally with activities in Brazil, Cameroon, China, Ethiopia, Ghana, Guinea, India, Kenya, Madagascar, Mali, Sierra Leone, Tanzania, Uganda);
- Improved forest monitoring systems (e.g., FLEGT/VPA) and market function to increase smallholder participation in legal domestic and international timber market with a particular focus in Central and West Africa (Cameroon, DRC, Gabon, Ghana, Liberia, Sierra Leone, Tanzania, Zambia);
- Enhanced on-farm diversity and productivity to increase agroforestry-based income through development and dissemination of optimal agroforestry systems and management practices (Burkina Faso, Ethiopia, India, Indonesia, Kenya, Malawi, Mali, Niger, Rwanda, Tanzania, Uganda, Vietnam, Zambia);
- Expanded natural resources conservation rewards schemes (China, India, Indonesia, Nepal, Philippines, Vietnam);
- Modifying cross-sector policy frameworks and finance models to foster community-based enterprises and sustainable access to forest resources (Cameroon).

The following section presents evidence of outcome realization in the cluster-level sub ToCs. Detailed cluster-level sub-ToCs for Challenge 4 can be found in Appendix 1 (see also [Miro](#)).

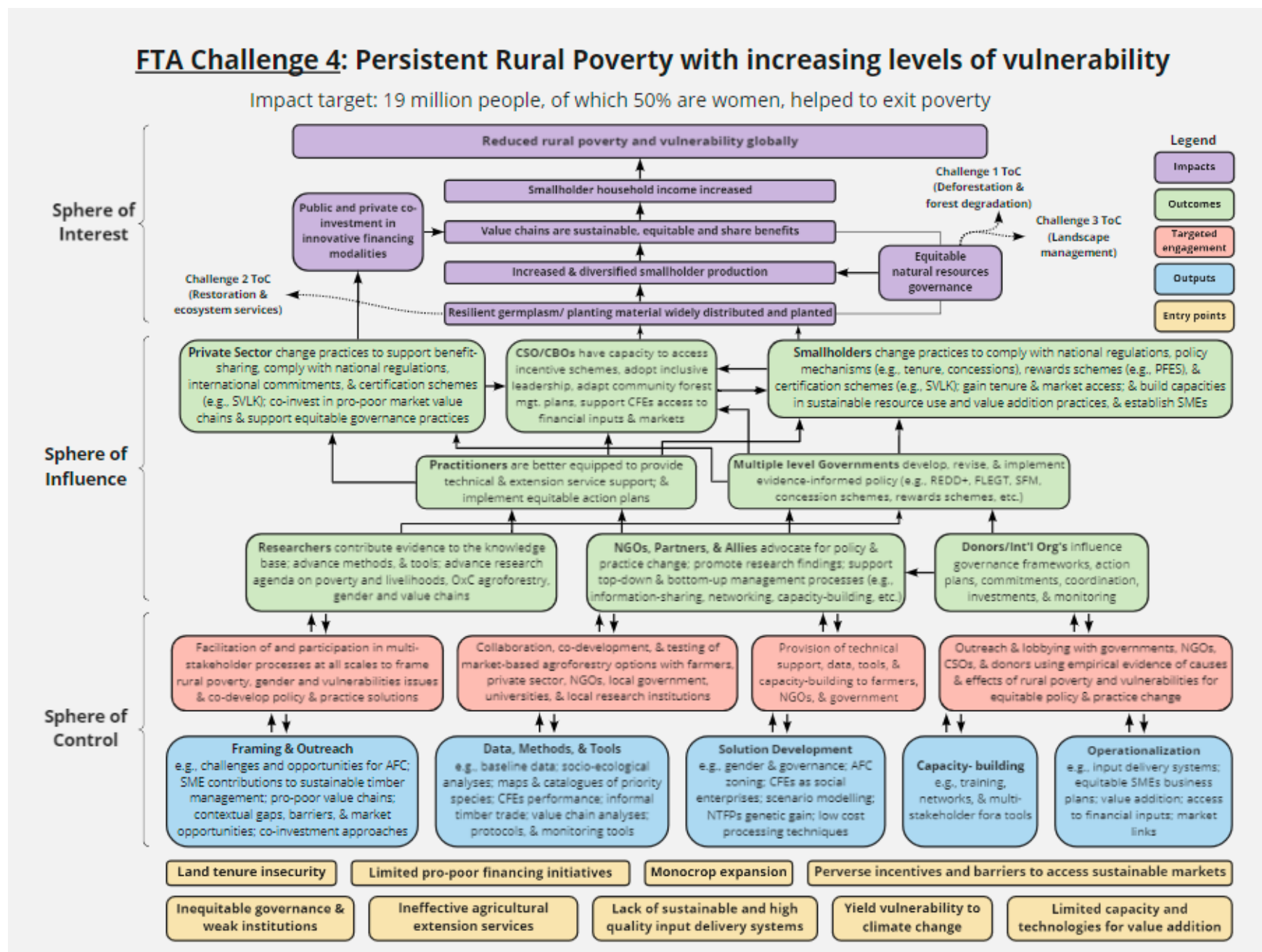


Figure 1. Summary overarching ToC outlining expected FTA's contributions to Challenge 4.

6. Results

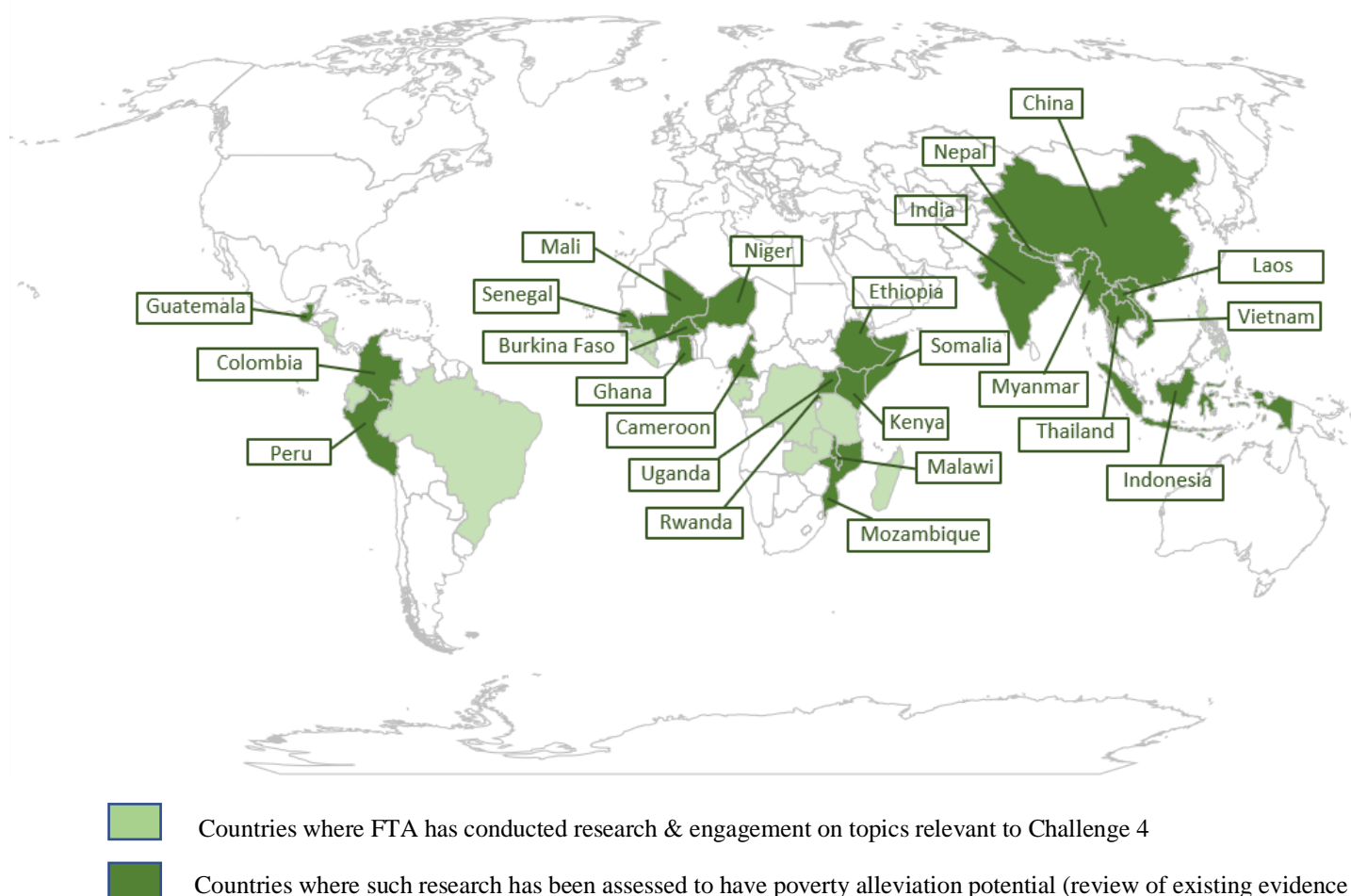


Figure 2. Countries where FTA carried out research on topics mapped to Challenge 4. The range of impact estimates correspond to the countries coloured in dark green.

6.1 Outcome Assessment

The results presented below answer the guiding evaluation question for the FTA integrative studies: *To what extent and how did FTA's research portfolio realize outcomes in each of the five challenges?* In this section, we summarize the extent to which there is reliable evidence that outcomes in the overarching Challenge 4 ToC (Figure 1) and the respective cluster-level sub-ToCs (see Figures 3-16 in Appendix 1) were realized. This section presents outcome narratives and impact estimates for each cluster, as well as deep dive case studies for two clusters (e.g., Diversification of Agroforestry-based Income in Asia and Bioenergy (Global)).

The assessment indicates that FTA made notable achievements to influence policies, practices, and research that contribute to poverty alleviation and reduction of rural and forest dependent peoples' vulnerabilities to impoverishment across Africa, Asia, and to a lesser extent, in Latin America. FTA achieved influence in policy, practice, and research trajectories to support pathways to impact for poverty alleviation and increased resilience. Some examples include: new FTA-informed agroforestry policies and integration of agroforestry in rural development policies, strategies, and action plans, development of large-scale supply of genetically superior quality planting material (QPM) in resource-poor remote regions, enhanced cross-sector coordination among multiple stakeholders for pro-poor value chains development, and capacity-building of several thousand local stakeholders (e.g., extensionists, communities, farmers and producers) influencing integration of tree-based and agroforestry systems into local practices for household income and livelihoods. Yet, the assessment highlights that additional data collection is required to get a more complete picture and more robust assessment for what has

been achieved to date to address the challenge and estimate impacts. Due to limited availability of gender-disaggregated data in the evidence sources consulted, the assessment of FTA's contributions towards gender target for the challenge was not feasible. Gender-disaggregated data is reported in cluster-level results narratives and respective summary outcome table when available.

The following section presents evidence, for each cluster mapped to Challenge 4, about FTA's main contributions to outcomes through policy influence, practice influence, and research influence. Results are differentiated at the global and country level as appropriate. The assessments are based on available evaluation evidence (i.e., theory-based outcome evaluation reports, outcome stories, final reports, FTA and centre annual reports, interviews with key scientists, etc.). The tables that accompany each narrative provide evidence of outcomes supporting the realization of impact targets, impacts achieved to date, and potential estimated impact. A discussion of outcome achievement per actor group according to the overarching ToC for the challenge is provided.

6.1.1 FLEGT (Congo Basin) Cluster Results:

In support of sustainable livelihoods for forest-proximate communities, FTA aimed to develop options for expanding livelihood and income of forest-proximate communities. It did this through the successful implementation of the Forest Law Enforcement, Governance, and Trade (FLEGT) mechanism as well as through increased domestic legal timber trade in the Congo Basin. FTA's research targeted governmental policy and informal markets to promote and incentivize FLEGT compliance, policy reforms for the integration of smallholders, chainsaw millers, and traders in FLEGT-VPA agreements, and the formalization of artisanal loggers to enhance the sustainability of the artisanal timber sector in the Congo Basin. The research also offered training and technical capacity development for student learning (i.e., Bachelor, Masters and Doctoral students) in several countries. FTA generated a scientific database on the vibrant but generally informal domestic timber sector in six African countries (Cameroon, the Central African Republic (CAR), the Republic of Congo, the Democratic Republic of Congo (DRC), Gabon and Côte d'Ivoire), wood-fuel value chains dynamics and flow maps, policy analysis and recommendations for FLEGT mechanism implementation and monitoring systems, and engaged diverse actors (i.e., government stakeholders and forest sector experts) in multi-stakeholder working groups to discuss cross-sectoral advocacy strategies in support of formal artisanal logging in public procurement, and provided recommendations for integration of smallholders and small-scale chainsaw millers into the domestic timber markets (i.e., legality compliance and livelihoods trade-offs). FTA advanced scientific understanding of internal markets in Congo Basin producer states, raised the profile of the informal domestic timber sector to policymakers, and produced several policy-relevant and innovative research outputs. CIFOR is now recognized as an authoritative source of scientific evidence to inform decision-making in Cameroon, Gabon, and DRC.

Policy Influence

In Cameroon, FTA successfully influenced the Cameroonian government through the provision of policy-relevant options to better regulate and integrate the domestic timber sector into the formal economy, secure forest-dependent people livelihoods, and promote the adoption of improved management practices by smallholders. Cameroonian stakeholders gained new insights and perceptions of the importance of local/domestic timber markets in relation to export trade (e.g., importance of chainsaw logging sub-sector in Cameroon's forest economy, role/conceptualization of SMEs, systematic sector illegality), and the sector's importance as a source income for local communities (e.g., informal and small-scale timber sector responsible for 45,000 jobs). Stakeholders (government, donors, NGOs, and civil society) gained new opportunities for knowledge exchange (e.g., meetings, dialogues) with other stakeholders who would not otherwise have had a voice in public fora (e.g., small timber traders) to build mutual understanding on timber markets issues. As a result of FTA's engagements, the Ministry of Forestry and Wildlife (MINFOF) established two working groups, one to develop a legal timber procurement policy and a parallel advocacy strategy in favor of legal sawnwood in public contracts and a second on anti-corruption using FTA's Rapid Results Initiative approach. The latter received further support from UNEP for the implementation of initiatives focused on the reduction of corruption in the timber value chain and also

influenced an NGO's (e.g., *Forêts et Développement Rurale* (FODER)) proposal for livelihood studies of chainsaw operators. FTA's findings were taken up in MINFOF's 2013 wood sector industrialization plan, giving prominence to small-scale logging and chainsaw milling. FTA's policy engagement supported the development of a conjoint draft national decree by three ministries (MINFOF-MINMAP-MINTP) promoting use of legal timber on public contracts. Existing regulations were also simplified to make them more accessible to and cost-effective for small operators. This process inspired COMIFAC to extend the approach to other countries in Central Africa. Sharing of FTA's policy briefs with the national government, the European Union, and the European Commission for International Cooperation and Development (DEVCO) directly contributed to the new Forest Law and influenced DEVCO to be more effective in documenting results about the compliance of exporters regarding legally-sourced timber. FTA's finding on the domestic market informed several technical and formal FLEGT-VPA negotiation sessions between Cameroon and the European Commission (EC), giving prominence to the development of small-scale logging/chainsaw milling sectors and SMEs formalization. There are positive indications of uptake of FTA's recommendations to recognize and integrate informal domestic markets in FLEGT contracts; however, successful implementation is dependent upon the existence and effective implementation of industrial timber traceability systems in Cameroon. FTA's findings have been acknowledged in FLEGT discussion fora organized by global stakeholder organizations like Chatham House, FAO, and the European Forests Institute, among others. To secure forest-dependent people livelihoods in Cameroon, FTA partnered with MINFOF to support wood-energy value chain sustainability and livelihoods by launching a reforestation campaign targeting 100,000 trees planted in Okola and Evodoula municipalities, which is expected to enhance economic opportunities for the forest-dependent people in the municipalities, and enabled diverse stakeholders (e.g., Far North and East Provinces' wood-fuel groups, MINFOF, MINEPDED, and MINWE) to engage in national dialogue for improved policy on sustainable charcoal.

In the Democratic Republic of Congo (DRC), FTA engagements with local stakeholders (e.g., landscape and provincial levels) are expected to co-produce a roadmap for sustainable wood-fuel management.

In Gabon, the Ministry of Water and Forests (MINEF) revised its Forest Control Strategy based on FTA data, putting in place fixed and mobile forest patrols to prevent illegal logging. There is indication of uptake of FTA data and methods for monitoring domestic timber market (i.e., *quincailleries*, hardware stores). Dialogue with the EU also recommenced, with indications of potential adoption of FTA recommendations in the future.

In Ghana, FTA provided technical inputs to the Ghanaian Forestry Commission to improve wood-fuel value chains, which influenced deployment of the national climate change strategy and the Cocoa-Forest REDD+ Programme. The relationship fostered with the Commission enabled FTA centres to better navigate and contribute to national processes, garner endorsement of co-developed land use maps, and replicate FTA's approach in other jurisdictions.

In Kenya, FTA and NGO partner (e.g., FFF Kenya) supported SMEs engagements in national dialogues for revisions of charcoal regulations (e.g., safeguard for *Prosopis* charcoal trade). FTA's participation in multi-stakeholder processes also supported the integration of sustainable wood-fuel value chain options into county environmental management plans (e.g., Baringo County), bolstered by NGO partners' advocacy and capacity-building support for charcoal producer associations. There are indications that Baringo County's Environmental Committees will further develop a roadmap for implementation of *Prosopis* exemption at the local level and stakeholders will support replication of the approach in Kitui County to lift the *Prosopis* charcoal ban.

In Zambia, FTA and NGO partner (e.g., FFF Zambia) supported district- and national-level policy dialogues to engage strategic partners in cross-border areas and production hot-spots to formulate a new regulation on charcoal. While FTA intended to help develop participatory forestry action plans with Zambian stakeholders, these activities have been postponed.

Practice Influence

FTA's research and engagement activities also influenced practice, supporting the formalization of the informal SME sector across target countries by improving their capacities to comply with FLEGT legality requirements,

and the optimal use and sustainability of resources by enhancing producers' management and processing skills. FTA-trained farmers transferred knowledge on natural resource-sourcing (e.g., wood) and skills (e.g., efficient carbonization) to 150 charcoal producers in Cameroon, DRC, Kenya, and Zambia via diverse training and engagement opportunities.

In Cameroon, FTA and partners (e.g., ANCOVA) brought the issue of the domestic timber market to the public's attention, influencing attitudes of urban markets on timber. Over 381,000 people were reached as part of several media campaigns (e.g., Facebook, Twitter, YouTube), increasing consumer awareness on the importance of the legal origin of timber products. Sellers were also sensitized and increased promotion of sawnwood of legal origin in 14 urban markets. FTA's engagement with private sector actors involved with timber supply chain management (e.g., SGS, Helveta) influenced revisions of companies' existing traceability contracts, which now feature smallholders, chainsaw millers, and traders as part of the formal supply chain. Seventeen construction companies have enhanced understanding of their social and environmental commitments for FLEGT compliance because of FTA. As a result, three private companies expressed intent to voluntarily adopt a legal sawnwood purchase constraint; however, market linkages between companies and legal timber producers are yet to be established. Governments and a smallholder logger's association (ANCOVA) increased dialogue on SMEs formalization sensitization strategies facilitated by FTA engagement activities. As a result, ANCOVA indicated intention to support SME formalization (i.e., plans for promotional campaigns) in 15 urban markets of Yaoundé. FTA supported a network for smallholders and SME producers to promote charcoal production from wood residues in the Littoral region through Wood Processing Units (WPU) in one community (e.g., Douala) and built local capacities to develop a business model for charcoal briquettes production from organic residues from households, agriculture, or factories (including sawdust) for increased economic opportunities and resilience of forest-dependent communities. There is potential to scale out FTA activities using the WPU approach across the Yaoundé community.

In DRC, charcoal producer communities learned about multiple land use and built capacities for more sustainable production (e.g., fast-growing species, communal agroforestry, plantation rotation cycle), processing practices (e.g., transformation of sawmills residues), and trade from FTA pilots. Local stakeholders learned about the importance of chainsaw loggers to domestic timber market – comprising an estimated 85 percent of domestic timber trade and generating employment opportunities for close to 25,000 people in rural and urban areas. As a result, an NGO (e.g., Ocean) liaised with FTA researchers and drew upon findings to inform their sensitization programme on FLEGT.

In Ghana, FTA helped establish a multi-stakeholder learning platform and piloted different business models and independent monitoring and traceability systems with three private companies (e.g., GOPDC, Serendipalm, Rubber Plantations Limited) for improved management, supply chain monitoring, good agricultural practices, and FLEGT and RSPO compliance. Through engagement with the National Cocoa Board (COCOBOD), a new collaboration arose to support the National Cocoa Replanting and Agroforestry Program, where FTA will help identify and test innovations to attract farmer buy-in (e.g., replanting cocoa stands, introducing tree species).

In Kenya, FTA and NGO partners (e.g., FFF Kenya) built capacities of charcoal producer associations (e.g., Charcoal Producers Federation of Kenya-CPFK), SMEs, and communities on wood production techniques (e.g., planting, FMNR, harvesting) and processing (e.g., charcoal production options).

In Zambia, FTA and NGO partner (e.g., FFF Zambia) built capacities of charcoal producer associations to enhance resource efficiency (i.e., carbonization techniques) and pilot tested Participatory Guarantee System for charcoal. One Zambian private company (e.g., ZAFFICCO Plantations) began to produce industrial charcoal from invasive species (i.e., *Toona ciliata*) as result of FTA's pilots.

In the reviewed sources, there was no evidence of policy, practice, or research influence in **Liberia, Sierra Leone, or Tanzania.**

Table 3. FLEGT (Congo Basin) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Cameroon</p> <ul style="list-style-type: none"> • Influenced regulation and integration of domestic timber sector into the formal economy • FLEGT-VPA negotiation sessions between Cameroon and the European Commission (EC) informed by FTA <p>Ghana</p> <ul style="list-style-type: none"> • Influenced integration of wood-fuel value chains into national climate change strategy and the Cocoa-Forest REDD+ Programme <p>Kenya</p> <ul style="list-style-type: none"> • Enhanced participation of SMEs in national dialogues for revisions of charcoal regulations • Integration of sustainable wood-fuel value chain options into county environmental management plans
Practice Influence	<ul style="list-style-type: none"> • Enhanced multi-stakeholder dialogue and mutual understanding on timber markets issues • Reforestation campaign (MINFOF) support wood-energy value chain sustainability and livelihoods • 150 charcoal producers in Cameroon, DRC Kenya and Zambia have skills for efficient carbonization <p>Cameroon</p> <ul style="list-style-type: none"> • MINFOF launch reforestation campaign targeting 100,000 trees planted at local level (e.g., Okola and Evodoula) • NGOs support policy implementation and compliance via media campaign on timber products of legal origin • Domestic market sensitized influencing attitudes of urban markets on timber • 2 Private companies adapt existing traceability contracts to include smallholders and SMEs in formal supply chain • SME support smallholder logger's formalization in 15 urban markets of Yaoundé <p>DRC</p> <ul style="list-style-type: none"> • NGO support sensitization programme on FLEGT <p>Gabon</p> <ul style="list-style-type: none"> • Enhanced Forest Control Strategy to prevent illegal logging and monitor domestic timber market <p>Ghana</p> <ul style="list-style-type: none"> • Enhanced multi-stakeholder collaboration for tree-crop sustainability through National Cocoa Replanting and Agroforestry Program • 3 Private companies pilot test novel business models and independent monitoring and traceability systems <p>Kenya</p> <ul style="list-style-type: none"> • NGO support charcoal producer's capacity and value chains <p>Zambia</p> <ul style="list-style-type: none"> • NGO support charcoal producer's capacity and value chains • 1 Private company adopt production of industrial charcoal from invasive species
Research Influence	<ul style="list-style-type: none"> • 8 Masters' (6 in Cameroon, 1 in DRC and 1 in Gabon) and three Doctoral students (1 in Cameroon, 1 in Congo, 1 in DRC) enhanced research capacity • Supported advancement of research agenda on timber markets and wood fuel issues in the Congo Basin <ul style="list-style-type: none"> • 54 presentations, in at least 17 countries in Africa, Asia, Europe and Latin America • Informed international FLEGT discussions • FTA (CIFOR) recognized as an authoritative source of scientific evidence to inform decision-making in Cameroon, Gabon, and DRC <p>Gabon</p> <ul style="list-style-type: none"> • Uptake of FTA data and methods for monitoring domestic timber market • Influenced National Research Institute research agenda on economic importance of the artisanal sawnwood sector for urban and rural development
Impact	<p>Low-end estimate: Not possible to calculate from available evidence</p> <p>High-end estimate: 300,000 individuals directly and indirectly</p> <ul style="list-style-type: none"> • 71,000 informal timber operators (~300,000 individuals indirectly) involved in small-scale logging and milling in Central Africa influenced by policy change
Underlying Assumptions	<ul style="list-style-type: none"> • Enabling policy environment supports adoption of FLEGT • FLEGT policies are implemented and enforced • Private timber sector meets its obligations under the Voluntary Partnership Agreement • Significant and varied demands for legal sawnwood products in domestic markets

6.1.2. Timber Markets (Central Africa) Cluster Results⁸:

To improve income, resilience, and sustainability of timber markets in Central Africa (Cameroon, Gabon, DRC, and Zambia), FTA investigated current and potential national demands for legal artisanal and industrial sawnwood, explored community forestry and SMEs market opportunities and gaps, and provided recommendations for sustainable management systems for community forest enterprises and improved income-generation potential of smallholders and SMEs in legal markets.

Policy Influence

In Cameroon, collaboration between MINFOF and FTA resulted in an inter-ministerial decree imposing the use of legal timber in Cameroonian public contracts which took effect in December 2020. In the reviewed sources there was no evidence of implementation of the regulation. FTA also supported MINFOF to leverage funds from the FAO-EU FLEGT program to further develop a virtual platform to monitor the Cameroonian domestic timber market.

In Zambia, FTA's research successfully demonstrated the importance of charcoal production at the national scale, the extent of charcoal use for the livelihoods of about 85 percent of households in Lusaka, and the high level of women's participation in the charcoal value chain. These findings served to raise the profile of charcoal production and trade for rural and peri-urban livelihoods amongst government officials (e.g., Zambia Forest Department) and donor organizations (e.g., USAID). Uptake of this learning resulted in a call for the National Charcoal Indaba in 2013, which guided the identification of options and best practices for policy implementation at the sub-district level to address environmental and social trade-offs regarding charcoal production and trade.

Practice Influence

In Cameroon, FTA and ANCOVA, an association of artisanal chainsaw milling, co-developed a method to record timber flows in urban markets. The partnership enhanced ANCOVA's capacities to monitor domestic legal trade, being equipped to take active part in the process of formalization of artisanal chainsaw milling at local level. ANCOVA also took up FTA's findings for advocacy efforts and played a key role in sensitization of urban sellers for the importance of market of legal origin timber products in Yaoundé. In the reviewed sources, there was no evidence of change in consumer patterns as a result of FTA's or local partners' influence.

In Zambia, FTA's technical support and training enabled and equipped charcoal producers to produce green charcoal to comply with local regulations on charcoal trade. Despite the lack of evidence of established market linkages, there are indications that proceeds from charcoal sales are used by communities to bolster household incomes, to reinvest in agricultural production and children's education.

In the reviewed sources, there was no evidence of policy or practice influence in **Gabon** or **DRC**.

Table 4. Timber Markets (Central Africa) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Cameroon</p> <ul style="list-style-type: none"> • Inter-ministerial decree imposes use of legal timber in Cameroonian public contracts • MINFOF leveraged funds to support monitoring of informal domestic timber trade <p>Zambia</p> <ul style="list-style-type: none"> • Government officials sensitized on the importance of the charcoal production for livelihoods
Practice Influence	<p>Cameroon</p> <ul style="list-style-type: none"> • ANCOVA supports local advocacy for consumption of sustainable timber products • ANCOVA supports advocacy efforts for SMEs formalization <p>Zambia</p> <ul style="list-style-type: none"> • Charcoal producers enhanced capacity to abide by regulations
Research Influence	>100 outputs produced to date (e.g., publications, blogs, manuals, tools, peer reviewed articles)
Impact	No quantitative impacts reported

⁸ Outcomes realized in **Indonesia** are reflected in the 'Furniture Value Chains in Indonesia cluster'

6.1.3. Diversification of Agroforestry-based Income in Sub-Saharan Africa Cluster Results:

To improve farmer livelihoods and resilience through diversified and sustainable agricultural production and income, FTA supported production of biophysical and socio-economic inventory, developed suitable tree species selection tools (Rwanda and Ethiopia), identified context-appropriate agroforestry systems and conducted tree-diversity trials (i.e. on farm and on-station experiments), co-developed sustainable and high-quality germplasm supply systems, produced training materials on agroforestry system (AFS) design and management building on experiences of FTA's trials, offered training on AFS design and management to diverse stakeholders, developed business models for smallholders, and engaged stakeholders in policy dialogues on agroforestry for cross-sectoral policy change.

Policy Influence

In Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, and Somalia FTA supported the identification of context-sensitive regreening options to reverse land degradation (covering at least 1 million hectares) using priority species with market potential. National Stakeholder Approach to Risk Informed and Evidence Based Decision Making (SHARED) workshops in seven countries (with the exception of Somalia) and participation in the co-development of national roadmaps to regreening influenced stakeholders' engagement and commitment for the promotion of regreening options through both direct intervention work at the community level and through influencing wider policy and practice change. Online dashboards at country level are expected to further engage stakeholders (i.e., national and sub-national government, NGOs, CBOs, farmer representatives, private sector, donors, and media) and inform decision-making on roadmaps' implementation plan at multiple levels.

In Kenya, FTA's on-farm trials in Makueni, Machakos and Kitui counties successfully demonstrated to Kenyan government representatives the benefits of farm pond technology to improve production, income, and livelihoods. As a result of FTA influence in policy dialogues, the Kenyan government incorporated a national water harvesting authority to oversee the construction of 125,000 ponds by 2022 aimed at increasing water storage per capita in the country for livelihoods and on-farm income-generating activities, under the stipulation of the Kenya Irrigation Act of 2019. In the reviewed sources, there was no evidence of realization of targeted ponds construction. Engagement with policy development partners, government entities, and service providers at the national level, to support implementation of the Act, are at early stages.

In Rwanda, FTA was invited by the Food and Agriculture Organization (FAO), to provide technical expertise to the development of the Rwandan National Agroforestry Strategy and Action Plan. As a result, the Ministry of Environment developed an ambitious and visionary National Agroforestry Strategy (2018–2027). The national strategy will support mainstreaming agroforestry as a key intervention into rural development. It has been accepted by the Prime Minister's Office, and is pending approval by the Cabinet and Parliament. The Strategy will be the catalyst for aligning the Government's budgets and various mandates, and for bringing ministries and other stakeholders together to mainstream agroforestry targets as integral part of rural and national development strategies.

In Ethiopia, FTA's successful alignment of research activities with national and regional governments' key policies and strategies (e.g., National Regreening Programme) has helped leverage resources (i.e., technical, financial & material) and create strong coordination with key government sectors regarding natural resource development and management to improve market access. A National Agroforestry Platform (NAP) was formed under the chairmanship of the Ministry of Agriculture and Natural Resources (MoANR) co-chaired by ICRAF. The platform further contributes to the fulfilment of Ethiopia's agricultural transformation agenda and influenced the formation of a National Watershed and Agroforestry Multi-Stakeholder Platform (NWAMP). NWAP engages various government ministries and NGOs to scale agroforestry adoption and management nationally. Successful uptake of FTA's co-developed recommendations on sustainable grazing influenced policymakers to establish a Sustainable Grazing Platform to conduct policy analysis and develop recommendations on integration of sustainable grazing management options within agroforestry policies at local and national levels enabling smallholder's diversification of on-farm income-generating activities.

In Uganda, FTA research on trees in fields and farming landscapes for enhanced and sustainable crop yield and food security was accredited to the Queen's Commonwealth Canopy (QCC) initiative raising the profile of FTA research initiatives in the country, opening opportunities for policy engagement. Fifteen parliamentarians demonstrated commitment to scale up agroforestry nationally by establishing a task force led by the Uganda National Farmers Federation with FTA technical support. The Ministry of Agriculture Animal Industry and Fisheries (MAAIF)'s Agricultural Extension Services assured government's commitment through provision of enhanced extension services in support of smallholder farmers' household annual incomes. In the reviewed sources, there was no evidence of farmers accessing enhanced extension services.

In Malawi, FTA supported district councils to formulate by-laws to curb bushfires and reduce livestock damage to the agroforestry trees. FTA lobbied for inclusion of agroforestry seed germplasm in the draft Seed Act.

In the reviewed sources, there was no evidence of policy influence in Burkina Faso, Ghana, Mozambique, Niger, Tanzania and Zambia.

Practice Influence

In Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, and Somalia, a total of 144,181 households have been reached by FTA and local implementing partners with information on land restoration practices such as FMNR on farmland and communal areas, enrichment planting in area enclosures, and agroforestry (boundary planting, woodlots and home gardens on private land). Collaboration with government extension agents is ongoing to promote scaling-up of locally relevant greening options. In most countries, lead farmers are expected to serve as resource persons to build the capacities of fellow farmers (structured into farmer groups) and to support adoption of evergreen agriculture practices. Future adoption will be monitored by FTA-developed Regreening Africa App. Progress in tree nursery infrastructure establishment was achieved in Rwanda, Kenya, Ethiopia and Niger. Value chain development is at early stages. Local stakeholders have co-identified opportunities for value chain development for wood, fruits, medicinal trees products, cosmetics (e.g., shea) and beekeeping (honey and beeswax).

In Ethiopia, Kenya, Tanzania and Uganda, through FTA's diverse capacity-building events (e.g., field days, training, exchange platforms), approximately 40,850 farmers learned and built skills on forage conservation and concentrate making and use. By promoting increased adoption of improved feeds and fodder technologies (e.g., dry season feeding practices and climate-smart agricultural interventions), FTA has significantly contributed to farmer's livelihoods through increased milk production at household level (i.e., access to water resource, productivity per cow per day) and income from enhanced market linkages and networks to support farmers' feeds and water plans. Particularly **in Uganda,** FTA facilitated the adoption of agroforestry practices by vulnerable populations by promoting tree-planting and soil improvement projects in refugee camps for enhanced livelihoods. Through 386 farmer's demonstrations events, a total of 664 volunteer farmer trainers (VFTs) have supported approximately 9,300 additional farmers to adopt practices such as livestock feed technologies per year of intervention. Overall, 133,938 farmers adopted various types of crop residues technologies including rice straw, bean straw and groundnut haulms, produced 10,479 tons of silage, and 31,438 bales of hay (Boma Rhodes, *Brachiaria mulato* hybrid II) have been made on 639 farms across Ethiopia, Kenya, Tanzania and Uganda. Through participation in Service Providers Entrepreneurs (SPEs) network, youth groups in these countries were equipped with skills and tools to offer a paid service to farmers in production and conservation of high-quality fodder. Through this model, a total of 5,196 farmers have enhanced access to technical and practical guidance on hay and silage making. Farmer's enhanced capacity for increased productivity and silage conservation contributes to increased resilience of on-farm income generating potential year-round. Participating youth have developed the necessary skills to increase their employment prospects.

FTA collaborated with the Government of Uganda through the Operation Wealth Creation (OWC) program to further support large scale fodder production and conservation in South Western Uganda through enhanced access to machinery such as tractors, ploughs, harrows, and trailers to support fodder production. As a result of the collaboration, 19,190 Ugandan farmers established 3,159 acres of Rhodes grass plantations and 537,560 bales of hay have been harvested. FTA also collaborated with development organizations (e.g., Agriculture,

Environment and Ecosystem (AGRENES), Conserve Nature, Youths for RWH) to increase water availability to farmers. Through these collaborations, 23,068 farmers learned about rainwater harvesting (RWH) for livestock production. FTA facilitated linkages between farmers and public and private partners (e.g., government ministries, agencies and financial institutions) for increased co-investments in RWH technologies (e.g., unroofed and roofed dam-lined tanks, shallow wells, and valley tanks) for improved farm productivity. As a result of enhanced linkages to markets and improved technologies, 424 Ugandan smallholders now benefit from 53 rainwater recharging valley tanks, each with a storage capacity of over 1.5 million liters of rainwater, enough for supporting 143 heads of cattle for 3 months. Additionally, 980 households are directly benefiting from 63 shallow wells and 35 dam-lined tanks with farmers reporting use of available water resources for farm production and improved livelihoods (e.g., water for domestic consumption, washing clothes, and watering calves).

Across **Ethiopia, Kenya, Tanzania and Uganda**, 235 extension workers participated in capacity-building events (e.g., annual refresher training, SPE training, mentoring sessions, climate change platform meetings), and developed skills on feeding technologies (e.g., fodder conservation, utilization of fodder shrubs, concentrate feeding & homemade block making, calf feeding & management) through participation in training. As a result of enhanced capacities, extension agents facilitated farmer access and procurement of silage and hay-making materials (e.g., silage tubes, molasses, livestock microbes) to support farmer adoption of enhanced management practices. Through field days, meetings, and dialogues with service providers, 43,682 farmers in those countries have enhanced links to various input and service providers, such as financial institutions (i.e., credit to invest in water for production), agrovet suppliers for mineral supplements, concentrate feeds and/or their ingredients, seed companies for pasture planting materials, equipment suppliers, and relevant government /private projects that promote feed, water and tree-planting which are expected to facilitate and potentially enhance farmers' productivity over time.

FTA also mobilized fragmented small-scale producers to collectively sell their milk at one central location (e.g., dairy hubs) to facilitate economies of scale. FTA and its partners (e.g., Heifer International) developed 27 milk collection hubs, strengthened 10 existing hubs, where farmers can get their milk tested for quality control, measured out and then chilled before being transported by the hub. Through dairy hubs, 179,000 farming families also gained access to training and services (such as veterinary supplies, breeding supplies and nutrition supplements for their cattle), which they might otherwise not be able to reach or afford, as well as enhanced access to markets. FTA and partners also supported the establishment of 68 farmer business associations to manage the plants and sell directly to major dairy companies. As each cooperative provides a guaranteed supply of milk that passes quality tests, farmers can acquire higher prices for their production. Enhanced collaboration with Volunteer Farmers Trainers and the networks or linkages with government and other private service providers is expected to further stimulate the adoption of improved livestock feeding practices by farmers and continue the sustainability of the milk hubs across Ethiopia, Kenya, Tanzania and Uganda for improved farmer livelihoods.

In Kenya and Uganda, nearly 8,500 smallholders were engaged by FTA and local partners in knowledge exchange events, cross-site learning visits, and targeted training on cultivation of prioritized food tree and crop species and varieties, and nursery management. Eight site-specific food tree and crop portfolios for four arid and semi-arid land counties in Kenya and one for Uganda were co-developed by FTA and smallholder farmers according to seasonal food availability, nutrition and medicinal needs, and potential for income generation informed by FTA's Priority Food Tree and Crop Food Composition Database and climate suitability models. Feed the Children successfully established two agroforestry and nutrition innovation hubs to serve as convergence points for capacity-building, six school/community nurseries, and one pilot school programme engaging 570 households. FTA facilitated access to food tree and crop portfolios including quality planting material, technical agroforestry training, and targeted nutrition messaging and awareness in English and Kiswahili (e.g., presentations, promotional videos, blogs and media pieces, and local harvest calendars). As a result, a total of 453 food tree portfolios demonstration plots were established on farms. Plant distribution activities were accompanied by on-site rapid training for farmers on key technical areas related to tree

management. Farmers learned and developed skills on tree management, vegetative propagation, food tree nursery establishment and management through participation in demonstration plots activities. There is indication that Feed the Children has adopted the FTA pilot school approach and integrated agroforestry and nutrition programme in three additional schools in Kenya, two in Machakos County and one in Laikipia County, but not externally validated. Two novel food tree products were developed in collaboration with Jomo Kenyatta University of Agriculture and Technology (JKUAT) including a probiotic mango beverage and dried mango-tamarind fruit bars/leathers from two prioritized food trees (mango, tamarind) which can potentially be taken up by SMEs or private companies increasing demand for agroforestry produce over time. A total of 185 individuals (67% women) learned about enterprise development and financial management (e.g., savings and loans) through capacity-building events in Kenya and Uganda enabling participants to become entrepreneurs. Training of the Trainers provided on current and new technologies available for value-addition, processing and product development for **six** individuals including university personnel and extension agents along with training videos target for farmers and implementing partners (governmental and NGOs) are expected to continue multiplying learning across target area to support adoption. There has been no observable change in private company or farmer business practices to date, possibly due to the project's infancy.

In Burkina Faso, Ethiopia, Kenya, Mali and Niger, FTA and local partners offered diverse capacity-building opportunities, and farmer-to-farmer engagement activities. As a result, 219,694 farmers (49% women) learned or enhanced skills on techniques for soil erosion control (e.g., terraces, contour ridging, stone lines, contour bunds), water harvesting and conservation structures (e.g., infiltration pits, zai pits, half-moons, runoff water collection basins, mulching), soil fertility management practices (e.g., composting, micro dosing, crop rotation, organic manure application, bio fertilizers), agroforestry practices (e.g., farmer managed natural regeneration (FMNR), tree-planting), as well as other practices including conservation agriculture, bio-pesticides, and improved seeds. 143,067 farmers (29% women) successfully adopted one or several techniques learned via FTA training. Furthermore, FTA strengthened the capacity of local nurseries in plant production facilitating planting of over 4.5 million of quality tree seedlings, enabling farmers to secure or increase production of key crops, (fruit) trees and vegetables for consumption and sale. Successful results of FTA approach in Mali have influenced World Bank's investments in the country through Mali Drylands Development Project. Successful uptake of FTA-promoted technological innovations across the five countries attracted youth to participate in activities, improved community's access to water, decreased the physical work-burden for women, and contributed to improved yields and livelihoods. FTA's investment in 953 rainwater harvesting and storage units enabled 53,779 farmers (24% women) to adopt irrigation practices increasing the likelihood of plant survival and increased yields. The major crops grown were vegetables for both food and sale, which especially benefited women and youth. Enhanced capacities of farmers, extension providers and researchers accelerated technology uptake. In the case of tree seedling planting techniques, farmers found that mulching and manure, bigger planting holes, and regular watering improved tree seedling survival rates significantly, from less than 10% (farmer traditional method) to 50-70%. **In Kenya**, farm pond technology emerged as a game changer in terms of improving production, income, and livelihoods in semi-arid lands. Kenyan farmers from Makueni, Machakos and Kitui counties demonstrated through participation in FTA's pilots that they could pay back initial investments for pond installation (around US\$3,000 each pond) in less than two years with additional income generated from increased yields further influencing policy outcomes (e.g., Kenya Irrigation Act 2019). Increased fodder and animal production significantly improved farm productivity and incomes with remarkable success stories.

There is evidence that farmers across the five countries have secured or increased production of key crops. Successful use of FMNR approach as an entry point for FTA's intervention prior to agricultural production was considered relevant and effective by farmers to increase yields. By diversifying their crops with (fruit) trees and vegetables farmers have improved household food security with indications of increased household cash income. External evaluation has confirmed that smallholder farmers benefited from enhanced market opportunities, and participation in cooperatives or associations facilitated storage and adoption of processing techniques for added value and increased profit for onions, green grams, fruits, and tree products. However, those farmers also indicated having not observed positive effects on household income to date as it depends on a variety of external

factors and influences according to the context. In Ethiopia, there is evidence of FTA's influence for enhanced livelihoods and household income increases reported by some farmers as successfully assisting them to phase out from the Productive Safety Net Programme (PSNP) of the government. Overall, 81,750 farmers (45% women) in Burkina Faso, Ethiopia, Kenya, Mali and Niger have enhanced market links after participating in FTA engagement activities. Of those, 52,570 (53% women) are successfully selling commodities to local markets.

Successful uptake of FTA's working packages on local government institutional development, monitoring and evaluation enhanced local governance capacity. A total of 3,668 individuals (28% women) comprising farmer representatives, sub-national government leaders and technical experts were engaged in trainings to promote good governance and improve service delivery to farmers. Of those, more than 2,500 people (30% women) took actions enhancing their roles and leadership responsibilities, including driving and catalyzing farmer-to-farmer extension systems. As a result, a total of 1,489 Farmer Organizations (FOs) across the five countries formalized through registration as cooperatives and or associations. With increased capacity, most of the FOs improved the quality of services delivered to their members, through the initiation of new economic activities, developing linkages with input suppliers and markets, establishing sustainable input supply systems, improving management of FOs storage units, and providing group sales and insurance services (e.g., warrantage). FO leaders also built capacities in conflict resolution and policy issues (e.g., pastoralism law, land tenure ownership and land transaction) enabling them to voice community needs and local perspectives in diverse multi-stakeholder fora. Farmer organizations harvested a total of 1,600 bales of grass per season, earning US\$ 4,800 per year in Kenya and US\$ 1,329 in Niger. In Kenya, the county governments engaged some FTA's Trainers of Trainers (ToTs) to provide extension services to farmers engaged in other non-FTA initiatives in Kitui, Machakos and Makueni counties.

With FTA support, FOs and other CSOs established multi-stakeholder platforms for enhanced dialogue, linkages, training, and networking among value chain actors including women (e.g., Peace women group in Kitui, Kenya) and youth leaders (e.g., Kiembara youth group in Burkina Faso). More than 8,500 individuals (46% women) engaged in these multi-stakeholder participatory learning platforms facilitating wider adoption of innovations and scaling across the five countries. For instance, in Ethiopia, FTA influenced women groups to establish or join saving groups and provided institutional support (e.g., subsidized inputs such as poultry or goats) to increase their productive assets. There is evidence that participation in FTA activities and multi-stakeholder group's activities contributed to women farmers enhanced self-esteem, increased production of food and income for their families, gained entrepreneurial confidence and agency within their household. In Ethiopian hilly areas, FTA's interventions in communal lands have enhanced and diversified traditional measures to rehabilitate land and re-establish ecosystem functions. Initial income-generating activities implemented in communal lands with FTA support have contributed to the empowerment of Ethiopian women by enabling increased participation of women in commodity value chains, such as dairy and piglet rearing. Improved status and confidence of participating women led to some women investing surplus income in income-generating activities, such as poultry, piglet and fruit trees. Successful introduction of a savings culture has been greatly appreciated by women. There is indication that the ability to create and manage wealth has given women increased voice and bargaining power within household and improved the attendance of children at school. A total of 63,156 people (41% women) developed financial literacy and have increased linkages to microfinance institutions including local saving groups such as the Nigerian Mata Masu Dubara Savings and Credit Cooperative Organizations in Kenya (SACCOs), and insurance (warrantage) systems through 357 farmers organizations across all countries.

Forty-three value chains were developed to varying levels of success across the five countries. Increase in commodity sales was contingent on adequate access to information by farmers and the establishment of successful linkages to markets. For instance, in Kenya a total of US\$ 211,283 was generated from sales (between 2016-2019) by communities and smallholders participating in commodities value chains such as pulses (green gram, pigeon and cow peas), mango, indigenous chicken, and honey combined.

In Malawi, there is evidence of high level of adoption of AF seeds technologies in participating communities that are expected to sustain adoption of AF technologies in the long term at district level. FTA provided training

and facilitated communities to develop community forest management plans for Village Forest Areas (VFAs) and woodlots. A total of 120 community-based governance structures had their management plans developed, endorsed and signed by their respective district councils facilitating sustainable use and shared accountability by community members and the local government. Over 11,800 individuals are involved in either co-management of the reserves or management of Village Forest Areas.

FTA and implementing partners (e.g., National Smallholder Farmers' Association of Malawi in Mzimba District; the Catholic Development Commission in Malawi in Dedza District; and Concern Universal in Thyolo District, etc.) built capacities of 339 extension workers and farmers (43% women) in seed quality assurance, seed harvesting, grading seed viability testing, and storage. FTA training enabled the provision of enhanced extension services and technical support to farmers in AF seed management. Through training and farmer-to-farmer engagement activities, FTA influenced farmers adoption and establishment of 243 Community Agroforestry Tree Seed (CATS) Banks contributing to improved resilience against income and food vulnerabilities among 11,524 CATS Bank participating farmers (44% over project target). By adopting improved AF practices through participation in CATS Bank activities, farmers have observed increased access to fuel wood for cooking, improvements in pasture, and increased soil fertility reducing farmers' vulnerabilities to loss farm income. All sites visited during an internal evaluation clearly demonstrated significant improvements in soil fertility and maize crop (e.g., healthier crops without basal dressing) as a result of adoption of agroforestry technologies compared to non-participating sites. Moreover, land that was deemed to be unproductive is now being used by farmers. There is evidence in project reports that FTA research contributed to relevant improvements in soil fertility with some farmers observing between 100% -200% increase in maize production per unit on land where *tephrosia vogelli* was also grown. On average, the gross margin profit observed by farmers from maize sale was 59%. Analysis of the outcomes shows that FTA has contributed to improved resilience against income and food vulnerabilities among participating farmers. The value of agroforestry seed, enhanced extension services and management practices, increased yields, and successful markets links, facilitated by FTA and local partners, have driven most of the farmers to demand and adopt agroforestry technologies for diversified sources of household income. For instance, by 2013, 59 CATS Banks have sold 16,092kgs of AF seed to agro-dealers acquiring a total revenue of US\$15,473 directly benefiting 489 farmers in Angonia, Kasungu, Mzimba, and Tsangano districts. Farmers who benefitted were able to buy significant household items including bicycles, clothes, farm inputs, livestock, supplement food resources for their households, and pay school fees. A total of 717 farmers are involved in agroforestry seed trade suggesting the continuation of production of quality AF seeds over time.

There is indication of new CATS Bank groups being formed and registered by the Ministry of Agriculture (AEDOs and AEDCS) and NASFAM after FTA's intervention. Moreover, farmers have expressed interest in scale up adoption of FTA's promoted AF seeds practices if market links and demand are sustainable. There is indication of commitment from agro-dealers (e.g., Land Resource Center and Total LandCare) to provide a sustainable market for agroforestry seeds. With the improved food security and incomes realized from the sales of AF products, farmers are re-investing in AF technologies apart from using the income to meet basic needs. The reinvestments are expected to serve as an engine for growth and for underpinning sustainability of the CATS bank model.

FTA also influenced the adoption Fertilizer Tree Systems (FTS) using improved cultivars, so farmers were able increase maize production while producing quality fruit to meet market demands. A total of 191,839 farmers enhanced capacities on management, grafting and budding to improve planting material and expand their orchards via FTA's outreach and engagement activities. Of those, 80,828 farmers learned and developed skills in agroforestry/maize cropping systems via FTA capacity-building activities enabling them to make better natural resource management decisions at the farm and village level. However, adoption of the Fertilizer Tree Systems (FTS) was found by ICRAF's internal evaluation to be low (14% ~4,233 households) among the 30,240 farming families targeted. Among alternative explanation for low adoption rates is the unsuccessful result of initial FTA trials in yields attributed to late rains and dry spells in 2015/16 season. Maize yields were lower than the baseline in Dedza and Thyolo districts by 21.4% and 94.4% respectively. Maize yield was only higher than the baseline

by 102% (3223.75Kg/ha) in Mzimba district. Additionally, FTA approach for seedlings distribution (i.e., 10 to 20 improved seedlings and trees distributed to each participating farmer) conflicted with traditional cultural practices where shared resources among non-participant farmers was preferred. Despite dry spells, a remarkable survival rate for timber and fruit tree of 83% and 71%, respectively, was achieved.

FTA was highly successful in leveraging resources from other donors (e.g., DFID) to build capacities of forest-dependent community members in forest resources entrepreneurship and commercialization equipping 21,815 households with skills to operate forest-based enterprises (FBE). Ninety percent of trained people reported acquiring enhanced skills to participate in forestry and AF value chains. There is evidence that approximately 1,358 FTA-trained individuals in forest entrepreneurship and commercialization are participating in the selling of forest based related products such fruits, honey, cook stoves via >200 forest-based enterprise groups. To diversify income streams and reduce risk of business failure, households preferred participating in more than one type of FBE (e.g., bee keeping for short term- and timber for long-term income). An NGO (e.g., United Purpose) is further supporting a FBEs sustainability by purchasing production of improved cook stoves through a signed MoU. There is indication that the continuation of FTA-promoted activities (e.g., provision of capacity-building on market and development of business plans) will be supported by government partners (Forest Department, Community Development, Trade and industry Agribusiness and Agriculture staff) at district and community levels after FTA-project end as part of the national programme with potential to benefit 56,000 households in 280 forest-dependent communities.

It was observed in Burkina Faso, Mali and Niger that the value chain approach must be complemented by a more open local economic development approach, which fits better in the context of local dryland economies such as structuring inter-professional (e.g., cooperatives) value chains. Smallholders in Niger had increased incentives and capacity to adapt their business models by collectively investing in storage, conditioning, input delivery, and low-cost information systems. Adoption of FTA promoted techniques and practices in Burkina Faso is in the early stages, however, there is evidence that FTA has given a boost to rehabilitate horticulture perimeters to benefit women which now, after FTA intervention, grow vegetables and fruits not only for family consumption, but also for sale at nearby markets.

In Zambia, FTA influenced smallholder farmers' adoption of Integrated Soil Fertility Management (ISFM), agroforestry practices and deforestation free supply chains to support increased production and household income. Through FTA demonstration plots results, farmers learned that, with favourable rainfall, adoption of ISFM practices and drought tolerant improved seeds can lead to a 20% increase in productivity. With FTA support, a youth-led start up (e.g., Agripredict) developed a mobile app for drought prediction, and rain forecasts (>90% accuracy) which also provides advice on crop diseases identification and treatment services to support farmers' decision-making. A total of 26,256 farmers built capacities in ISFM via FTA and local partners training activities resulting in 18,116 farmers adopting enhanced management practices enabling farmers to diversify and increase productivity. Enhanced productivity remains contingent on favourable climatic conditions. Farmers who adopted ISFM/agro-forestry, observed production cost reduction from reduced use of expensive chemical fertilizers (USD25-30 per 50kg bag). Building on FTA's results, private cotton companies (e.g., NWK and Alliance Gineries) taken up ISFM in their practices and the Zambia Agriculture Research Institute (ZARI) taken up FTA's solution for production cost reduction in extension services to farmers (e.g., land preparation, planting of crops and trees, fertilizer application, weed management).

Farmers were influenced to organize in associations (e.g., Kum'mawa Agroforestry and Seed Growers Association -KASEGA) which increased their access to market links for input procurement and sale. Farmer associations further supported capacity-building opportunities for processing (e.g., packaging) and provided opportunities to strengthen relationships with other farmers associations. A total of 15 inclusive business arrangements were established with FTA and local partners' support.

To increase women's participation in economic activities, FTA and local partners (e.g., Katete District Women's Development Association -KDWDA and Good Nature Agro - GNA) targeted market engagement activities for women to develop links for raw materials, and facilitate access to finance, inputs, extension services, and

markets. As a result, 300 women farmers were able to acquire inputs (soya beans seed) on a loan arrangement and several others venture into businesses such retail businesses (e.g., butchery and grocery shops), raising chickens for sale etc. Through FTA- introduced saving groups, farmers were able to access financing for cook stoves and solar home lighting systems. According to project reports, FTA successfully demonstrated that seed multiplication and tree nurseries are viable through the established enterprises. However, enterprise development at scale with sufficient capacity to supply all farmers targeted has not being achieved. Micro Loan Foundation was successfully influenced by FTA to increase investments to support farmers to upscale the Tillage Service Provision (TSP) model. The potential for realization of economic outcomes as a result of diversified tree yields (fruits, wood, fodder etc.) are expected over time in Zambia, assuming sustainable demand for agroforestry products at local markets.

Table 5. Diversification of Agroforestry-based Income (Sub-Saharan Africa) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Ethiopia</p> <ul style="list-style-type: none"> • NWAMP established in support to agroforestry adoption and management at national level • Sustainable Grazing Platform established for integration of sustainable grazing management options within agroforestry policies at local and national levels <p>Kenya</p> <ul style="list-style-type: none"> • 2019 Irrigation Act adapted to support increased water storage for livelihoods and on-farm income-generation <p>Malawi</p> <ul style="list-style-type: none"> • District councils draft by-laws to curb bushfires and reduce livestock damage to the agroforestry trees <p>Rwanda</p> <ul style="list-style-type: none"> • National Agroforestry Strategy (2018–2027) endorsed by the Prime Minister's Office <p>Uganda</p> <ul style="list-style-type: none"> • FTA research accredited to the QCC initiative • Policymakers committed to scale up agroforestry nationally • (MAAIF committed to provide enhanced extension services for smallholders
Practice Influence	<ul style="list-style-type: none"> • 133,938 farmers (~535,752 individuals) adopted various types of crop residues technologies in Ethiopia, Kenya, Tanzania and Uganda • 5,196 farmers (~20,784 individuals) have increased resilience via enhanced silage conservation across Ethiopia, Kenya, Tanzania and Uganda • 19,190 farmers (~90,193 individuals) benefit from fodder production and conservation in South Western Uganda • 424 smallholders (~1,993 individuals) benefit from RWH for livestock production in Uganda • 980 households (~4,606 individuals) benefit from shallow wells and dam-lined tanks in Uganda • 453 households (~1,812 individuals) adopt food tree portfolios in Kenya and Uganda • 143,067 farmers (29% women) (~572,268 individuals) adopt AFS and enhanced management practices in Burkina Faso, Ethiopia, Kenya, Mali and Niger • 53,779 farmers (24% women) (~215,116 individuals) adopted irrigation practices in Burkina Faso, Ethiopia, Kenya, Mali and Niger • 52,570 (53% women) (~210,280 individuals) are successfully selling commodities to local markets in Burkina Faso, Ethiopia, Kenya, Mali and Niger • 11,524 (~51,858 individuals) farmers adopt improved AF practices in Malawi • 717 farmers (~3,227 individuals) have established sustainable links for agroforestry seed trade in Malawi • 4,233 households (~19,049 individuals) adopt FTS in Malawi • 1,358 households (~6,111 individuals) benefit from forest-based enterprise in Malawi • 873 households (~3,492 individuals) adopt agroforestry in FTA trials in Kenya, Ghana, Niger and Rwanda • 18,116 farmers (~92,392 individuals) adopt AF and enhanced management practices in Zambia <p>Burkina Faso, Ethiopia, Kenya, Mali and Niger</p> <ul style="list-style-type: none"> • Extension workers (including farmer-to-farmer extensionists) provide enhanced extension services to farmers • Farmers adapt business models and formalize through registration as cooperatives and or associations • Multi-stakeholder learning platforms established to support wider adoption of innovations and scaling • CSOs support adoption and scaling up AF practices by farmers • 43 value chains developed to varying levels of success across the five countries <p>Kenya, Ghana, Niger, and Rwanda</p> <ul style="list-style-type: none"> • Communities engaged via regreening committees to support scaling options <p>Malawi</p>

	<ul style="list-style-type: none"> • Strengthened partnerships between FTA (ICRAF), NGOs and District Councils • Communities engaged in natural resources management (village forest areas and woodlots) • Extension workers provide enhanced services in AF seed quality and management • 243 Community Agroforestry Tree Seed (CATS) Banks established • High level of adoption of AF seeds technologies by farmers • 14% of reached farmers adopted Fertilizer Tree Systems (FTS) • Farmers observe increased crop production from FTA trials • Farmers establish sustainable market links • Government support replication of CATS Bank model • NGOs support FBEs capacity and sustainability • >200 forest-based enterprise groups established <p>Mali</p> <ul style="list-style-type: none"> • Influenced World Bank's design of 'Mali Drylands Development Project' <p>Niger</p> <ul style="list-style-type: none"> • Smallholders have enhanced capacity to adapt their business models via cooperatives <p>Ethiopia</p> <ul style="list-style-type: none"> • Enhanced agency and participation of women in commodities value chain such as dairy and piglet rearing <p>Kenya</p> <ul style="list-style-type: none"> • Local governments support provision of enhanced extension services in three non-FTA influenced counties • NGOs support adoption of integrated agroforestry and nutrition programme approach in schools <p>Uganda</p> <ul style="list-style-type: none"> • OWC program supports large scale fodder production and conservation in South Western region <p>Zambia</p> <ul style="list-style-type: none"> • Local NGOs support adoption and scaling up AF practices by farmers • 2 Private companies and government provide enhanced extension services to farmers • Farmers sensitized to adapt business models - 2 farmers associations and 15 inclusive business established • private youth-led start-up developed mobile tool for rain forecast and drought prediction • 15 inclusive business arrangements established and functional • Successful market links for access to inputs and financial services • Donor organization sensitized to support scaling solutions <p><u>POTENTIAL</u></p> <ul style="list-style-type: none"> • 144,181 households (~576,724 individuals) informed on FMNR land other restoration practices in Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, and Somalia • 40,850 farmers (~163,400 individuals) in Ethiopia, Kenya, Tanzania and Uganda learned improved feeds and fodder technologies • 23,068 farmers (~108,420 individuals) learned about RWH for livestock production in Uganda • 43,682 farmers (~174,728 individuals) have enhanced market links in Ethiopia, Kenya, Tanzania and Uganda • 179,000 farming families (~716,000 individuals) have enhanced market links via dairy associations in Ethiopia, Kenya, Tanzania and Uganda • 8,500 smallholders (~34,000 individuals) trained on cultivation of prioritized food tree and crop species and varieties, and nurseries in Kenya and Uganda • 185 individuals (67% women) (~740 individuals) built capacities for enterprise development in Kenya and Uganda • 219,694 farmers (49% women) (~878,776 individuals) learned about AFS and enhanced management practices in Burkina Faso, Ethiopia, Kenya, Mali and Niger • 81,750 farmers (45% women) (~327,000 individuals) in Burkina Faso, Ethiopia, Kenya, Mali and Niger have enhanced market links • 63,156 individuals (41% women) (~252,624 individuals) increased linkages to microfinance institutions for income-generating activities in Burkina Faso, Ethiopia, Kenya, Mali and Niger • 191,839 individuals (~863,276 individuals) built capacities in tree seedling production and management in Malawi • 21,815 households (~98,168 individuals) equipped to operate forest-based enterprises in Malawi • 56,000 households (~252,000 individuals) in 280 forest-dependent communities' benefit from gov. support for capacity building in FBEs in Malawi • 26,256 farmers (~133,906 individuals) built capacities in ISFM in Zambia
Research Influence	<p>Kenya</p> <ul style="list-style-type: none"> • Enhanced research collaboration with Jomo Kenyatta University of Agriculture and Technology (JKUAT) for

	development of AF products processing techniques
Impact	<p>Low-end estimate: 1,828,931 individuals directly and indirectly [potential double counting] (of those, 446,418 people directly and 1,382,513 household members indirectly)</p> <p>High-end estimate: 4,579,760 individuals directly and indirectly [potential double counting] (of those, 1,099,976 people directly and 3,479,784 household members indirectly)</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Farmers plant all received trees and seedlings in their own farms • Farmers receive adequate advisory/extension services • Farmers adopt management practices learned in training • Fruit trees have generally high survival rates • Income will continue to grow as trees reach maximum fruit production • Farmers adopt post-harvest value addition, processing, and trade skills learned through training • Farmers adopt improved feeding practices leading to increased milk production and household income • Farmers have sustainable market links to sell agroforestry produce • Sustainable market demand for agroforestry produce

6.1.4. Sustainable Forest Enterprises in Cameroon Cluster Results:

Community forestry in Cameroon faces many challenges to provide stable and diversified income opportunities for forest-dependent communities, such as access to finance for the establishment and operation of community forest enterprises (CFE). Better access to finance can catalyze viable and sustainable enterprise around forest products and services for the benefit of forest-proximate communities. FTA helped establish CFEs, a community-based Field Monitoring System (FMS), and developed a performance-based financing approach to address weak monitoring by conditioning the receipt of financing (i.e., initial capital and investments) based on environmental, social development, and enterprise performance.

Policy Influence

Through FTA's engagement in policy discussions in **Cameroon**, there are indications that governments gained a better understanding of the diversity of CFEs' contributions to the local economy (i.e., as a provider of NTFPs, forest goods and services, beyond timber), as well as issues facing CFEs (i.e., lack of status as social enterprises, taxation, and centralized administrative processes (e.g., dispensations in the forestry law, issuance of permits, waybills, etc.). As a result, the Ministry of Small and Medium Size Enterprises, Social Economy and Handicrafts (MINPMEESA) drafted a MoU with ICRAF proposing inclusion of CFEs in the national definition of social enterprises. Through the DRYAD Congress, interactions and dialogue between CFEs and governmental representatives increased to enhance community access to governments (e.g., access to an official government phone number to report cases of harassment and fraud by forestry officials or follow up on issues), build mutual understanding regarding their respective perspectives (e.g., reasons for imposing strict regulations on communities to prevent exploitation), and provide technical advice and administrative assistance (e.g., the Ministry of Environment Nature Protection and Sustainable Development (MINEPDED) helped CFEs obtain environmental impact notice certificates).

Practice Influence

In terms of practice influence, communities' capacity to organize and establish CFEs was significantly increased through trainings with a total of 1,955 individuals (51% women) trained on varied aspects of CFE management, accounting, sustainable practices, and governance. Such training aimed to increase the model's sustainability and enhance community resilience to falling back into poverty. FTA established 34 CFEs from initial business ideas to fully functioning enterprises (across 9 different enterprise types), 29 of which reported growth after two years of operation, with an additional 84 business cases prepared for investment. CFEs reported low failure rate within first year (6% compared to national average of 90%). A total of 503 people (46% women and 44% being youth) currently benefit as full-time employees in 29 communities, generating a combined annual wage value of about USD 30,000, increasing income flow to households and the wider community (e.g., investments of profits back into community-led projects such as salaries for teachers, scholarships for female students, acquisition of pharmaceutical products during the COVID-19 pandemic, and investments in educational facilities), enhancing community resilience to poverty. Under the performance-based finance approach, CFEs successfully used the

FMS to track, monitor (being up to 8 times more cost-effective than ICRAF-led or outsourced monitoring), and report on performance demonstrating ability to generate revenues, averaging 50% of their targets in the second year. FTA successfully demonstrated the potential of the joint-enterprise timber model to de-risk and unlock community forestry profitability in Cameroon, enabling evidence-based decision-making across stakeholders including impact investors, bankers, and government policy-making.

Table 6. Sustainable Forest Enterprises (Cameroon) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<ul style="list-style-type: none"> • MINPMEESA influenced to include CFEs in national definition of social enterprise
Practice Influence	<ul style="list-style-type: none"> • MINEPDED supports CFEs to obtain environmental impact notice certificates • 34 CFEs established <ul style="list-style-type: none"> • 29 CFEs reported growth after two years of operation • 84 business cases prepared for investment • Successful uptake and use of cost-efficient community-based FMS by participating CFEs • 503 households (~2,616 individuals) have stable income opportunities in Cameroon <p>POTENTIAL</p> <ul style="list-style-type: none"> • 1,955 individuals (51% women) (~10,166 individuals) have enhanced capacities to participate in sustainable forest enterprises in Cameroon • Scaling of CFEs in 260 community forests in Cameroon
Research Influence	<ul style="list-style-type: none"> • 8 peer-reviewed articles, 2 policies briefs and 2 technical briefs were developed
Impact	<p>Low-end estimate: 2,616 individuals directly and indirectly (of those, 503 people directly and 2,113 household members indirectly)</p> <p>High-end estimate: 10,166 individuals directly and indirectly (of those, 1,955 people directly and 8,211 household members indirectly)</p>
Underlying Assumptions	<ul style="list-style-type: none"> • The CFE model is sustainable and attracts community interest to participate • CFEs reinvest profits into the CFE and the community, enhancing the sustainability of the model and resilience • Self-monitoring of the CFE model ensures sustainability of investments • New jobs created through CFEs increase income flow to households and community, enhancing resilience • Sustainable market demand for CFEs products

6.1.5. Agroforestry Concessions (Peru) Cluster Results:

To support smallholder's access and control over land for sustainable livelihood opportunities in Peru, FTA identified and quantified areas eligible for agroforestry concessions, investigated implementation challenges and opportunities (particularly for smallholders), and positioned the mechanism as a solution for climate mitigation and tenure insecurity necessary to support forest-proximate community livelihoods.

Policy Influence

Through engagement and facilitated discussions with regional and national government actors from relevant agencies and ministries (e.g., the National Forest and Wildlife Service (SERFOR), MINAM, the Ministry of Agriculture and Irrigation (MINAGRI), regional governments in San Martín and Ucayali), governments gained better understanding for future policy and technical guideline development, particularly in terms of smallholder heterogeneity and differing capacities to comply with regulations. FTA also built regional governments' capacities to accurately zone and identify eligible areas for concessions, using the government's existing meso-zoning as well as a new micro-zoning method developed by FTA to produce more accurate land suitability maps. FTA supported multi-level coordination between governmental and NGO partners (e.g., SERFOR, Global Green Growth Institute (GGGI), the Peruvian Society of Environmental Law (SPDA)), and succeeded in securing follow-up funding to implement and scale the mechanism in pilots and as part of follow-up projects with FTA. FTA continues to engage and provide technical inputs to national government agencies (e.g., SERFOR, Supervisory Agency of Forest Resources and Wild Fauna (OSINFOR)), regional authorities, and partners (e.g., GGGI) in meetings and through a partner consortium to support better implementation and scaling of the agroforestry concession mechanism. Enhancing data information systems, capacity for coordination and alignment, and extension services for holistic agroforestry concession governance are core foci of FTA's follow-

up projects. The Ministry of Economy and Finance (MEF) has also promoted agroforestry concessions as part of the economic recovery and reactivation plan for COVID-19.

Practice Influence

Through community engagement, 200 participating smallholders learned about the agroforestry concession mechanism and its requirements, how to register, and obtained know-how for more sustainable agroforestry-based management practices. FTA's data, methods, and technical inputs were taken up in a pilot implemented by regional governmental authorities and SPDA, where 14 concessions were awarded to smallholders in San Martín. Local NGOs have greater interest in and commitment to promote and support agroforestry concessions, entering into official collaborations with ICRAF and international NGOs. A follow-up project is carrying out additional pilots across three departments within the Peruvian Amazon. To date, 33 agroforestry concession contracts have been registered in San Martín, and 12 more contracts have been recently approved. In compliance with the regulations, concession-holders must adopt sustainable practices by establishing and maintaining agroforestry systems in the concession area to promote restoration (e.g., through soil and water conservation, reforestation, etc.). In the sources reviewed, there was no evidence to suggest that concession-holders' changed practices to date as this process will require time for sustainable concessions to be established. With effective implementation and successful scaling of agroforestry concessions across eligible areas in Peru, FTA estimated that approximately 123,000 farmer households can potentially benefit from improved access and control over land for sustainable livelihoods.

Agroforestry concessions offer tenure security and allow smallholders to maximize the productivity of the land through development of agricultural, forestry, or livestock activities in the same area for forestry production and restoration purposes. With growing governmental, NGO, partner, and FTA support for effective agroforestry concession implementation, a greater number of eligible smallholders are likely to be granted a concession and access benefits to support their livelihoods. For example, concession-holders will be able to formalize and gain access to formal market value chains, better prices, commercialization support, certification (as part of the green economy), and secure new market links through membership with producer associations. There are preliminary indications that some concession-holders have been able to obtain a plantation registry, allowing them to legally sell timber from their concession. Regulations also provide access to credit and financing through national development banks, which concession-holders can use to reinvest into their productive activities on their concession. Through other benefits, like access to technical assistance, concession-holders can diversify as well as improve yields and product quality for greater profit. Moreover, concession-holders can learn new techniques and gain capacity in sustainable production practices from extensionists to extend the productive capacities of the land in the long-term; thus, the concession becomes a source of reliable and sustainable income over time. The regulations also stipulate promotional discounts under certain conditions and with certain requirements, which acts as financial incentives to eligible smallholders. For example, there is a ten percent discount for the annual contract renewal fee and a payment exemption for 'right to benefit' payment (each year, concession-holders pay a reduced fee and are eventually exempt from this payment after ten years), allowing concession-holders to keep a greater share of their profits over time. Successful leveraging of these available benefits is likely to enhance concession-holders' livelihoods, reduce risk, and enhance resilience and sustainability.

While smallholders holding a concession have legal access to these benefits, this does not guarantee actual access (in that they have leveraged services available to them). Not only will smallholders have to be proactive in order to maximize benefits available to them, they will need support from other actors in the system to strengthen production chains, gain capacities in business, source other means of financial support, and build relationships and networks. Creating structures that would support smallholders to comply and benefit the most from the mechanism was identified as a next step for the government to deliberate and is a focal area of the follow-up projects.

Research Influence

FTA built and strengthened internal research capacities, advancing young researchers' careers into government positions. FTA findings were used to develop two additional research proposals, which were successfully

funded; these follow-up projects involve close ongoing collaboration between FTA researchers, government, and NGO partners, and support future realization of outcomes.

Table 7. Agroforestry Concessions (Peru) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<ul style="list-style-type: none"> Regional governments (San Martín and Ucayali) better understand agroforestry concession implementation options and compliance barriers to smallholders SERFOR understands the need to distinguish smallholders in policy (i.e., smallholder heterogeneity) Governments have capacity to identify areas eligible for agroforestry concessions using the meso-zoning approach detailed in the technical guidelines <ul style="list-style-type: none"> San Martín regional government proceeds with a technical group on zoning Indications of multi-level coordination MEF promoting agroforestry concessions for COVID-19 economic recovery
Practice Influence	<ul style="list-style-type: none"> Enhanced interest in, commitment to, and action on agroforestry concessions among NGOs New relationship and mutual interest recognized between ICRAF, GGGI, and SPDA for ongoing collaboration in follow-up projects NGOs built capacities in micro-zoning (from FTA training) <ul style="list-style-type: none"> NGOs adopted and applied micro-zoning in projects and agroforestry concession pilots in San Martín (run in cooperation with regional government) 200 participating smallholders learned about AFCs, registration opportunities, and agroforestry practices San Martín regional government ran 14 agroforestry concession registration pilots in late 2018 <ul style="list-style-type: none"> 14 smallholders in San Martín received concessions, adopting agroforestry practices Follow-up project carried out 3 additional pilots in San Martín, Loreto, and Amazonas To date, 33 agroforestry concession contracts (~92 individuals) registered in San Martín (12 more approved) <p>POTENTIAL</p> <ul style="list-style-type: none"> 123,700 agroforestry households (440,857 individuals) to benefit with AFC renewals
Research Influence	<ul style="list-style-type: none"> Produced 10 outputs <ul style="list-style-type: none"> 4 publications (articles, etc.), 33 citations 6 tailored products (infographics, modules, datasets, etc.), no view/download data 6 blogs (no view data) Research capacities developed among research team, some of whom have continued careers in the Peruvian government in natural resource management/ climate divisions SUCCESS findings used to develop 2 new research proposals to pursue further gaps Follow-up projects involve close ongoing collaboration with government and NGO partners
Impact	<p>Low-end estimate: 125 individuals directly and indirectly (of those, 33 people directly and 92 household members indirectly)</p> <p>High-end estimate: 440,857 individuals directly and indirectly (of those, 123,700 people directly and 317,157 household members indirectly⁹)</p>
Underlying Assumptions	<ul style="list-style-type: none"> AFC model is taken up (i.e., all eligible smallholders register for an AFC) Smallholders with a registered AFC contract have access to and leverage benefits provided by the concession (e.g., access to extension services to boost concession productivity, access to loans to re-invest in the concession's productivity, access to legal markets to sell produce/ products from concession, etc.) Follow-up projects to SUCCESS (e.g., PARA) are implemented as planned and build on the previous pilot Successful/sustainable scaling of AFC in study provinces are supported by NGO and government partners

6.1.6. Forestry and Tree Value Chains in Latin America Cluster Results:

To increase farmers' resilience and income in the forestry and tree value chains, FTA's research developed a geo-referenced genetic catalogue of target species to facilitate the development of genetic improvement plans for tree-resource sustainability, facilitated the participation of farmers, producers, forestry cooperatives, and NGOs in genetic improvement planning and project implementation and informed decision making with scientific-valid community forest governance data.

⁹ Total estimated impact from Reyes (2018)

Policy Influence

In Guatemala, FTA influenced the renewal of 1990's forest concessions to allow the sustainability of thousands of forestry-related community jobs (e.g., tree management, harvesting, transport, transformation and marketing) and rural livelihoods. FTA demonstrated successful models for community-led management of community forest concessions for environmental sustainability, while generating forest income for livelihoods. As a result, the National Council of Protected Areas (CONAP) revised its technical norms for the renewal process of community forestry concessions based on FTA findings. By provision of scientific-valid socio-economic performance of community forest concessions, FTA successfully influenced the renewal of one concession contract (e.g., Carmelita Cooperative) under the revised technical norms, contributing to creating job opportunities for 380 community members. The successful renewal of the Carmelita concession sets an encouraging precedent for the remaining eight concessions, which will be up for extended renewal between 2022 and 2027. Approximately 10,500 individuals benefit from the 8 other active concessions (Impulsores Suchitecos, Laborantes del Bosque, Uaxactún, San Andrés, Árbol Verde, Cruce a La Colorada, Custodios de la Selva, Civil El Esfuerzo). By 2019, the nine concessions have generated > \$6 million USD in annual revenue, helping to alleviate poverty rates in forest-proximate communities. There are promising indications of governmental support, notably CONAP, to implement a roadmap to renew other active community forest concessions. In the sources reviewed, there was no evidence of policy influence in Brazil, Colombia, Costa Rica, Peru and Nicaragua.

Practice Influence

In Guatemala, FTA research influenced a local NGO (e.g., ACOFOP) to adopt complex forestry activities (e.g., inventory, harvesting, transport, procurement and marketing, and advocate for farmer representation to advance progress to equitable governance arrangements. At the community level, FTA facilitated participatory germination pilots to demonstrate genetic diversity/population viability of key priority species (e.g., mahogany) to support community's sustainable economic viability from community concessions. There is indication that successful results in germination trials incentivized members of the community of Cruce a la Colorada to restore forest on degraded land with FTA technical support in government areas granted to the community (unexpected outcome). In Guatemala, timber sales generated a total gross income of around USD 24.7 million between 2012 and 2016 with an average of 74% of that coming from sales of FSC-certified mahogany (*Swietenia macrophylla*) indicating a promising market niche for the generation of job opportunities in the FSC-certified timber value chain. There is indication of CONAP's uptake of FTA findings on tree rings to evaluate growth rates for enhanced forest management in and surrounding the Maya Biosphere Reserve for sustainable management of mahogany while conserving forest and tree resources.

In Peru, FTA training in chuncho cacao renewal technology has increased awareness and built producers' capacities in cocoa diversity and quality, pruning management and soil analysis. Agreements have been signed with producers for FTA's technical support on rehabilitation, fertilization and animal health management including trials in three plots and nursery establishment. As a result, producers have started incorporating high-quality material into their farms to rehabilitate aging cocoa plantations.

In Nicaragua, a socio-economic study on the benefits of community forestry in the North Caribbean Coast Autonomous Region suggests challenges for the sustainability of community forestry enterprises (CFEs). There is indication of a limited number of employment opportunities generated from logging and milling (18 in Layasiksa, 23 in SIPBAA, and 22-25 in Francia Sirpi) with spillover effects to non-members sporadically to attend market demand. Of the three CFEs assessed, none were able to sustain its operation without external financial support and discontinued their activities. This was largely due to lack of skilled human resources for business management and limited working capital for wood processing. By 2016, none of the three CFEs had annual operational plans in place. Hence, legal timber extraction and processing was suspended. There is indication that non-timber forest products are extracted for household use but not on a commercial scale despite the potential to sell seeds and palm products.

Research Influence

To boost priority-trees' productivity, quality and climate resilience, FTA research has demonstrated proof-of-concept for identifying resilience among tree genotypes to abiotic stresses across agro-ecological zones in Latin America, developed standardized protocols for data collection, established a multi-stakeholder knowledge sharing platform, and identified sites for long-term studies (e.g., cocoa and mahogany) in tropical regions. The platform (Global Strategic Cacao Collective) provides a centralized infrastructure for cacao scientific data (e.g., ontology, semantics for allowing annotation for germplasm, phenotypes, plant anatomical structures, etc.) contributing to increased collective action (including universities, research centers, cacao breeders, physiologists, statisticians, government and private-sector organizations) to garner research support and attention to advance research to improve climate resilience in cacao plantations. The platform is expected to continue contributing with scientific evidence to better inform farmers and producers on potential impacts of climate change (e.g., increased CO₂, drought and heat) on farm productivity and influence adoption of climate-smart varieties to support cocoa value chain sustainability over time. In Peru, there is indication that the National Institute of Agrarian Innovation (INIA) has continued FTA's project activities in Quillabamba and developed further research proposals to advance research building on FTA findings. In Colombia, an NGO partner (Agrosavia) has increased commitment to generating and translating agricultural research and innovation to strengthen scientific capacity and the sustainable production of natural resources moving forward, with potential to benefit >35,000 farmers via provision of improved climate-smart planting material. The Colombian Corporation for Agricultural Research (CORPOICA) has proposed work on cacao drought to be applied to 500 ha and nurseries.

Table 8. Forestry and Tree Value Chains (Latin America) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Guatemala</p> <ul style="list-style-type: none"> • CONAP adapt technical norms for community forestry concessions renewal • Influenced renewal of one community forest concessions • Model for Carmelita Concession's renewal to be replicated in 8 additional concessions
Practice Influence	<p>Guatemala</p> <ul style="list-style-type: none"> • NGOs support forest equitable governance arrangements • Communities adopt high-quality planting material for land restoration • CONAP uptake FTA research on tree growth for enhanced forest management • 380 households (~1,824 individuals) benefit from access to natural resources for income-generating opportunities from Carmelita concession's renewal in Guatemala <p>Peru</p> <ul style="list-style-type: none"> • Farmers have increased awareness on tree-crop vulnerability • Early adopter farmers incorporate climate-smart management in their practices <p>Nicaragua</p> <ul style="list-style-type: none"> • Communities demonstrate interest in value addition technologies, but challenges for CFEs sustainability remains <p>POTENTIAL</p> <ul style="list-style-type: none"> • Potential to benefit ~10,500 households (~50,400 individuals) from the 8 other active concessions in Guatemala • 35,000 farmers (~122,500 individuals) benefit from improved climate-smart planting material in Colombia
Research Influence	<ul style="list-style-type: none"> • Multi-stakeholder platform on cacao supports collective action • NGO committed in disseminating FTA innovations on climate-smart cacao to farmers in Colombia
Impact	<p>Low-end estimate: 1,824 individuals directly and indirectly (of those, 380 directly and 1,444 household members indirectly)</p> <p>High-end estimate: 172,900 individuals directly and indirectly (of those, 45,500 directly and 127,400 household members indirectly)</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Farmers plant all received trees and seedlings in their own farms • Farmers receive adequate advisory/extension services • Farmers adopt management practices learned in training • Farmers access enhanced extension services • Fruit trees have generally high survival rates • Income will continue to grow as trees reach maximum fruit production • Other active community forestry concessions will be renewed for another 25 years. • Community forestry concessions improve the livelihoods for all households belonging to the concession

6.1.7. Gender Issues in the Oil Palm Sector in Indonesia Cluster Results:

In Indonesia, FTA research interventions aimed to influence policy at subnational and national level, by either contributing directly to policy processes, or through stakeholder engagement. FTA facilitated opportunities to share ideas and discuss in multi-stakeholder fora (e.g., gender dialogue), which enhanced government stakeholders understanding of equity challenges in the oil palm (OP) sector (e.g., gender blindness of oil palm labour policy and RSPO certification standards), and decision-making capacity (i.e., via awareness and understanding of oil palm issues from different perspectives – e.g., effects of gender). Efforts to align FTA research with parallel policy and multi-stakeholder initiatives helped facilitate private sector outcomes.

At the international level, FTA's findings on gender and the role of women in Indonesia's oil palm sector informed revisions made to RSPO's Principles and Criteria to reflect and respond to challenges women face working in the sector. RSPO changes to ensure the rights of women are protected have led to the development of new standards and indicators to certify member companies, that better reflect the need for adequate consultation of women, and mechanisms to ensure fair working conditions for women employed in the sector. Changes in RSPO's certification scheme has had a trickle-down effect to member companies which established gender committees to better include women in decision-making, suggesting that women have improved representation in policy. Some private companies have taken preliminary steps to make their supply chains more sustainable and equitable, such as Wilmar International, Golden Agri Resources, Musim Mas, Cargill, and Asian Agri. For instance, Wilmar International released a Women's Charter, which outlines commitments to respecting women's rights and ensuring their welfare. The charter also outlines new governance arrangements within the company to ensure key issues (i.e., protection and care of female health, care of family life and welfare, protection from sexual harassment and violence, non-discriminatory, fair, and equal opportunities at work and in workers' representation, and continuous education) are addressed. NGOs allies used FTA research in their advocacy work relating to gender equality (e.g., RSPO Human Rights Working Group, Oxfam Novib, Forum for the Future, RRI) in oil palm and other commodity sectors that face similar social issues (e.g., seafood).

It was noted, however, that the realization for changes toward more sustainable and inclusive business models for RSPO members and suppliers to be realized, RSPO's auditing capacity and mechanisms needs to be improved. There is indication of interest from private companies for evidence-based solutions and guidance to improve private sector practice toward sustainability and inclusion, but the implementation gap (i.e., how to realize sustainability and inclusion in oil palm business practices) remains a key challenge.

Table 9. Gender Issues in the Oil Palm Sector (Indonesia) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<ul style="list-style-type: none"> • Enhanced understanding of equity challenges in the oil palm sector • RSPO adapt certification standards to reflect and respond to challenges women face working in the sector
Practice Influence	<ul style="list-style-type: none"> • 6 Private companies establish gender committees to better include women in decision-making • RSPO increase investments in compliance monitoring • NGO used FTA research for cross-sectoral advocacy relating to gender equality
Research Influence	<ul style="list-style-type: none"> • Raised profile of and issues surrounding equity in oil palm governance
Impact	Not possible to derive
Underlying Assumptions	<ul style="list-style-type: none"> • RSPO companies successfully implement revised standards for certification • Benefit of certification is high enough to maintain companies accountable

6.1.8. Furniture Value Chains in Indonesia Cluster Results:

Indonesia's timber legality assurance system (SVLK - Regulation No. P38/MenHut-II/2009) was the first in the world to be approved for licensing and related legality verification under FLEGT, which allows legal timber to enter Europe's markets. There is indication that implementation of FLEGT has since increased the Indonesian timber products competitiveness for the EU and other regulated markets by improving their image as environmentally friendly industry products.

Policy Influence

To leverage the capacity of small and medium scale furniture enterprises in Indonesia to access global markets for sustainable livelihoods opportunities and increased income under FLEGT, FTA (CIFOR) supported

participatory action research and diverse engagement opportunities (e.g., survey, FGDs, training programs, and consultative meetings) with partners (e.g., Jepara Furniture Multi-stakeholder Forum, Jepara local government agencies, the Forestry Research and Development Agency of the Ministry of Forestry, and Bogor Agricultural University) resulting in the co-development a roadmap for strengthening the wooden furniture industry in Jepara 2013–2023, Central Java. Jepara's Parliament expressed its appreciation for FTA's contributions for roadmap development. As a result of FTA influence and policy dialogues the first district-level regulation focused on the development of the furniture industry in Indonesia was approved (Jepara's District Regulation PERDA No. 2/2014) aiming 1) to strengthen the furniture industry to become resilient, self-sufficient, and sustainable; 2) to improve the capacity of the furniture industry to run their business; 3) to improve the capacity to become competitive, and 4) to improve the capacity to grow the business to a larger scale. There is indication that Central Government intent to incentivize SMEs' compliance and renewal of SVLK certification by provision of government assistance to offset audit and first surveillance costs. However, it is noted that significant gaps in furniture producer's business practices and capacities (e.g., business skills and formalization) need to be addressed. The implementation of the Regulation was contingent of political processes and limited collaboration among agencies within the executive branch, and between the executive and legislative branches. As such, although the District Regulation was in place in 2014, there is indication that the implementation of programs supporting district-level furniture industry was largely supported by resources allocated from the national level budget through the Ministry of Environment and Forestry. There is indication of Bupati's trade and industry office interest in developing a technical guidance for PERDA implementation. There is potential to benefit up to 686,000 small-scale wood and handcraft enterprises employing up to 1.5 million people nationally from increased access to market opportunities with successful implementation of SVLK regulations across the country.

Practice Influence

In the practice pathway, there is evidence that FTA's training and engagement activities with small-scale producers incentivized and built capacities of small-scale producers to associate and access loans to invest in their business. For example, the Jepara Small-scale Furniture Producers Association (APKJ) was legally established on Dec 2008 with CIFOR support. Sixty small-scale producers joined APKJ in its first quarter of operations. An earlier adoption study conducted by FTA (CIFOR) shows that APKJ members benefited from membership with the association through increased access to market opportunities (e.g., trade shows, exhibitions, online market) and innovations (e.g., improved 10–15% efficiency in the use of natural resources) since joining APKJ. Members recognize APKJ as an effective forum for improving their capacity to manufacture better-quality furniture, to deal with management issues, and to reduce delivery time. Half of the APKJ members accessed loans from BRI (Bank Rakyat Indonesia) to invest in their business after participating in an FTA-led financial training course. Loans granted were in the range of 10 million–50 million Indonesian rupiah (~USD 1000-5000). In ten years of operations APKJ membership grew to 130. Of those, 120 members of APKJ have noticed economic outcomes related to FTA's interventions and participation in APKJ despite only 10 APKJ members (one group, one individual) attained national government certification for timber legality in 2013 (valid for six years). While 85% of APKJ members had seen improvements in total production, sales, and profits, in the 5 years of FTA intervention, economic results from APKJ may have been result of other factors (i.e., better use of natural resources, online market, increase in demand) as 60–74% of non-APKJ members have also reported increased revenue. In the sources reviewed, there was no evidence of APKJ sales to European markets as a result of having SVLK license. By 2017, >200 SMEs were SVLK certified in Jepara indicating increased awareness and adoption of the SVLK certification by smallholder producers over time.

The research has improved networking between small-scale furniture producers (e.g., Jepara and Pasuruan districts) and the Ministry of Trade and Industry, the Ministry of Forestry and other agencies at various levels. There is indication that networks are including APKJ and its members on capacity-building opportunities, policy dialogues to co-develop recommendations (e.g., e-audit and e-surveillance), and business events. Project findings regarding Jepara's furniture producers (n=117) shows that 60% of respondents have access to export markets, despite only 9% of furniture producers interviewed reported as SVLK-certified. One possible explanation found

by FTA research is the “renting legality” practice, where non-certified producers use certificate of other producers. In 2019, some APJK members could afford the renewal fees for individual certification, while the others applied for financial support from the Ministry of Environment and Forestry to cover certification renewal costs. This suggests further challenges and/or limited benefits for small-scale producers and furniture associations to comply with FLEGT requirements and maintain SVLK certification over time. Current evidence suggests a more detailed data collection and analysis of financial performance is needed so changes in income over time are better understood. In the sources reviewed, there was no evidence of SMEs/Furniture associations financial performance to enable assessment of changes in producer's income as a result of SVLK certification and access to global markets across time.

There is indication of intention from Pasuruan district government to replicate FTA approach in Jepara in support furniture producers' capacity-building (e.g., occupational health and safety training, support for SMEs association) but no further evidence of realization to date. Overall, there is indication that local stakeholders (e.g., members of business associations, government representatives, and furniture producers) have better and shared understanding of the low ratio of SVLK-certified micro, small, and medium producers in both regions (Jepara and Pasuruan). Challenges for furniture associations to access to global markets remain after 6 years of FTA research intervention.

Table 10. Furniture Value Chains (Indonesia) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<ul style="list-style-type: none"> • District level regulation established (Jepara) to support furniture industry development • Indication of uptake of FTA approach to support furniture industry in Pasuruan district
Practice Influence	<ul style="list-style-type: none"> • APKJ membership grew from 60 to 130 members • APKJ recognized as an effective forum for improving members' capacity to manufacture better-quality furniture, to deal with management issues and to reduce delivery time <ul style="list-style-type: none"> • Furniture producers become more efficient in their use of wood and of value chains • >200 SMEs were SVLK certified in Jepara by 2017 • 120 households (~480 individuals) have enhanced household income from sustainable furniture value chains • 1 APKJ member granted individual SVLK certification • 9 APKJ members granted with SVLK group certification, becoming a model for replication. • 6,000 furniture producers (~24,000 individuals) adopt SVLK certification in Jepara (Central Statistical Agency BPS Jepara 2018) <p>POTENTIAL</p> <ul style="list-style-type: none"> • 1.5 million people working in small-scale wood and handcraft enterprises adopt SVLK regulations
Research Influence	<ul style="list-style-type: none"> • 3 undergraduates (IPB) build research capacity in action research and value chain analyses
Impact	<p>Low-end estimate: 24,480 individuals directly and indirectly (of those, 6,120 people directly and 18,360 household members indirectly)</p> <p>High-end estimate: 1,5M individuals directly and indirectly</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Furniture producers have incentives and capacity to formalize and adopt sound business practices • SVLK certified furniture provides producers with better market price compared to non-certified products • SVLK certification implemented and monitored at country level • Local and global market demands SVLK certified products

6.1.9. Diversification of Agroforestry-based Income in Asia Cluster Results:

To improve equitable and sustainable agroforestry and forestry-based livelihood systems for rural communities in Asia, FTA and local stakeholders investigated contextual factors (i.e., gender, culture) that influence the design and adoption of agroforestry systems, as well as alternatives for improved natural resources management. To expand and fully realize the socio-economic and environmental potential of diverse value chains in Asia, FTA supported the facilitation of conducive institutional arrangements, policy and development of equitable and inclusive market opportunities; built capacities of government officials, NGOs, researchers, CBOs, and community members through diverse training opportunities; supported the establishment of multi-stakeholder policy dialogues and working groups at the local and sub-national levels; and co-produced recommendations and implementation guidelines on land tenure issues, timber production, diverse agroforestry systems, and NTFP management practices.

Policy Influence

In Indonesia, multiple FTA projects supported the co-development of policy frameworks for integrated timber and NTFP management at the landscape level as well as context-appropriate strategies for sustainable livelihoods in several districts. FTA's policy findings provided strong basis for discussions in stakeholder fora. For example, FTA's research on land tenure systems in Timor Tengah Selatan (TTS), NTFP management practices, and timber production informed district level governments' discussions for policy development. Through participatory action research, project partners and key local stakeholders – particularly policy working group members – improved their capacity to formulate science-based regulatory frameworks. FTA's findings (e.g., potential products alternatives, market estimations, NTFPs' trade hub locations) were taken up by multiple district level governments in, Sumbawa, TTS, and Gunungkidul, influencing the co-development of 'Grand Strategy Documents' (GSD) with communities to guide NTFP development, resulting in the reflection of community interests in the GSD and their commitment in supporting its implementation. The three GSDs contain plans for integrated timber and NTFP management, proposals to improve the cost-effectiveness of timber verification and certification, and promotion of NTFP as part of the local government development strategy. The GSD for TTS includes a proposal for the installation of five market hubs using provincial investments. FTA's collaborative approach served as a model for GSD development that was replicated by five other communities (Nenas, Kuanoel, Tutem, Nunbena, and Taneotob), and influenced other nine villages' commitment to adapt Village Medium Term Plan (RPJMD) and include integrated NTFP production and marketing in their agenda. The approach was also taken up by other government agencies (e.g., Directorate General of Social Forestry) and NGO partners (e.g., Partnership on Environment) for wider dissemination of lessons learned from Grand Strategy development at the national level (e.g., talk show as part of the national festival for community on social forestry across Indonesia Archipelago -PeSoNa 2016).

FTA's research also influenced the Farm Forestry Consortium (FCC) to integrate sustainable NTFP and timber production and trade into their agenda, which stimulated a regency working group mandate to develop an FCC action plan using FTA findings. There is indication of adoption of the GDS approach and lessons learned at provincial level for the development of strategies for developing NTFP management regulations for the entire province, but no supporting external evidence was available. By facilitating capacity development of local government officials and village leaders and the establishment of multi-stakeholder policy working groups (PWG) (e.g., TTS, Sumbawa, multi-stakeholder fora, NTT), FTA influenced the approval of Regional Regulation No.14/2019 for forest management, as well as informed and influenced the integration of NTFP and timber production issues on district and provincial policy agendas resulting in the enactment of three district decrees in TTS (No.70/2015, No.1224/2015, No.1286/2015) and budget allocation in support of a GSD process, two provincial decrees, and a draft regulation on harvest and management of NTFPs (e.g., East Nusa Tenggara Province). The West Nusa Tenggara Provincial Environment Agency expressed interest in continuing collaboration with FTA as it considered FTAs' forestry science relevant for commodity and policy development and supported alignment with provincial economic priorities (e.g., industrialization).

New policy allowed the establishment of six social forestry schemes through which communities gained access to forest and park lands. Social forestry schemes became operational at 15 sites, strengthening tenure through confirmation of agreements, issuance of permits, and legal documents drafted by FTA. These contributions increase the likelihood of a secure legal tenure system for forest-dependent people over time. There is potential for additional six schemes to be operational at six other sites through negotiations and FTA's technical support. FTA's partner (e.g., Balang) was invited by district governments to assist the resolution of land tenure disputes and negotiations to establish social forestry schemes at other sites.

FTA co-developed incentive schemes for environmental services with communities, district governments, NGOs, and universities to reward communities for sustainable land management (e.g., watershed management, collaborative forest conservation management, land rehabilitation through tree and bamboo planting). The schemes were directly linked to the livelihoods and conservation strategies developed between communities and local governments. By 2015, four districts (e.g., Bantaeng, Bulukumba, Jeneponto, and Gowa) implemented

strategy for sustainable livelihoods and conservation promoted by FTA. Six environmental services schemes were co-developed and are awaiting implementation. Overall, 19 sites have participatory governance models, land access/tenure agreements, and environmental services schemes in place and operational with FTA's support, benefitting a total of 32,948 people (50% women).

Box 1. FTA Showcase: Assisting the Development of an Agroforestry Policy in India

In India, FTA played a key role in the development of the 2014 National Agroforestry Policy (NAP), being the first of its kind in the world. The NAP exempts twenty multipurpose tree species from all restrictions related to harvesting, transportation, and marketing grown under agroforestry systems on farmlands across the country. It also contains provisions for land tenure security; increased investments in research; enhanced extension and capacity-building services; access to QPM, institutional credit, and insurance; increased participation of industries dealing with agroforestry produce; and strengthening marketing information systems for tree products (Chavan et al, 2015). As such, the mechanism brings legal clarity for smallholders' and private companies' investments in agroforestry models from seed procurement to marketing of the products to support adoption at scale. By aligning coordination, convergence, and synergy among various existing agroforestry schemes, and government agencies involved in agriculture, environment, forestry and rural development sectors, NAP is expected to promote value chain, climate-resilient technology development and pave the way for region-based marketing linkages in agroforestry. ICRAF is currently the only non-governmental member of the Inter-Ministerial Committee overlooking its implementation. An enabling policy environment, clear legal aspects and financial prospects across different policy levels are expected to support farmers' and private companies' decision-making to integrate trees into their cropping systems overtime. Preliminary evidence indicates there has been an increase in green cover (1% between 2017-2019) with >80 % of increased area composed by tree outside forest. FTA is supporting the adoption of agroforestry at the subnational level, targeting 5,000 households from 140 villages in two districts (e.g., Bolangir and Nuapada, Odisha), with potential to generate employment opportunities and income for farmers and reduce in-country migration.

In Vietnam, consultations with farmers, governments, extensionists, and local merchants co-created sustainable options for upland farming systems. Positive results from FDTs and ELs raised policymakers' awareness of agroforestry system benefits for smallholder livelihoods, induced policy dialogues and influenced policy, and increased public investments for agroforestry at the provincial and district levels. For instance, in **Dien Bien province**, policy was enacted in support of the development of agriculture and forestry protection sectors (e.g., Decision No. 14/2018/QĐ-UBND, No.45/2018/QĐ-UBND). **In Son La** province, FTA influenced the enactment of policy for the development of production, processing, and consumption of safe agricultural products and food (e.g., Resolution No.76/2018/NQ-HĐND), the expansion of son tra and other fruit tree plantations (e.g., Resolution No.80/NQ-HĐND, Decision No.675/QĐ-UBND), market promotion (e.g., Decision No.61/KH-UBND, implementation plan No.118/KH-UBND), and provision of support to develop 15,000 cooperatives and unions by 2020 (e.g., implementation plan No.114/KH-UBND). **Yen Bai's** provincial government promoted agroforestry adoption in policies by creating financial incentives such as subsidies for son tra planting (6 million VND per ha (~USD 260/ha) in Tram Tau and Mu Cang Chai districts (e.g., Decision 2412/QĐ-UBND; Resolution 15/2015/NQ-HĐND) and subsidies for practices preventing soil erosion (1 million VND per ha (~USD 45/ha) of grass-planting along contour lines on sloping lands) (e.g., Decision 27/2015/QĐ-UBND). Nine other policy documents were approved with FTA's technical support, including five decisions allocating funds in support of the development of agricultural, forestry, and fishery production at the provincial level. It is expected that enacted policies will create an enabling regulatory environment to support agroforestry adoption by farmers at scale. Over 240,000 trees (including son tra and other species) have been planted to date, raising the total area planted with son tra to 10,000 ha in Yen Bai, improving biodiversity and carbon sequestration. FTA's suitability maps for agroforestry options, the first of its kind for Vietnam's northwest region, were taken up by provincial

governments for enhanced land-use planning. Previous land use maps for forestry and agriculture produced by the government did not identify 'agroforestry' as a land use category. Approximately 1.4 million ha across Son La, Yen Bai, and Dien Bien are now recognized by local policy-makers as suitable for agroforestry expansion based on FTA's recommendations, with potential to benefit between 123,000-247,000 households (467,400-938,600 individuals) through policy incentives. The mapped agroforestry expansion domain provided a basis for investment planning by decision-makers and other stakeholders, leading to more targeted socio-economic and environmental benefits. Policy enactment is expected to continue stimulating wide-scale adoption of son tra-based agroforestry in the FTA-influenced region and beyond.

The Lam Dong Provincial government took up FTA's findings and recommendations into the Green Growth Action Plan (e.g., Decision No.68/QD-UBND) which will guide the province's transition to a 'green' and sustainable economy for the coming decade (2021–2030) with a vision to 2050. Nine Green Growth orientations (energy, GHG, waste control, land use, water, natural resources and biodiversity, market access, urban consumption, green tourism, and green economy) are integrated into environmental and economic policy priorities for Lam Dong province. Under the Plan, three main economic sectors (e.g., agriculture, forestry and tourism) have the potential to indirectly benefit 485,131 individuals in the agriculture sector (including agroforestry, forestry, livestock and fishery), and is projected to generate a gross regional domestic product of VND 85,019 billion (around USD 3.7 billion) for the province by 2030 if the plan is fully and effectively implemented. However, the plan requires a larger provincial workforce (i.e., 377,096 additional workers from other provinces) to meet all outcome targets in the 2016-2020 provincial planning. In the sources reviewed, there was no evidence of the implementation of the strategy by Lam Dong Provincial government.

At the national level, FTA's research aligned with governmental strategies for rural development, green growth, and climate change objectives and influenced change or enactment of three national level instruments. Agroforestry was included in the National Action Plan Framework for Adaptation and Mitigation of Climate Change of the Agriculture and Rural Development Sector (2008-2020). In 2020, the Prime Minister signed a decision to support agroforestry solutions involving fruit tree development in the north-western region (e.g., Decision No.1055/QD-TTg, MARD Decision No.156/QD-BNN-KHCN) as part of the 2021-2030 national action plan for climate change, supporting livelihoods and climate change resilience. As a result of FTA's policy analyses and national-level policy dialogues, the Ministry of Agriculture and Rural Development (MARD) created the first national agroforestry Technical Working Group to develop recommendations for agroforestry adoption at national level to be endorsed by MARD as an ODA (Overseas Development Assistance) priority. Expected impacts include landscape resilience and agro-biodiversity conservation to reduce farmers' vulnerabilities to soil erosion and potential loss of on-farm income.

Practice Influence

FTA produced several context-appropriate technical guidelines (including in local dialects) for farmers and extensionists to apply better management practices, increase yields, and alleviate vulnerabilities to climate change (e.g., nursery management, seedling propagation, organic fertilizer production, species' prioritization, FDTs, etc.) in India, Indonesia, and Vietnam.

In India, FTA introduced landscape-tailored food production systems, using the options-by-context approach, to reduce farmers' production vulnerabilities and increase food security year-round. FTA supported the establishment of 26 nutri-gardens with enhanced water infiltration systems (e.g., AgriVoltaic System), enhanced the capacities of extensionists (e.g., mobile-based monitoring), and increased farmers' access to high-quality seeds and saplings of nutritious biofortified varieties, which was bolstered by local NGO extension support and seed distribution (e.g., NRRI) post-project. Communities gained new learning and capacities through 644 workshops and trainings on agroforestry systems and nutrition, benefiting over 29,500 households to adopt agroforestry practices. For instance, FTA distributed 50 million tons of paddy seed for improved rice varieties to approximately 1,800 farmers where dominated by resource-poor and migrate farmers who are facing food and nutritional insecurity in rice-based agricultural system. Replication of FTA's capacity-building activities by governments and NGOs is estimated to directly benefit 373,214 households through adoption of nutria-gardens

for provision of food and household income via market of production surplus. Moreover, as a result of FTA's engagement with private sector companies, Dugar India expressed interest in supporting agroforestry development by integrating medicinal trees in communities' future interventions, including provision of training, improved planting materials, and market linkages for poor farmers, increasing the likelihood of sustainable employment opportunities from agroforestry and NTFPs in India over time.

In Indonesia, FTA's technical support secured farmers' access to natural resources for livelihoods. FTA built capacity of approximately 5,000 community members on conflict resolution and equitable participatory governance models, equipping them to develop options to address land disputes and natural resources management issues in the Nipa-Nipa (Southeast Sulawesi) and Labanu (Gorontalo) regions. Communities' perceptions of FTA as an honest broker facilitated engagement opportunities for community dialogue, improving information exchange and building understanding, for the resolution of tenure and land disputes and enhanced community planning.

FTA and local partners also improved the function of particular markets by enhancing connectivity between different parts of the value chain (e.g., physical infrastructure, facilitating business-to-business connections), improving the information available to market players, and supporting the development of new products, services, and context-appropriate business models so farmers could maximize the value from their products. In the NTB and NTT regions of Yogyakarta, FTA built farmers' business capacity through an integrated system that supported, advised, and trained farmers in processing techniques, financial literacy and business skills, as well as established regional and international market links for sustainable employment opportunities and livelihoods. Through trainings, workshops, farmer's days, cross-visits, and 11 demonstration plots (e.g., Gunungkidul, Sumbawa, Lombok, TTS), approximately 2,800 farmers and governmental extensionists learned about silviculture, apiculture, and market issues, and developed skills for production and/or processing of timber, NTFPs, honey, coconut oil, candlenut oil, bamboo, and Indigofera paste. As a result, farmers are better equipped with knowledge and capacity for product diversification and value-addition to get better prices for their products and built relationships to support knowledge exchange among extensionists and farmers. Producers, processors, and traders were also equipped to establish community-owned enterprises or form associations for improved cooperation and business cohesion (e.g., group-selling). Moreover, there are indications that banks and other financial institutions are sensitized on opportunities to support community access to financing and credit in Gunungkidul and Sumbawa through FTA's engagement, increasing the potential for farmers to access financial resources to invest in their businesses. Already ten percent of tree growers that participated in FTA's projects have adopted enhanced management practices which have resulted in higher quality and productivity for both timber and NTFPs. For those, a positive net cash flow is likely to occur after 6 years of project implementation if outcome-level assumptions are sustained. The rate of adoption of appropriate silvicultural practices by smallholder farmers is expected to increase as they continue to improve their technical capacities through extension training programs, strengthened farmer groups' institutions, and increased knowledge on management and marketing regulations. The exposure to diverse market opportunities and skills gained from FTA provided farmers and local stakeholders, including partner organizations, with increased experience and incentives to continue producing and marketing timber and NTFPs in integrated scenarios post-project.

In Sulawesi, SMEs, producers, and intermediaries learned how to strengthen local value chains. For example, approximately 15,300 individuals (35% women) learned about nursery management and tree propagation, which led to the establishment of 348 group or individual nurseries operated by local partners producing over 2 million seedlings by 2017. Commercial prospects for seedling sales were developed with several institutional customers including provincial agencies, district agencies, private plantations, and commercial plant outlets. By 2017, 12.3% of total production generated close to IDR 1,104,161,000 (approximately USD 106,262) in sales revenue across 10 districts. Additionally, there is potential for residents in 42 sub-districts to indirectly benefit from improved access to quality tree seedlings via farmer-owned nurseries. Through FTA's training, 13,300 individuals (35% women) learned about agroforestry systems for income generation, and 3,470 farmers (36% women) built technical capacities in agroforest management through engagement in 562 FDT of priority crops (cacao, rubber, coffee, black pepper, timber, clove, durian, rambutan, orange, and nutmeg). Some participating

farmers became independent extension workers. 139 farmers' groups with a combined membership of 2,881 individuals (35% women) actively participated in FTA's research activities, resulting in the development or strengthening of 114 agroforestry enterprises (group and individual) and directly benefiting 1,470 people (32% women). Improved value chains were developed through farmer-trader partnerships. Some value chains traded multiple products providing farmers and traders with advantages from economy of scale and by reducing transaction costs. For instance, FTA facilitated enterprise development for coffee farmers in Campaga, Pattaneteang and Pa'bumbungan in Bantaeng district. By organizing as an enterprise, individual farmers and traders could share knowledge, improve harvesting methods and production skills, and gain competitive advantage. 133 agroforestry-based value chains were established and strengthened with FTA's technical support, benefiting 9,830 individuals (46% women) in Southeast and South Sulawesi. Overall, 636,972 people (52% women) are estimated to have benefitted from improved incomes from agroforestry and forestry systems and related enterprises with average annual household income increased by 14% in South Sulawesi and 18% in Southeast Sulawesi. An additional 5,135 households in provinces outside of FTA's project area (450 people in Buol, Central Sulawesi; 3,750 in East Sumba, Nusa Tenggara Timur; 130 in Pidie, Aceh; 55 in Kapuas Hulu, South Kalimantan; and 750 in Gorontalo City) are estimated to have increased their incomes after adopting FTA-promoted technologies learned during cross-visits and from technical assistance.

In Sumba Island, FTA's research focused on Farmer Managed Natural Regeneration (FMNR) and Local Value Chain Development (LVCD) approaches to improve sustainable economic development at the sub-district level. FTA and local partners-built capacities of 18 farmer extensionists (44% women) and facilitated engagement opportunities with local farmers using a Farmer-to-Farmers (F2F) approach. Agroforestry and FMNR activities and practices adopted by farmer extensionists focused on fruit tree and cassava vegetative propagations, liquid organic fertilizer, organic pesticide, nursery establishment and management, good agricultural practices (GAPs) for food crops and intercropping. Farmer extensionists built capacities of other 1,618 farmers (40% women) through 243 agroforestry and FMNR focused trainings at 21 FMNR and 15 FDTs sites, resulting in 148 farmers (44% women) adopting GAP practices in their own farms for improved economic and ecological conditions. Farmer extensionists and farmers who adopted and applied agroforestry practices showed enthusiastic and high motivation to improve the management and productivity of FMNR. Preliminary evidence indicates adopted practices have begun to increase yields for several crops (e.g., peanuts, maize, chili, cassava, sweet potato, shallots, tumeric), though the direct economic impact has not yet been observed. It is expected that higher yields in these demonstration farms will further incentivize other farmers to adopt GAP practices to alleviate poverty and increase community resilience.

In Vietnam, to improve the performance of smallholder farming systems, FTA introduced trees in mono-cropped landscapes through agroforestry to reduce farms' vulnerabilities to land degradation, reduce farmers' dependence on annual crops, and increase and diversify incomes from tree products. Through FTA's training, 1,200 individuals (e.g., farmers, extension workers and staff, DARD officials, and research partners) learned about context-appropriate agroforestry systems, son tra value chains, and on-farm tree nursery management. FTA helped translate extension materials for specific species such as son tra into the H'Mong language. Participation in FDT and ELs activities influenced farmers' perceptions and transitions from mono-cropping to integrated agroforestry-based systems. Over 70% of surveyed trained farmers reported as technically equipped to implement agroforestry on their own. Experience-sharing through farmers' field schools, cross-site visits, and training sessions influenced uptake of agroforestry practices (e.g., son tra-forage grass system) by neighbouring farmers. With increased capacity for processing techniques and value-addition, 163 farmers adopted agroforestry systems (e.g., son tra-maize-grass, tea-maize, plum, mango, orange, longan, macadamia intercropping with maize or peanut) or soil erosion control measures. Farmers experienced higher yields (e.g., household tea production grew from 1.4 tons in 2013 to 2.15 tons in 2016), increased incomes through surplus production, and increased savings (e.g., on-farm production of grass for livestock consumption during winter season and seedlings to plant on their farms). FTA also facilitated private sector linkages to expand market opportunities for growers. Simple, low-investment mass production technologies, co-developed by FTA and local stakeholders, were adopted by a private company through a technology transfer agreement with TAFOOD to develop non-perishable products

(e.g., dried tea extracts) for the urban market, potentially creating sustainable demand for son tra growers. Other private sector actors (e.g., Hoan Duong trading and manufacturing joint-stock company, Viet Nam BigGreen clean food company) are interested in establishing market links with farmers, conditional to the quality of production. The combination of governmental subsidies and FDT and Els results are expected to incentivize non-project smallholders' adoption of FTA-promoted agroforestry practices. Potential adoption of agroforestry systems by up to 247,000 households could accrue an estimated economic value of USD 160,000,000-320,000,000 over fifteen years if all assumptions within this cluster are sustained.

Box 2: Agroforestry in Vietnam, a deep dive

Economic impacts and assessments of agroforestry adoption in Northwest Vietnam

Following the implementation of two consecutive and complementary FTA projects -Agroforestry for livelihoods of smallholder farmers in northwest Vietnam ([AFLI-1](#)) and Developing and promoting market-based agroforestry and forest rehabilitation for northwest Vietnam ([AFLI-2](#)) - exemplary agroforestry practices were established on approximately 300 hectares of degraded land, once dominated by maize monocropping. Experimental approaches were used to evaluate the biophysical effects and potential livelihood impacts associated of agroforestry adoption. The empirical results indicate that agroforestry systems have significant and positive economic impacts on smallholder agricultural income, as well as an overall positive return on investments for plots where agroforestry is practiced. The results generated through in-depth engagement in the exemplar landscapes contributed to the recognition of agroforestry at national level, which has been facilitated with communication, training, and extension manuals for large-scale roll-out.

Case study: Impact of agroforestry adoption on household income

Data on household demographics and plot-level agricultural production were collected using a cross sectional survey administered to 537 households in 2019. The resulting data were then analyzed using Propensity Score Matching (PSM) to assess the impacts of the adoption of agroforestry practices on agricultural income of smallholders. The empirical results indicate that agroforestry adopting households increased their agricultural income by nearly 350 USD per hectare annually, representing 15% of the average GDP per capita in Vietnam.

Profitability analysis in introducing/ adopting Agroforestry as a new agricultural practice

Data from field experiments and interviews with experts and scientists were used to assess the long-term benefits of agroforestry (Do. H., et al., 2020). This involved using decision analysis, probabilistic modeling, and Cost Benefit Analysis (CBA) to project the returns of seven different agroforestry interventions promoted under AFLi. The intervention combinations assessed including a) traditional agroforestry with commercial tree crop intercropped with forage grass (two models); b) maize-based agroforestry with fruits trees (two models); and c) coffee-based agroforestry (three models).

Net Present Values (NPVs)—a key indicator of returns on investment—were significantly greater for all seven agroforestry practice combinations compared with maize monoculture production. The analysis also highlighted different transition pathways for households with varying resource endowments. Maize-based agroforestry was deemed likely preferable for resource poor farmers, given its short time period to generate positive returns (Quang et al., 2014). While the long-term economic benefits of agroforestry adoption are positive, offering financial incentives to address the time-lag before the full economic benefits manifest is likely important to enable many farmers to overcome the agroforestry adoption hurdle.

Uptake of agroforestry practice in the region

AFLi's action research is well recognized in the region, especially with respect to capacity building and knowledge/technical transfer. According to the interviews carried out with central government officials from forestry and agricultural sectors, appreciated aspects of AFLi's approach include 1. Developing the capacity of stakeholders at various levels through the development of training manuals and guidelines and the provision of training at multiple levels; 2. Promoting agroforestry based on local needs and priorities; and 3. Disseminating project derived knowledge and learning through mass media, apps, and online videos. At the national level, extension guidelines were developed through an extension policy workshop and co-formulated with scientists, extension officers, and farmers. This has elevated the reputation ICRAF-FTA's work in the country, thereby supporting its agroforestry promotional efforts.

Research Influence

FTA's research influence has broadened understanding on priority species management and production, agroforestry practices, and NTFP value chains across **Indonesia** and **Vietnam**. In India, FTA established collaboration with Odisha University of Agriculture and Technology for technical support and expert training and support to ongoing distribution of quality planting material for smallholders. In Vietnam, FTA established ongoing collaboration with the National Institute for Medicinal Materials (NIMM) to co-develop techniques for producing pre-processed son tra products to expand urban demand.

At the international level, results generated from FTA research in Vietnam contributed to building the compendium of knowledge and practices on landscape management through the global 'Landscape Academy' initiated by a global network of scientists from the CGIAR and FAO. Moreover, findings of FTA's research on teak and silviculture were taken up by international organizations (e.g., FAO, IUFRO, Teak Net) and donor projects (e.g., ACIAR projects in Laos, Papua New Guinea, and Vanuatu). FTA findings in Indonesia were presented at four international fora (e.g., World Agroforestry Congress 2014, Forest Restoration at Landscape Level in Asia Pacific, IUFRO Research Group Small-scale Forestry, and Forest Asia Summit). FTA provided opportunities for two Vietnamese government partners (e.g., DARD Son La and DARD Dien Bien staff) to participate in the World Agroforestry Congress in 2019. By supporting several undergraduate and graduate students (24 Indonesian, 13 Vietnamese, and 8 international), as well as contributing to university training programs (e.g., SCU-TBU) and partnership arrangements (e.g., Bonn University, Bangor University, Swedish University of Agricultural Sciences (SLU), Vietnam National University of Agriculture (VNUA)), FTA built national research capacities to advance the agenda on agroforestry and NTFP value chain issues throughout the region.

Table 11. Diversification of Agroforestry-based Income (Asia) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>India</p> <ul style="list-style-type: none"> • Influenced development of National Agroforestry Policy, 2014 • Subnational government (Odisha) supports AF adoption by smallholders <p>Indonesia</p> <ul style="list-style-type: none"> • Integrated NTFP and timber production on district- and provincial policy agendas • Influenced co-development of 3 Grand Strategy documents (e.g., Sumbawa, TTS, Gunungkidul) guiding NTFP development <p>Vietnam</p> <ul style="list-style-type: none"> • Integrated NTFP and timber sustainable production and trade into provincial and district levels policy, strategies, and budget • Integration of agroforestry in the National Action Plan Framework for Adaptation and Mitigation of Climate Change of the Agriculture and Rural Development Sector (2008-2020). • Green growth orientations integrated in provincial environmental and economic priorities (Lam Dong)
Practice Influence	<p>India</p> <ul style="list-style-type: none"> • NGO support equitable and integrated sustainable community planning and management of natural resources • Extension agents have increased capacity to deliver pro-poor agroforestry and livelihoods services • Smallholders adopt AFS and management practices for diversified agricultural production • 1 Private company express interest in demand AF products • 29,583 households (~141,998 individuals) diversified agricultural production through adoption of AF practices <p>Indonesia</p> <ul style="list-style-type: none"> • CBOs gained access to forest and park lands and establish social forestry schemes • Uptake of approach for GSD in five additional communities (Nenas, Kuanoel, Tutem, Nunbena, and Taneotob) • Uptake of FTA approach by government agencies and NGO • 9 villages committed to adapt RPJMD to include integrated NTFPs production and marketing • FTA reputation as honest broker for to support land access disputes • NGO support equitable and integrated sustainable community planning and management of natural resources • 19 sites (e.g., Nipa-Nipa, Southeast Sulawesi and Labanu, Gorontalo) have participatory governance models, land access/tenure agreements, and environmental services schemes • Smallholders have increased market links to sell AF and NTFP

	<ul style="list-style-type: none"> • Communities sensitized to form CBOs for improved cooperation and business cohesion • CBOs support market links • Smallholders benefit from economy of scale and by reducing transaction costs • Private companies and financial institutions support AF value-chains • Farmer-extensionists deliver effective AF extension services to farmers • 120 households (~480 individuals) benefit from access to Trigona honey market • 348 group or individual nurseries (~1,392 individuals) generate household income from sales revenue • 1,470 people (~5,880 individuals) have sustainable employment opportunities through 114 agroforestry enterprises • 9,830 individuals (~39,320 individuals) benefit from improved value-chains of AF products • 148 farmers (44% women) (~592 individuals) adopt GAP practices in their own farms • 636,972 people (52% women) are estimated to have benefitted from improved incomes from agroforestry and forestry systems and related enterprises in Sulawesi¹⁰ <p>Vietnam</p> <ul style="list-style-type: none"> • Extension agents have enhanced capacity and tools to deliver effective AF extension services • Smallholders adopt AF practices • Private company adopt and advance processing technologies • 163 households (~619 individuals) adopt AFS for on-farm savings and diversification of cash income <p>POTENTIAL</p> <p>India</p> <ul style="list-style-type: none"> • 373,214 household (~1,791,427 individuals) benefit from nutri-gardens • 5,000 households (~24,000 individuals) from 140 villages in two districts (e.g., Bolangir and Nuapada, Odisha) adopt market-oriented agroforestry <p>Indonesia</p> <ul style="list-style-type: none"> • 2,800 farmers, voluntary and governmental extensionists across seven villages in three districts (~11,200 individuals) have enhanced capacity to adopt AF practices • 15,300 individuals (~61,200 individuals) have enhanced capacity to generate income through nurseries • 13,300 individuals (35% women) (~53,200 individuals) learned about AFS for income generation • 5,135 households (~20,540 individuals) estimated to have increased their incomes after adopting FTA-promoted technologies • 1,618 farmers (40% women) (~6,472 individuals) have increased capacity to adopt GAP practices for enhanced on-farm production <p>Vietnam</p> <ul style="list-style-type: none"> • Potential adoption of AF practices by 247,000 households (~938,600 individuals) through policy incentives • Green Growth Action Plan have the potential to indirectly benefit 485,131 individuals in the agriculture sector (including agroforestry, forestry, livestock and fishery) by 2030 in Lam Dong Province • 1,200 households (~4,560 individuals) have enhanced capacity to adopt AFS and participate in value chains
Research Influence	<ul style="list-style-type: none"> • 45 students developed research skills through FTA research • 15 working papers and extension documents (600 downloads) • FTA findings presented at 4 international fora (e.g., World Agroforestry Congress 2014, Forest Restoration at Landscape Level in Asia Pacific, IUFRO Research Group 3.08 Small-scale Forestry, and Forest Asia Summit). • Enhanced academic understanding on priority species management and production, agroforestry practices and NTFP value chains across Indonesia and Vietnam • Uptake of findings on teak and silviculture by international organizations (e.g., FAO, IUFRO, Teak Net) and donor organization's projects (e.g., ACIAR projects in Laos, PNG, and Vanuatu) • Uptake of silviculture findings by other FTA projects (e.g., Agroforestry and Forestry in Sulawesi (AgFor) Project) • Ongoing research collaborations with universities (India, Indonesia, and Vietnam) to support value-chain development
Impact	<p>Low-end estimate: 827,204 individuals directly and indirectly (of those, 200,893 people directly and 626,311 household members indirectly)</p> <p>High-end estimate: 3,396,330 individuals directly and indirectly (of those, 664,567 people directly and 2,731,763 household members indirectly)</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Assumes farmers/smallholders have property or land tenure secure

¹⁰ Assuming reported estimate includes direct beneficiaries and household members

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|---|
| <ul style="list-style-type: none"> • Assumes perfect adoption and scaling of agroforestry systems and other practices promoted by FTA projects to sustain/increase production over the years • Selected priority species for AFS have high market potential • Product prices remain attractive, with risk mitigated by diversification of products • Smallholders/farmers learn and adopt recommended flexible and context-specific marketing strategies • Distributed seedlings have a high survival rate and are effectively managed • Adequate extension services to support adoption and optimal yields |
|---|

6.1.10. Payment for Environmental Services in Asia Cluster Results:

To reduce smallholder vulnerabilities and increase income through Payment for Environmental services (PFES) in Asia FTA supported the initiation and promotion of multiple co-investment and rewards for ecosystem services schemes to restore land, and informed policy on rewards for ecosystem services to ensure workable incentives for communities and smallholders. **In China, India, Indonesia, the Philippines, Nepal, and Vietnam**, FTA supported the establishment of communities of practice on ecosystem services and rewards for ecosystem services, which has built trust among stakeholders involved in rural development and environmental conservation, and increased cooperation and advocacy for the bottom-up design and inclusive negotiation and expansion of rewards for environmental services (RES) schemes. FTA has played an integral role in shaping policy discourse on incentives for landscape-based restoration of ecosystem services as a trusted source of technical advice.

Policy Influence

In China, the State council and the Government of Xishuangbanna Prefecture adopted the lessons from a FTA-RES scheme for designing ecological land-use plans on grasslands.

In Indonesia, CIFOR's strong reputation and relationship with governments facilitated uptake of FTA's findings on gender (e.g., gender inclusiveness indicator tool) sensitizing governments on cost and trade-offs of PFES (REDD+) implementation on women influencing revisions on the National Reward for Ecosystem Services (RES) protocol which guides the implementation of Law 32/2009 on Environmental Management and Protection. Contractual arrangements between communities and ecosystem service investors (e.g., parastatal water companies) have been established. For instance, The Ministry of Women's Empowerment and Child Protection recommend CIFOR's collaboration in a gender task force from the Ministry of Environment and Forestry and the Ministry of Foreign Affairs. Results of this collaboration were used by the Indonesian negotiation team at COP21 Paris. UNDP and UNWOMEN further invited CIFOR to explore gender and financing research initiatives using FTA developed gender tool. At local level in Indonesia, FTA influenced Buol's local government (Central Sulawesi) adoption of the co-investment principle in district regulations on CSR and the Village Fund, and together with an oil palm company, is involved in the co-investment of a scheme for smallholder tree farming and watershed monitoring.

In the Philippines, FTA supported drafting the Philippine Climate Change Act of 2008 and influenced an executive order on RES within the National RES Technical Working Group. FTA facilitated the implementation of a local government (e.g., Lantapan) Incentive-Based Policy Program and Mindanao's Development Authority set up co-investment schemes co-financed by private-sector companies, however, in the sources reviewed, there was no evidence of implementation.

In Vietnam, FTA supported the development and piloting of a M&E system and a national guideline for PFES financial management for improved accuracy of payments (**for detailed information, see Box 2 in Challenge 1**). By adopting FTA developed PFES M&E system, the Vietnamese government is equipped to ensure payments are made to the right people, and communities have full transparency of fund allocation resulting in increased equity and transparency. PFES was implemented country-wide since 2010 supported by over twenty legal instruments (e.g., decrees, prime ministerial decisions and circulars). Forest protection and development funds (FPDFs) have been established at both central and provincial levels facilitating 242,983 smallholder's access to the incentive mechanism. In several provinces, such as Lam Dong, Lai Chau and Kon Tum, PFES payments to individuals, households, communities and companies exceed the financial support of VND 200,000 per ha per

year provided by the government to forest owners for forest protection and development through the State budget. The local Department of Agriculture and Rural Development and the commune people's committees in two provinces (e.g., Ha Tinh and Quang Binh) adopted the home-garden and sloping-land replanting approach into their regulation, as an example of climate-smart agricultural practice. This led to the integration of PFES schemes into rural development policy at national level including the New Rural Development Program and the Local Agricultural Restructuring Program (Decision No. 923/MARD/2017 on Green Agricultural Development).

Across **Indonesia, the Philippines and Vietnam**, several development projects (e.g., CIDA, FAO, DIDA, UNDP-GEF, ADB) adopted FTA-developed Rewards for Environmental Services (RES) model and applied it in other regions. Building on FTA success, IFAD Asia has set a target for integration of RES strategies in at least 20% of new projects in Asia. As a result, in 2013 18% (6 out of 33) of new IFAD projects in Asia integrated RES in their strategies. Furthermore, CARE-WWF invited FTA within the Global Project on Equitable Payments for Watershed Scheme to support project development in Tanzania and Kenya.

Practice Influence

FTA engaged local communities in capacity building activities (e.g., knowledge-sharing sessions, participatory mapping, biodiversity research, awareness raising events) to increase local stakeholders' awareness of environmental services, which incentivized local communities to protect and manage their forests sustainably for availability of natural resources for livelihoods and income generating activities in the long-term. Communities in FTA- target areas were sensitized on the role of trees in water and soil conservation which is expected to influence adoption of management measures for erosion reduction, prevention of illegal cutting of trees, and waste management. For example, in Vietnam (e.g., Quang Nam and Dak Nong provinces), villages have used PFES payments to establish patrol teams to support forest protection.

FTA built capacities of PFES providers (e.g., brokers of RES, local NGOs and local governments) on new models of PFES facilitating links between supply and demand and cost-effective brokerage. FTA provided scientific information for business case development and engagement opportunities for international, national, and local beneficiaries as investors in ecosystem services' schemes, thereby enabling sustainable PES implementation in **Indonesia, the Philippines, Nepal and Vietnam**. Through FTA training and provision of technical assistance, NGOs and CSOs (project implementers) have enhanced capacities to quantify and identify ES for business case development and contract negotiations. A total of 2,975 individuals have directly benefited from PFES/RES schemes across China, India, Indonesia, Nepal, Philippines, and Vietnam with FTA support. For instance, in Cidanau, Indonesia, the annual PFES income of USD120 per hectare contributed around 3% to participants' household incomes, stimulated local business, and reinvestments for enhanced community livelihoods (e.g., access to water).

In the Philippines, FTA demonstration plots' positive results in cacao-rubber and coffee-rubber agroforestry systems have influenced adoption in farmers' practices. Around 60 hectares of enhanced farms were established (from the initial 4.3ha of learning sites established by FTA) indicating adoption is starting to take place across four priority river basins. FTA also influenced the Department of Environment and Natural Resources (DENR) and DTI to support communities' value addition initiatives. A total of 307 community groups have established 321 initiatives, including facilities upgrade (e.g., concrete drying pavement, storage or warehouse facilities) and acquisition of equipment and tools for product processing enabling communities to work collectively and increase profit from their production. To date, 476 individuals (40% women) have increased capacity in processing enabling them to move up in the value chain. For instance, a community-owned cooperative (e.g., Samahan ng mga Palaw'ano sa Amas Brooke's Point) now trades almaciga resin collectively with approximately USD 20,000 of annual revenue shared between communities and indigenous groups. FTA also influenced an MoU between the National Power Corporation and the Local Government of Lantapan for provision of technical support and funding for rehabilitation, reforestation, and protection of the Alanib sub-watershed.

In Vietnam, two provincial governments (e.g., Ha Tinh and Quang Binh) and tree-seedling companies are supporting smallholders in a co-investment scheme by enriching home gardens with productive trees, crops and grass. A total of 348,715 households have improved income/livelihood from forestry with an average of 90

USD/household/year. Under the scheme, the companies provide seedlings and buy the harvested fruit from the farmers.

Table 12. Payment for Environmental Services (Asia) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>China</p> <ul style="list-style-type: none"> Local government integrate lessons from FTA research on RES scheme into ecological land-use plans <p>Indonesia</p> <ul style="list-style-type: none"> National Reward for Ecosystem Services (RES) protocol integrates gender equity aspects Ministry of Environment and Forestry and the Ministry of Foreign Affairs better informed on gender for equitable environmental management UNDP and UNWOMEN invite CIFOR's technical guidance on gender and financing Local government adopts co-investment schemes in district regulation and budget Local government and private companies co-invest in PFES scheme <p>Philippines</p> <ul style="list-style-type: none"> Local government implements Incentive-Based Policy Program Provincial government set up co-investment schemes co-financed by private-sector companies <p>Vietnam</p> <ul style="list-style-type: none"> Revise national guideline for PFES financial management Implement PFES nationally Forest protection and development funds established at provincial level Provincial government adapt PFES regulation to include pro-poor initiatives National rural development policy integrates PFES
Practice Influence	<p>Across the region</p> <ul style="list-style-type: none"> 2,975 individuals (~11,900 individuals) participate in PFES/RES schemes across China, India, Indonesia, Nepal, Philippines, and Vietnam Smallholders have increased awareness on PFES schemes and enhanced management practices Practitioners have enhanced capacity on benefit-sharing PFES schemes Practitioners use FTA data to develop enhanced business cases NGOs and CSOs have enhanced capacity to support PFES implementation <p>Philippines</p> <ul style="list-style-type: none"> Smallholders adopt improved agronomic practices Private sector supports and co-invest in PFES schemes at local level Local government support AF value chain 476 individuals (~2,237 individuals) move up in the value chain <p>Vietnam</p> <ul style="list-style-type: none"> Smallholders access PFES benefits through state budgets Private sector supports and co-invest in pro-poor PFES schemes 242,983 smallholders (~923,335 individuals) participate in PFES incentive mechanism 348,715 households (~1,325,117 individuals) have improved income/livelihood from forestry
Research Influence	<ul style="list-style-type: none"> Numerous publications <ul style="list-style-type: none"> >60 policy briefs and other relevant policy publications 6 synthesis reports on RES policy 9 policy working papers 29 action research studies 2 booklets and 1 poster of site profiles 5 videos related to RES Thai Nguyen University of Agriculture and Forestry integrated PFES in Forestry undergraduate curricula IFAD integrates RES into new projects
Impact	<p>Low-end estimate: 2,265,565 individuals directly and indirectly (of those, 595,149 people directly and 1,670,416 household members indirectly)</p> <p>High-end estimate: Not available</p>
Underlying Assumptions	<ul style="list-style-type: none"> Availability of forest inventory Timely land allocation processes Adequate technical and financial capacity at central and provincial levels and strong coordination among government agencies for implementation Transaction costs are not a barrier for smallholder

- | |
|--|
| <ul style="list-style-type: none"> • Incentive level is adequate to motivate behavioural change in the absence of competitive markets for ES • Policies and laws that regulate the planting, harvesting and sale of trees on state land enables communities and large-scale private investments in tree-based businesses |
|--|

6.1.11. Climate-resilient Livelihoods in Asia Cluster Results:

To increase smallholders and forest-dependent communities' resilience to climate-change in Asia and the Pacific region, FTA investigated the socio-economic impact of monocultures on smallholder household revenue and livelihoods, and engaged with smallholders to pilot and assess climate-smart crop alternatives for sustainable and resilient production. FTA contributed to enhanced multi-stakeholder dialogue via the Platform on Sustainable Rubber and advanced the research agenda on climate-smart crop alternatives and sustainable production through ASEAN and the Global Landscape Forum. There are indications that the research contributed to policy influence in Indonesia, Philippines, and Vietnam via a series of policy workshops involving government officials and policymakers at sub- and national levels.

Policy Influence

In Indonesia and the Philippines, FTA was instrumental to establish multi-stakeholder dialogue to enhance support and participation of local governments, development agencies, and the private sectors to co-invest in smallholder tree farming. In the Philippines, local NGO plays a role as a seed fund manager between farmers and FTA smart tree-investment project for nursery establishment and trainings, and potential co-investors are explored through their government networks (e.g., Mindanao Development Authority). In Indonesia, local government support in co-investment activities through a village fund (e.g., Buol District, Central Sulawesi) with involvement of about 90 smallholders after FTA intervention. FTA research influenced local government's practices that now uses Village Fund for agricultural and conservation development.

In Vietnam, FTA spearheaded collaboration between district authorities, other development initiatives (e.g., IFAD funded Sustainable Rural Development for the Poor Project in Ha Tinh and Quang Binh Provinces) enhancing local capacity to implement co-investment ecosystem service schemes while mainstreaming the approach into policies and programmes. Promising policy change have been observed in Vietnam with the integration of FTA approach of home-garden and sloping-land scheme into district level decisions in Ha Tinh and Quang Binh Provinces (e.g., District Decision No. 71/QD-HDND and Decision No. 735/QD-UBND), as well as the integration of climate-smart approach at national level (e.g., National policy Decision No. 819/2016 on Program 135 integrated climate-smart approach, and Decision No. 923/MARD/2017 on Green Agricultural Development).

Practice Influence

The research also supported practice change in **Indonesia, Vietnam, and the Philippines** through the involvement of 400 smallholders (34% women) in co-investment of ES pilot. Farmers learned that green alternatives to rubber monocultures (e.g., herbicide cessation) had no implications on yields, and alternative management practices (e.g., intercropping) had potential to increase farm's annual revenue through diversification of short-term income sources as well as provide long-term income sources by growing valuable assets (e.g., timber), which have the potential to generate income in contexts of price volatility and/or after rubber yields diminish or cease. FTA research has influenced the private sector to co-invest in scaling of agroforestry models (e.g., combination of orange & pomelo with short term crops on sloping land) in two additional communes in Vietnam. Tree-seedling companies are supporting smallholders in enriching their home gardens with productive trees, crops and grass. Under the scheme, the companies provide seedlings and buy the harvested fruit from the farmers. Hence, income diversification through intercropping is expected to reduce production risks, and support income stability to smallholders over time. There is indication of replication of FTA approach post-project in Vietnam (178 additional households) through co-investment with local partners, and policymakers. Co-investment envisages that parties interested in a particular landscape become involved in and contribute to schemes by jointly investing both financially and in kind. It involves longer-term engagement and greater awareness of the importance of ecosystem services at the community level. Once the prerequisite of

co-investment has been established, there is potential for development of market-based value chains with stronger emphasis on pro-poor and fair processes.

Table 13. Climate-resilient Livelihoods (Asia) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Vietnam</p> <ul style="list-style-type: none"> • Integration of FTA approach of home-garden and sloping-land scheme into district level decisions • Integration of climate-smart approach at national level
Practice Influence	<ul style="list-style-type: none"> • Local governments in Indonesia and the Philippines support and influence participation private companies in the smallholder tree farming co-investment scheme • Enhanced multi-stakeholder dialogue via the Platform on Sustainable Rubber • Farmers have increased awareness of crop climate vulnerability via the Platform on Sustainable Rubber • Smallholders engaged in co-investment of ES pilot in Indonesia, Vietnam and the Philippines • Private sector supports scaling of FTA models on climate-smart crop alternatives and sustainable production • 400 households (34% women, ~1,600 individuals) benefit from diversified short- and long-term on-farm income generation sources in Indonesia, Vietnam, and the Philippines • 90 additional Indonesian households (~360 individuals) adopted FTA approach post-project • 178 additional Vietnamese households (~676 individuals) adopted FTA approach post-project
Research Influence	<ul style="list-style-type: none"> • Research agenda on climate-smart crop alternatives and sustainable production advanced through ASEAN and the Global Landscape Forum
Impact	<p>Low-end estimate: 2,636 individuals (of those, 668 people directly and 1,968 household members indirectly)</p> <p>High-end estimate: Not available</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Selected priority species for AFS have high market potential • Timber and fruit trees have high survival rates and are effectively managed • Adequate extension services to support adoption and optimal yields • Market demand for timber and agroforestry produce

6.1.12. Tenure Mechanisms (Global) Cluster Results:

In order to increase equitable participation and benefit-sharing for forest-dependent communities, FTA collected gender-differentiated data on forest use, tenure, and participation in governance, investigated the socio-ecological benefits of tenure arrangements, and conducted policy analyses in case studies across Africa, Latin America, and Asia to raise the profile of forest-based tenure and present recommendations for equitable tenure reform amongst decision-makers and policy-makers. FTA developed resources and provided training to governments, NGOs, and communities on participatory forest governance processes and approaches (e.g., Prospective Participatory Analysis (PPA), Adaptive Collaborative Management (ACM)) to secure and strengthen forest-dependent people's tenure rights, guide equitable reform, and enhance representation and participation in forest governance and management.

Policy Influence

With successful uptake of learning and capacity-building by government actors, FTA contributed to policy processes in **Indonesia, Peru, and Uganda**. FTA projects fostered opportunities for forest-dependent communities and multiple levels of governments to engage in constructive dialogue using PPA, share perspectives and challenges, and co-develop solutions for tenure using FTA data and tools. This has served to both enhance awareness amongst stakeholders and facilitate better representation of women, youth, and minority groups in policy reform processes that will ultimately reflect the interests of communities in forest tenure policy, redressing former policies' land use and access rules that failed to account for their needs.

In Indonesia, PPA activities and training increased governments' knowledge on the intersection of gender and tenure rights for forest-adjacent communities and stimulated reflection on the implications for forest management. FTA also secured the attention of the KHLK regarding evidence-informed policy development and related conflict resolution on the issue, provoking debate for inclusive planning for better implementation of tenure reform in the country. As governmental actors are more aware of tenure issues that affect communities, they are more likely to involve communities in policy decision-making and planning development. Through PPA scenario-building, Indonesian PPA participants indicated that the process of co-identifying prioritized actions

will inform regional governmental programmes and coordination on forest tenure and has increased their capacities to incorporate gender considerations into tenure policy in the future. For example, PPA outputs, such as tenure reform scenarios and co-developed action plans, fed into the KHLK's regulation on social forestry (PP No.83/2016), which established a Working Group of Social Forestry to improve multi-level governmental coordination and accelerate the implementation of forest tenure reform. The social forestry approach is one avenue for Indonesia to tackle large-scale forest reform and related tenure issues. A KHLK participant of FTA's South-South exchange events on forest tenure reform was promoted to director of social forestry and began to promote gender and the role of women in social forestry regulation and practice, drawing on discussions raised in the exchange. Through these and other supports to the social forestry programme, FTA created opportunities for forest-adjacent communities to advocate for local interests, tenure rights, and SFM. The social forestry programme continues to be a regional priority in Maluku, being included in the 2019-2024 regional midterm development plan (RPJMD) and the 2019 Work Plan for Social Forestry and Environmental Partnership Center for Maluku-Papua Region (RENJA BPSKL Maluku-Papua 2019). In Lampung, PPA-identified actions were synergized with the 2014-2023 Long-term Forest Management Plan (RPHJP) of the Batulegi Forest Management Unit (FMU) and the 2015-2019 Strategic Plan of the Lampung Provincial Forestry Service (RENSTRA DKP). By integrating and synergizing co-identified priorities from PPA into these action plans and programmes, regional governments are better positioned to implement more effective and context-appropriate actions for social forestry and tenure that benefits impoverished communities.

In Peru, FTA researchers took advantage of a policy window for a national-level tenure reform process by facilitating participatory scenario-building exercises using PPA with over one hundred governmental, forest community, and NGO stakeholders in Loreto and Madre de Diós. During these exchanges, stakeholders gained a better understanding of other actors' perspectives and barriers and learned lessons on how to improve the implementation of forest tenure reform. Both national and sub-national governments acknowledged the value of PPA and FTA's outputs to help redefine priorities and inform their work, such as clarify the land titling process in policy and draft implementation guidelines, though such changes have not yet occurred. With time, it is likely that Peru's forest tenure reform will happen and reflect FTA's influence.

In Uganda, FTA's involvement in policy dialogues, roundtables, and stakeholder fora were extensive, exerting notable policy influence, starting with endorsement of ACM by relevant representatives in parliament (e.g., Natural Resources and Environment Committee, Women Parliamentarian Association) as well as government agencies like the Forest Sector Support Department (FSSD), a forest inspection division of the Ministry of Water and Environment (MWE). There are indications of roll-out of ACM at the district-level by the FSSD's integration of the approach into the second phase of the government's Farm Income Enhancement and Forest Conservation Project. Moreover, the Ugandan government invited CIFOR to inform revisions of the national participatory forestry guidelines based on lessons learned from practical application of ACM to ensure gender considerations are reflected. By sharing knowledge on gendered forest use among policy-makers and fostering interest in more inclusive policy, FTA's contributions supported the legal recognition and registration of 279 people (54% women) under six community groups. By being part of a formally recognized group, community members – particularly women – had more opportunities to participate in decision-making processes. FTA also supported these groups to negotiate with the NFA on land allocation, resulting in successful tenure of degraded forest land for 40 years in the Central Forest Reserve (CFR). With this tenure security, community groups established their own rules of engagement for sustainable forest use and management, which have begun to reduce pressures on forest resources and restore degraded areas. The NFA has also approved a new collaborative forest management (ColFM) partnership with Mbazzi Village in Mpigi district, allocating them additional land to use for reforestation and income generation (e.g., replanted with eucalyptus to produce firewood and wooden poles). FTA ran PPA in review of the Community Forest Management (CFM) gender guidelines, which national policy-makers found to be a useful process to improve cross-sectoral problem-solving and generally helped them to identify actions to strengthen tenure security in future action plans. While no policy change has manifested yet, several Ugandan PPA participants hoped these experiences would catalyze uptake of PPA processes in other regions of the country.

Practice Influence

FTA supported the capacity-building of hundreds of governments, communities, NGOs, and journalists globally in topics such as gendered aspects of tenure reform and implementation, gender reporting on forestry and natural resource issues, community forest tenure rights, leadership and governance training, and conflict management, among others. The establishment of multi-stakeholder platforms for dialogue brought diverse actors to discuss forest tenure issues and build professional networks in-country for collective action – some of which continue to be used post-project (e.g., Uganda, Indonesia). Other South-South networks enabled hundreds of government actors, practitioners, and researchers to learn from and share experiences, successes, and failures on forest tenure and reform. Globally, FTA's PPA activities enhanced stakeholder engagement and communication, especially between sub-national governments and forest-adjacent communities, to co-identify feasible and desirable solutions for tenure insecurity and coordinate action. Communities were also given a space to advocate for and voice their needs, reaching mutual understanding and having built trust with governmental decision-makers that served to strengthen their relationships and reinforce their shared goals. Stakeholders were also empowered through these processes as there was joint ownership over the collectively identified solutions for equitable tenure reform.

In Indonesia, FTA and partners (e.g., Lampung Mangrove Center, Samdhana Institute) supported awareness-raising of the political, social, and ecological dimensions of forest tenure reform and implementation, as well as built stakeholders' capacities in tools for PPA, gender and leadership, legal literacy in forest tenure reform, and conflict management (e.g., Rapid Land Tenure Assessment Dispute Analysis (RaTA AGATA) method). Local governments expressed their appreciation for the training in conflict management, as they found it useful to reflect on land tenure conflicts, foster participatory involvement of communities, and devise appropriate solutions for conflict resolution. There is also evidence of uptake of the PPA method by local government staff in their day-to-day work on forest governance, in recognition of the value of engaging relevant stakeholders and fostering opportunities for collaboration and coordination. The Samdhana Institute also shared FTA's guidelines for the practical application of social forestry policy that outline the legal and logistical aspects of forest tenure reform and promote recognition of community rights over traditional territories and customary forests. By sharing these guidelines through the Samdhana Institute's networks in Indonesia and Southeast Asia, other tenure-focused organizations in the United States and Europe adopted the guidelines in their advocacy work. This also served to draw international attention to forest tenure and reform issues.

In Nicaragua, FTA training in ACM and gender helped communities learn how to foster women's inclusion and leadership in forest governance and resource management. FTA's workshops and trainings in forest monitoring built over 400 people's skills to develop a participatory monitoring tool, identify indicators, implement the tool, and build analytical capacity to use monitoring data to inform community and governmental decisions on forest management. While some resistance remains, Nicaraguan women occupy a more prominent space in discussions on land and forest governance (where they previously were excluded).

In Uganda, FTA trained nearly 250 community members in tree-grafting, tree planting assessment, resource analysis, micro-finance schemes, and ACM. This training helped build the knowledge, skills, and confidence of women to increase their participation in and lead forest user groups, taking up ACM practices and other technical skills to dually restore degraded forest areas and improve their incomes. Successful adoption of ACM in Uganda enhanced horizontal and vertical interactions between communities, sub-national and national governmental agencies, and NGOs, which has resulted in greater technical support for community initiatives. With increased participation of women in leadership and decision-making processes in FTA's six study sites, rising from two women in leadership positions before FTA to 36 five years after the first project phase, women gained stronger and a greater breadth of rights and control in forest management, land ownership tenure, and forest-based income.

Research Influence

FTA's research influence was also substantial, as FTA centres continue to fill knowledge gaps on the importance of equitable governance arrangements and tenure for SFM and expand the debate to include mangrove forests.

FTA participated in several international conferences and fora, sharing findings to advance the global debate on forest tenure reform and promote gender and tenure-based forest management, such as the World Bank's annual Land and Poverty Conference, the Forest and Livelihoods: Assessment, Research, and Engagement (FLARE) Conference, International Fund for Agricultural Development's (IFAD) Global Call to Action for Indigenous and Community Land Rights, Rights and Resources Initiative's (RRI) Global Coalition, and the International Association for the Study of the Commons (IASC), among others.

Through research partnerships in Peru, FTA enhanced the research capacities of national researchers, academic consultants, and students from the Universidad Agaria la Molina in PPA, forest tenure, and project management, and expanded their career prospects. Some professors integrated FTA's findings on forest tenure into their teaching, curricula, and research. Partners designed new research projects on tenure following a similar methodology, and FTA centres continue to collaborate with GIZ to apply methods and collect data for two other regions in the Peruvian Amazon. Owing to their experience on the topic, several FTA researchers were invited by international organizations to join expert committees on tenure and provide technical advice (e.g., World Bank project, Peru-Norway agreement). In Nicaragua, collaboration with local universities (e.g., Bluefields Indian and Caribbean University (BICU), University of the Autonomous Regions of the Nicaraguan Caribbean Coast (URACCAN)) strengthened working relationships and helped build research capacities in ethnographic methods, gender and masculinity, community forest governance, and more, particularly for graduate students. FTA's research collaborations in Indonesia also enhanced the research capacities of local partners and students from the University of Indonesia (UI), Bogor Agricultural Institute (IPB), University of Lampung (UNILA), Pattimura University (UNPATTI), and the Regional Community Forestry Training Center (RECOFTC), adopting learning and participatory methods into their teaching and research practice.

Table 14. Tenure Mechanism Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Global:</p> <ul style="list-style-type: none"> • Better representation of women and youth in tenure reform policy processes <p>Indonesia:</p> <ul style="list-style-type: none"> • Informed establishment of the Working Group of Social Forestry • PPA identified prioritized actions to inform regional governmental programmes and social forestry schemes • Social forestry programme a regional priority in Maluku province (e.g., 2019-2024 RPJMD, RENJA BPSKL Maluku-Papua 2019) • PPA outputs synergized with action plans in Lampung province (e.g., 2014-2023 RPHJP of Batulegi FMU, 2015-2019 RENSTRA DKP) <p>Peru:</p> <ul style="list-style-type: none"> • Facilitated multi-stakeholder fora to design action plans for tenure reform using PPA <p>Uganda:</p> <ul style="list-style-type: none"> • Endorsement of ACM by government • FSSD of MWE integrated ACM into second phase of government project • CIFOR invited to inform revision of the national participatory forestry guidelines • Supported registration of 6 community groups to obtain legal recognition • Enhanced women's participation in decision-making • Supported negotiation with NFA on land allocation • Groups established their own rules of engagement • NFA approved new CFM partnership • PPA helped identify actions to strengthen tenure security in future action plans
Practice Influence	<p>Global:</p> <ul style="list-style-type: none"> • Supported national and international networking and knowledge-sharing (e.g., South-South exchange) • Enhanced stakeholder engagement, coordination, advocacy, and empowerment on tenure issues • Stakeholder capacity-building in forest tenure reform and gender <p>Indonesia:</p> <ul style="list-style-type: none"> • FTA and partners (e.g., Lampung Mangrove Center, Samdhana Institute) built awareness-raising and capacities • Uptake of PPA in practice • Uptake of FTA guidelines <p>Nicaragua:</p> <ul style="list-style-type: none"> • Capacity-building in ACM and gender

	<ul style="list-style-type: none"> • Community monitoring of self-identified governance issues • Increased participation of women in land and forest governance • Two government champions advocating for women's leadership <p>Uganda:</p> <ul style="list-style-type: none"> • Capacity-building and uptake of ACM by communities • Enhanced interaction between stakeholders (e.g., horizontal and vertical linkages) • Increased participation of women in leadership positions and decision-making processes • Increase in women's land ownership and management • 279 people (54% women) (~1,311 individuals) in six community groups have increased participation in tenure governance <p>POTENTIAL</p> <ul style="list-style-type: none"> • 250 community members (~1,175 individuals) have increased capacity to participate in and lead forest user groups in Uganda
Research Influence	<ul style="list-style-type: none"> • Produced 158 outputs <ul style="list-style-type: none"> • 61 publications (articles, book chapters, working papers, briefs, etc.), 214 citations, 40,615 downloads • 31 tailored products (infographics, manuals, brochures, flyers, etc.), 57 citations, 30,077 downloads • 16 presentations (16,118 downloads, 4,347 views) • 31 blogs (22,267 views) • 15 videos (11,454 views) • Promotion of tenure-based forest management (e.g., World Bank's Land and Poverty Conference, FLARE Conference, IFAD's Global Call to Action for Indigenous and Community Land Rights, RRI Global Coalition, IASC, etc.) <p>Indonesia:</p> <ul style="list-style-type: none"> • Enhanced research capacities of local partners <p>Nicaragua:</p> <ul style="list-style-type: none"> • Enhanced research partnerships with local universities (e.g., BICU, URACCAN) • Built graduate student research capacities <p>Peru:</p> <ul style="list-style-type: none"> • Enhanced research capacities and career prospects of partners • Application in teaching • New research on tenure and ongoing collaborations with GIZ • FTA researchers invited to join expert committees on tenure
Impact	<p>Low-end estimate: 1,311 individuals directly and indirectly (of those, 279 people directly and 1,032 household members indirectly)</p> <p>High-end estimate: 1,175 individuals directly and indirectly benefit (of those, 250 people directly and 925 household members indirectly)</p>
Underlying Assumption	<ul style="list-style-type: none"> • Enhanced knowledge enables individuals to be better equipped to defend their rights and seek alternative equitable livelihood options

6.1.13. Forest-based Livelihoods (Global) Cluster Results:

To enhance forest contributions to poverty alleviation and livelihoods globally, FTA investigated and quantified the contribution of forest and environmental income from natural forests and other non-cultivated ecosystems and their role in different aspects of rural livelihoods across the developing tropics. There is strong evidence that Poverty Environment Network (PEN) was influential in research agenda on forests and poverty as a result of the design of the methods, the numbers of researchers involved, the geographic dispersal of the PEN partners, the profile of key investigators, and the outreach efforts of FTA (CIFOR). Partners and their field networks have enhanced research capacity, expertise on the topic, networks and career development opportunities via participation in FTA research activities and engagement opportunities. PEN partners used their data as a basis for graduate theses and journal articles. The research results received wide attention and increased the awareness on the critical role of environmental income in rural livelihoods and the costs of environmental degradation to poor people.

FTA's global dataset was shared with the extended PEN Network (a total of 16 partners) and made publicly available in October 2015 on the Dataverse site with 1,780 total aggregated downloads as of July 2021.

Download numbers indicate high levels of research uptake and possibilities for onward use, and several examples of publications resulting from this are provided.

The PEN Network was effective in reaching multilateral actors that provided the most influential pathways to influence. There is clear evidence that PEN is influencing the debate and discussion amongst key actors at the global level such as multi-lateral groups using PEN methods and findings to inform work, decisions and strategies (e.g., World Bank, UNEP, IFAD, FAO) and change in multi-lateral policy to acknowledge the contribution of forests to livelihoods (e.g., the importance of environmental income, the roles of men and women in forest-product use, and the function of forests as safety nets). By achieving influence on the World Bank's Living Standard Measurement Survey (LSMS), the importance of forests to rural livelihoods is better represented in global datasets. CIFOR's long-term engagement with key multilateral partners resulted in FAO's endorsement of PEN findings and further recommendation for standardised collection of data on forest contributions to livelihoods by National Statistics Offices in forest-rich developing countries.

There is indication that FTA supported and engaged national institutions in Indonesia and Tanzania (e.g., ministries and statistical bureaus) in the planning, implementation and analysis of pilot survey using FTA-PEN method. There is no line of sight between the PEN project and improvements in national policies. Hence, logically there is also no evidence yet of enhanced livelihoods outcomes. The time lags for eventually observing such changes are probably a decade at least.

Table 15. Forest-based Livelihoods (Global) Cluster: Key results of policy, practice, and research influence and impacts

Policy Influence	<ul style="list-style-type: none"> • Change in multi-lateral policy to acknowledge the contribution of forests to livelihoods • PEN's data on the role of forests in livelihoods informed policy and practice discussions, and made its way into some strategy and guidance documents • Multi-lateral groups use PEN methods and findings to inform work, decisions and strategies • World Bank request PEN researcher's contribution (e.g., two background papers) in preparation for the Paris Climate Summit in 2015 (UNFCCC COP21) • Influenced World Bank's Shock Waves report on climate change and poverty (potential for forests to serve as cushion for climate shock impacts on rural livelihoods)
Practice Influence	<ul style="list-style-type: none"> • FTA-PEN economic data influenced advancement of research agenda on environmental income for livelihoods • Clear evidence that PEN is influencing the debate and discussion amongst key actors at the global level; the linkage between these debates and effective policies and practices are still emerging. • The methods have been adapted for use by the World Bank's Living Standards Measurement Study (LSMS) and applied nationally in four countries • National stakeholders in Indonesia and Tanzania (e.g., bureau of statistics) adopt the new forestry survey module
Research Influence	<ul style="list-style-type: none"> • Produced 241 outputs (journal articles, books, book chapters, working papers & reports, conference, graduate research), 17,354 downloads, 1,841 citations <ul style="list-style-type: none"> • 1 tailored product (Dataverse data-sharing website) 1,780 downloads • Article published in World Development special issue (Angelsen et al. 2014) received 'Citation of Excellence Award' in 2017 from Emerald publishing. 400 citations (as of Feb 2019) • PEN influenced global research agenda on forests and poverty • Enhanced capacity and collaboration among PEN research partners and practitioners • Researchers uptake PEN dataset, methods, tools and findings to advance research agenda on socioeconomic contribution of forests to rural livelihoods • Knowledge networks and capacity developed through PEN provides the opportunity for future research
Impact	<ul style="list-style-type: none"> • Expected impact from this cluster is filling a strategic knowledge gap on the role of forest and environmental income in rural livelihoods for decision-making at national and international level
Underlying Assumptions	<ul style="list-style-type: none"> • A lack of knowledge about the role of forests and wild resources in rural incomes is constraining good policy and practice at all levels; • PEN investment in methods development, capacity building, research and dissemination will influence prevailing research agendas, paradigms, academic debates/discourse and practice, contributing to more and better research on forests and livelihoods; • PEN communication and engagement strategies are sufficient to reach key actors; • High quality results and findings about forests and livelihoods will influence key actors working in the sector and contribute to more effective policies and practice; and • Improved knowledge, policies and practices for forests and livelihoods contribute to better livelihood outcomes

6.1.14. Bioenergy (Global) Cluster Results:

Approximately half of the people living in developing countries traditionally rely on wood biomass for cooking. This contributes not only to environmental degradation, but also poses serious health hazards, especially for women and children. To address these threats, FTA adopted a landscape approach for integrated food and energy systems planning with native multifunctional crops (such as bamboo, macaúba, pongamia, simarouba and neem), and Transfer of Technology Models (TOTEMs) in support of the establishment and development of bioenergy value chains for increased employment opportunities and income, while reducing poor peoples' vulnerabilities to lost income and health risks. FTA informed several policy engagements, processes and documents on the sustainability aspects of agroforestry-based integrated food-energy systems that provide multiple benefits, including several bioenergy products (e.g., straight vegetable oil -SVO, biodiesel, biogas, briquettes) and valuable co-products (e.g., animal feed, organic fertilizers, biopesticides, biochar) that can provide local clean energy solutions, while boosting food production and income. As a result, FTA influenced national policies, stimulated institutional reforms within key sectors, and informed the design of new government programs in several countries.

Policy Influence

In Brazil, FTA established ongoing collaboration with MDA, the (former) Ministry of Agrarian Development and the Agrarian Development Secretariat of Ceará State by offering technical support to implement a regional plan for macaúba development. FTA and the Brazilian Agricultural Research Corporation (Embrapa) engaged with senior policy makers, representatives from international development organizations, private sector, and other stakeholders in discussions on the potential and challenges for the sustainable development of pro-poor biofuel models in Brazil and worldwide. An MOU signed between FTA and Embrapa opens up possibilities for collaboration on pro-poor bioenergy technology development between the two institutions, not just in Brazil but in other areas of mutual interest such as Central America, the Caribbean and Sub-Saharan Africa, building on the Brazilian experience. Brazil declared their intentions to scale up sustainable biofuel production and agroforestry systems as key components of their Intended Nationally Determined Contributions (INDCs).

In India, FTA and the University of Agricultural Sciences, Bangalore (UASB) demonstrated that production of biofuels (and other bioenergy products) from native oilseed trees within agroforestry systems is not only economically viable, but also has a positive social and environmental impact greater than traditional models based on monoculture of annual (and often food) crops raising the profile of agroforestry systems in generating savings and providing additional income for the poor among farmers and senior government officials. FTA research demonstrated that smallholder farmers adopting such agroforestry systems will experience an increase of 30% in annual income after five years (depending on the adopted distribution of trees) without reducing food yields. Additionally, biofuel production can also contribute positively to gender equality and women's empowerment, as women are traditionally more involved in collecting, trading and processing oilseeds than men. FTA engagements in policy dialogues, sharing of findings and lobbying have influenced the Minister of Agriculture (Government of Karnataka) uptake of FTA recommendation of growing oilseed trees to meet the local energy needs of the rural poor (2015). For instance, the Government of Karnataka and other partners, such as the National Bank for Agriculture and Rural Development (NABARD) and the Working Group on Biofuels at the Ministry of Petroleum and Natural Gas supported the scaling up of food-energy agroforestry models to Maharashtra and other states. FTA and key stakeholders co-organized forty events for knowledge-sharing and advocacy, ranging from local and national workshops to global high-level conferences. As a result, the government of India expressed intentions to scale up sustainable biofuels production and agroforestry systems as key components of their Intended Nationally Determined Contributions (INDCs). The successful collaboration with the government of India also influenced and informed the Nepalese government's draft a strategy to support new policies, investment plans and projects in the bioenergy sector, as well as interest in replicate FTA research at country level. Moreover, the Indonesian government requested FTA's technical support to scaling up sustainable bioenergy production at national level building on lessons and FTA science-based evidence from India.

In Ethiopia, Kenya and Uganda, FTA was a major contributor to the realization of a hugely untapped economic opportunity in East Africa's bamboo sector – known to have sub-Saharan Africa's largest natural bamboo forests and accounting for around 3-4 per cent of the world's total known bamboo coverage. Until FTA's intervention, these countries had been largely excluded from the international/export trade in bamboo. Successful uptake of FTA-developed national bamboo resource assessments influenced national policies, stimulated institutional reforms within key sectors, and informed the design of new government programs. For instance, Ethiopia included bamboo into the (1) National Development Strategy and Action Plan for 2019-2030 based on FTA evidence, the (2) Ethiopian Energy Policy (Ministry of Water and Energy) and (3) the National Policy on Growth and Transformation (Ministry of Agriculture). The latter further issued regulations for bamboo charcoal trade. The Ethiopian Environment, Forest and Climate Change Commission (EFCCC) has taken further efforts to design a national bamboo sub-sector strategy and action plan through an elaborated stakeholder consultation process with FTA financial and technical support. The strategy aims support the creation and/or strengthen direct income and complementary employment opportunities for about 500,000 green jobs, with an annual income increase of 10%, as well as create 100,000 new jobs in SMEs and large-scale industries by 2030. In Kenya, a co-developed National Bamboo Policy was enacted legalizing bamboo growing and exploitation for timber, biochar and other byproducts. As result of FTA's research, the policy now classifies bamboo as a grass allowing Kenyans to grow and harvest bamboo for both environmental conservation and value addition. To ensure that the use of bioenergy resources is optimized, the Ministry of Energy co-developed the Kenya Bioenergy Strategy 2020–2027 with FTA (ICRAF) and other partners (e.g., World Bank, and GIZ). The strategy will provide a road map for the country to manage and sustainably harness its bioenergy resources. With financial and technical support from FTA, Uganda's government developed and adopted a ten-year National Bamboo Strategy and Action Plan (see Box 2 below). The document's vision, goal, guiding principles, strategic objectives and strategies are all tailored towards achieving a viable and sustainable bamboo industry in Uganda with an estimated one million bamboo stakeholders across several districts (e.g., Mbale, Sironko, Kabale, Adjumani, Moyo, Rubanda, and Kisoro). FTA facilitated the participation of Ethiopian government at the UN Forum on Combating Climate Change (2011) and at the UNFCCC COP 18 (2012) where bamboo bioenergy was recognized by participants as high potential for impact. New policies and strategies set an enabling policy environment to attract private investment in a diversified bamboo value chain.

Box 3: Diversified Bamboo Value-chain in Uganda, a deep dive

In Uganda, natural stocks of bamboo have been constitutionally protected since 1995 (Article 245(b)). As most of the estimated 50,000 ha of bamboo are located in protected areas (mainly forest reserves and national parks), the government was mandated to manage these areas for sustainable development (Article 237(2)(b)). Sustainable management of bamboo resources have long been neglected even though they have been included in policy measures such as the 2003 National Forestry and Tree Planting Act enabling communities to include bamboo in the management plans for forest reserves and community forests. As bamboo has traditionally served as a vital NTFP and source of rural communities' livelihoods, poor management has depleted bamboo stocks and increased vulnerabilities for impoverishment. Until 2019, little attention was paid to the development, management, and trade of bamboo at scale, limiting the potential use of this untapped natural resource for economic, social, and environmental benefits for Ugandans.

Supporting the Policy Process

Research by the International Bamboo and Rattan Organization's (INBAR) Dutch-Sino-East Africa Bamboo Development Programme generated findings about the potential significance and contributions of bamboo to sustainable growth in Uganda. Drawing on a regional remote sensing assessment, a property test of indigenous bamboo species, value chain analyses, and training materials informed the development of a national-level ten-year strategy and action plan to increase bamboo stocks and support the development of a sustainable bamboo sector industry. INBAR's knowledge products, coupled with cross-learning visits, south-south knowledge transfer for capacity-building, and the development of a demonstration model caught the

interest of policy-makers for a dedicated national bamboo strategy. Starting in early 2019, INBAR engaged a wide range of stakeholders (e.g., Ministries of Agriculture, Industry, Energy, Water and Environment, the National Forest Authority (NFA), district administrations, development agencies, the Uganda Bamboo Association, and other actors within the private sector) in consultative processes to develop a strategy and action plan for bamboo industry development. A three-day regional workshop on bamboo strategy was held in Addis Ababa with participants from Ethiopia, Kenya, Uganda, and the Netherlands to foster regional collaboration, and exchange best practices in policy development, implementation, and trade. In September 2019, the strategy was approved and released by Uganda's Minister of State for Environment. The **2019-2029 Uganda National Bamboo Strategy and Action Plan** aims to ensure coordinated development of the bamboo industry to foster green economic development and increase the production of high-value products targeting domestic, regional, and international markets. The National Bamboo Strategy is aligned with Uganda's international obligations (e.g., the UN Sustainable Development Agenda) and cross-sectoral national policies and planning frameworks (e.g., Uganda Vision 2040, the Uganda Forestry Policy 2001, the National Forest Plan 2012, the National Land Use Policy 2013, and the National Energy Policy 2002).

Supporting Policy Implementation and Practice Change

In 2020, INBAR successfully raised funds for the second phase of the Dutch-Sino-East Africa Bamboo Development Programme to support policy implementation by leveraging Chinese and Dutch expertise in standardization, bamboo value-chain development, product design, and marketing. At the international level, by building the technical capacities of national standards agency staff and supporting the development of ISO standards and 14 technical manuals in the local language, Uganda became a participating member of the International Organization for Standardization's technical committee on bamboo and rattan (ISO/TC 296) to facilitate international trade of Uganda's bamboo and rattan products. At the national level, INBAR engaged over 1,600 stakeholders (e.g., senior government staff, ministry officials, research agencies, farmers, and entrepreneurs) in a national awareness campaign to sensitize and influence the development of a diversified bamboo industry. At the local level, by 2020, INBAR built the capacities of 44 trainers (55% women) in bamboo shoot preservation technology and 461 producers (23% women) in bamboo management and processing (e.g., bioenergy, machinery operation and maintenance, furniture-making, craft and jewelry, etc.) enabling local stakeholders to diversify income opportunities and move up in the bamboo value-chain. As a result, a model bamboo production and treatment centre (e.g., Friends of Bamboo Ltd, Moyo) and four model furniture and crafts micro-enterprises were established with INBAR's support, directly generating employment opportunities for 364 individuals (30% women). Additionally, INBAR supported SMEs' negotiations with buyers and traders in the value-chain and helped purchase and install machinery for processing bamboo jewelry, enabling a 600% increase in productivity for better livelihood opportunities and increased income.

Implications of the Policy

The National Bamboo Strategy and Action Plan targets 375,000 ha of degraded public and private lands to be planted with bamboo as contribution to Uganda's forest restoration target, requiring USD \$118 million in investments by 2030 to reach the target (MWE & INBAR, 2020). The net value of Uganda's bamboo trade at farm gate price is estimated to generate USD \$508.4 million in revenue. In the long-term (2025–2040), it is envisaged that an additional 230,000 ha of planted bamboo in public and private lands will contribute to the creation of 700,000 full-time jobs in diversified bamboo value-chains, increasing the natural stock from 54,533 ha to 505,000 ha (MWE & INBAR, 2020). With increased availability of bamboo stocks and a supportive policy environment, there is greater likelihood to scale bamboo solutions and technologies to increase employment opportunities and income from bamboo value-chains (e.g., bioenergy, furniture, crafts, jewelry, etc.). If successfully implemented, Uganda's National Bamboo Strategy and Action Plan are expected to promote a robust bamboo industry via new plantations, sustainable management of bamboo resources, the creation of green jobs, and value-addition.

In Ghana, FTA informed decision-making regarding the benefits of bamboo for sustainable development and green economies to improve rural livelihoods. Through FTA's policy dialogues, Ghanaian policymakers learned bamboo plantations' lower total carbon footprint (i.e., costs to human health, ecosystem, resource depletion, and global warming) for energy production from FTA pilots, resulting in adoption of bamboo-based charcoal into Ghana's National Renewable Energy Policy. The recognition of bamboo-based charcoal in the new policy legalizes its production, and further supports SMEs and producers' access to credit to enable scaling of production and trade. Additionally, the inclusion of bamboo in the Ghanaian Forest and Wildlife Policy gives smallholders legal assurance to invest in cultivation and use of bamboo charcoal and bamboo firewood for trade to support their livelihoods. Through several consultative engagements with experts and policy makers, FTA and the Forestry Commission of Ghana co-developed Ghana's Bamboo and Rattan Development Strategic Plan-2020-2024. The document guides the identification and management of natural bamboo stands as well as opportunities for plantation development, processing and utilization of bamboo and rattan to encourage bamboo sector activities at national level. FTA (INBAR), the Government of Ghana and other sector stakeholders also established a Bamboo and Rattan Development Programme (BARADEP). BARADEP now serves as the coordinating body for all bamboo sector activities and provides a legitimate national structure for sourcing external support for further development of the industry. BARADEP further influenced the Forestry Research Institute of Ghana (FORIG) to integrate bamboo components into their sustainable development programs. There is indication of governmental support (e.g., Ministries of Environment Science and Technology, Lands and Natural Resources, and Energy) for dissemination and replication of FTA-promoted bioenergy technology in Ghanaian Northern Savannah region.

In Madagascar, FTA and partner (IFAD-PROSPERER) organized eight regional policy consultation workshops resulting in the co-development of the Madagascar Bamboo Policy and Strategy which emphasizes bamboo for land restoration and industrial development for socio-economic development of the country. The policy document, endorsed by the Prime Minister Office in 2018, encourages public and private investments and call for development agencies to support the bamboo sector development in the country. The Ministry of Environment Ecology and Forests (MEEF) is playing a key role to further implement the policy and strategy.

In Tanzania, bamboo nursery and pilot plantations established by FTA influenced the Tanzania Forest Service interest to scale up bamboo plantations in three areas adjacent to FTA pilots (e.g., SAO Hill Plantation (Kibaha), Eastern Zone plantation, and Londo Plantation). In addition, Mbeya, Iringa and Kyela district councils will plant bamboo in water catchment areas for conservation and protection of drinking water. The Ministry for Agriculture, Natural Resources, Livestock and Fisheries is including bamboo into the Zanzibar Action plan 2030.

Regionally, FTA successful results across African countries leveraged further funding and collaborative commitment from partners and donors. Three follow up projects were initiated: (1) IFAD: Inter-Africa Bamboo Development Programme where Ethiopia is a beneficiary country (USD 2.5 million); and (2) CIDCA/MoFCOM Bamboo Bio-energy project for Ethiopia (USD 1.1 million). Under INBAR's Intra-Africa and SSTC grant, two regional level multi-stakeholder platforms were established. The Taskforce on Bamboo for Renewable Energy (TFB4RE), consisting of 21 experts from 12 countries, identified three working items for the development of three Voluntary Guideline Standards (VGS) on (1) bamboo charcoal, (2) design of charcoal kiln and (3) bamboo bio-energy commoditization. The Taskforce on Sustainable Bamboo Management (TFSBM), consisting of 30 experts from 15 countries, identified and accepted two working agendas for the development of two VGS namely (1) Step by Step Guide on the use of Bamboo for Forest Landscape Restoration (FLR) and (2) Guideline for certification of forest and planted bamboo. As a result of the regional engagement and FTA's close relationship with Ethiopian Environment, Forest and Climate Change Commission (EEFCCC) a 1000ha of bamboo forest was identified for FSC certification in Ethiopian Kafa Biosphere Reserve zone (Adiyo). The regional dialogue also influenced Malagasy government's' (e.g., Ministry of Environment, Ecology, and Forest) plans to establish a 50,000-hectare bamboo plantation as part of national restoration effort. FTA influence in both countries have the potential to create tree-planting job opportunities and rural income.

Practice Influence

FTA and NGO's partners engagements, sharing of findings and capacity development opportunities influenced the organization of bioenergy value chains by smallholders and SMEs across several countries.

In Brazil, most FTA activities are being conducted in experimental stations in the Northeast region with macaúba (*Acrocomia aculeata*), a palm species native to the tropical regions of the Americas. FTA supported the adoption of modernized processing technique for macaúba fruits by a local farmer association in Cariri. Dozens of farmers members of a local producer association (*Associação dos Moradores e Agricultores do Sítio Boa Esperança*) are benefitting from the processing equipment, developed by FTA and local partners, and distributed to them. Positive results have influenced State Government decision to co-invest (USD 100,000) in scale up macaúba processing in a new plant, and further develop a business plan to establish a community value chain. These value chains are expected to facilitate the integration of family farmers from the region into the National Biodiesel Production and Use Programme (PNPB) with biodiesel processing companies having procured the initial production. Once implemented, the regional plan for macaúba development and scaling up, being finalized in collaboration with MDA and Ceará State, is expected to reach over 500 farmers.

In India, FTA (ICRAF) promoted sustainable agroforestry models with multiple benefits, including the production of biofuels, while supporting smallholders to adopt the best systems and technologies available. Over 6,000 smallholder farmers in energy-poor villages were provided with quality plant material, processing equipment and technical assistance for growing native or locally-adapted oilseed trees, such as pongamia (*Millettia pinnata*), simarouba (*Simarouba glauca*), mahua (*Madhuca longifolia*), neem (*Azadirachta indica*), calophyllum (*Calophyllum inophyllum*). Most products resulting from seed collection and processing are consumed and marketed locally (e.g., Straight Vegetable oil -SVO, biodiesel and biogas are used mainly for running tractors, irrigation pumps and for cooking), while the seedcake is used, depending on the species and household preferences, as animal feed, organic fertilizer, biopesticide and/or catalyzer for biogas production. Positive results from experimental trials (e.g., 10-37% increase on biogas production, compared to cow dung conventional biogas systems) influenced five entire villages to adopt the system, replacing most (or all) of their consumption of firewood by biogas for cooking. The initiative was recognized by the Government of Karnataka, who declared them model "smokeless villages". Women in these villages now have on average three more hours per day available to productive or leisure activities, as the drudgery of biomass collection for fuel is no longer required. Health hazards have also been reduced, with beneficiaries reporting less eye irritation and breathing problems after adopting the cleaner cooking fuel. Such approach for biofuel production also contributed positively to gender equality and women's empowerment, as women are traditionally more often involved in collecting, trading and/or processing oilseeds than men in the Sarawada village, Bijapur district, Karnataka state. For instance, a group of 80 caste landless women who collect oilseeds were able to earn three to four times their daily earning. Over 10,000 beneficiaries, mostly poor smallholder farmers (and their households) benefited from additional income, access to clean energy products and other valuable co-products (e.g., organic fertilizers, biopesticides and animal feed solutions). In some cases, smallholder farmers experienced enhanced productivity of their regular food crops and livestock. It was found in FTA trials, for instance, that smallholder farmers adopting such agroforestry systems can have at least 10-30% annual income increase after five years (depending on the adopted distribution of trees), without negative impacts on food yields. Also, a potential revenue of over USD 300 could be derived from each ton of nuts that is processed into oil, seedcake for animal feed and fertilizer and sold at local market prices.

In Kenya, FTA (ICRAF) focused on the naturally abundant croton tree (*Croton megalocarpus*), traditionally planted on boundaries and marginal lands to provide firewood and shade. Until recently, its nut had no commercial value (since it is not edible) and in fact it largely remains a wasted natural resource. With FTA support, approximately 5,000 collectors in the central part of the country are currently engaged in croton collection and supply to a small social enterprise (e.g., EFK Group Ltd.) that produces liquid biofuel (SVO), organic fertilizers, poultry feed and biochar, among others, through an integrated manufacturing process based entirely on the nut of the croton tree. Preliminary studies indicate that the median additional income derived from

croton collection and sale was approximately KES 5,600 (USD 56) in 2016, with one third of the collectors being able to earn between KES 6,000 - 25,000 (USD 60-250) per year. This is significant in a country where half of the rural population lives below the poverty line, surviving on less than USD 200 annually per adult. For the poorest farmers surveyed, this additional income contributed up to 33-50% of their annual income. Most farmers (91% of the respondents) expressed interest and willingness to plant additional croton trees in their farms, even if current market prices for seedlings are increased significantly (e.g., doubled). Although the additional income derived from croton collection is already significant for collectors (typically representing 25% or more of their annual income), there is interest among farmers to move up the value chain through improvements on storage infrastructure or by engaging in nut processing activities.

Across several African countries, FTA supported the realization of the use of bamboo as a sustainable, renewable, clean-burning source of fuel. Through activities held at nurseries, Farmer Field Schools (FFS) and Common Production and Treatment Centers (CPTC) FTA raised awareness of bamboo as a sustainable and climate-smart alternative to wood and other fossil fuels for energy production influencing uptake in practice across **Cameroon, Ethiopia, Ghana, Kenya, Madagascar, Tanzania, Uganda**.

In partnership with national stakeholders, FTA implemented context appropriate communication strategies (i.e., market analysis, fairs, bamboo garden exhibitions, films, leaflets, piloting bamboo charcoal production, study tour, policy consultancy workshops, etc.), to raise awareness about the potential of bamboo products among key consumer groups (i.e., rural households, urban markets, public procurement sectors) in Ethiopia, Kenya and Uganda to influence uptake. FTA engaged with local partners (i.e., smallholder farmers, traders, private sector investors/industry, SMEs, women, technical agencies, research institutions, civil society organizations, organized groups, government agencies, etc.) and developed capacities on product development, improvement, processing, and technology to enable informed planning for the development of bamboo value chains. Local communities in Ethiopia, Kenya and Uganda adopted FTA findings to define priority products, optimal value-chain niches, and sustainable supply of resources required to produce the desired product and develop enhanced business cases for financing institutions' investments.

In Cameroon, Ghana, Kenya, Madagascar, Tanzania, and Uganda, where the bamboo sector is at an earlier stage of development, FTA established model community enterprises, to generate local revenue and incentivize bamboo resource development. Based on the limited quantity of quality bamboo planting material available in these countries, FTA supported the production of quality planting materials (QPM), large scale multiplication, management of mother nurseries and over all transfer of vegetative propagation technology to local communities. Approximately five thousand individuals learned about bamboo cultivation and management practices through FTA training. Participants were introduced to 13 exogenous bamboo species and learned techniques for the propagation of appropriate bamboo species for firewood and charcoal use through training and participation in activities held at nurseries. FTA supported the establishment 19 community nurseries in Ghana and Ethiopia for enhanced propagation and cultivar of bamboo species introduced by FTA. One local organization in Ethiopia (e.g., Bamboo Star Agroforestry) also established a QPM nursery to supply interested stakeholders with bamboo seedlings in Assosa district.

Several FTA projects in **Ethiopia, Ghana, Madagascar, and Tanzania** engaged local communities in diverse capacity-building activities where smallholders learned about bamboo's use for bioenergy and developed technical skills to become bamboo producers. Over 17,100 individuals learned about bamboo as a source for fodder, food, and biomass and developed planting and processing skills via participation in twenty-two farmer field schools and farmer training centers. As a result, 3,384 micro-nurseries were established by women households across Ethiopia, Madagascar, and Tanzania. Micro-scale nurseries are income-generating micro-enterprises in themselves with sales to development projects, government programmes, and farmers helping to meet large demand for planting material. Demonstration and sensitization training programmes on bamboo leaf harvesting and its use as feed and fodder for cows, goats, rabbits, mules and guinea pigs, were provided to benefit farmers and women. A total of 2,686 women adopted better management practices and are now able to

use bamboo plants for feed, fodder and biomass in Cameroon, Ghana, Ethiopia, and Madagascar reducing household expenses to procure those items

Positive results of bamboo plantation trials increased public awareness on the type of bamboo species appropriate for bioenergy production in target countries enabling farmers to acquire higher incomes. In Ghana, private commercial farmers and communities have established 74.5 ha of FTA-introduced bamboo species to support SMEs businesses sustainability and increase incomes over time. The installation of production materials (e.g., kilns, hand-held briquette making machine, grinder, etc.) and storage facilities with FTA support have helped community members to actively engage in the production and use of bamboo charcoal as a substitute to wood charcoal at community level.

FTA trained and supported local communities in Cameroon, Ethiopia, Ghana, Kenya, Madagascar, Tanzania, and Uganda to establish social enterprises with power-driven modernized charcoal briquette machines for increased incomes and employment opportunities. A total of 20 enterprises, such as Common Production and Treatment Center (CPTC) and micro enterprises, were established with machines, tools and equipment supplied from China and FTA technical support in these countries. In Cameroon and Ghana, the CPTC presents an innovative holistic model that assembles bamboo processing machines, incubates bamboo business ideas, provides learning space and facilitate skill development to enhance bamboo value chains. From the supply of bamboo material to primary processing to product development, these CPTCs offer a source of income for the beneficiary communities. For example, all FTA-trained youth (1,363 individuals) secured employment through 49 model enterprises after learning processing techniques and developing skills at CPTCs in Ethiopia, Tanzania and Madagascar. These individuals are engaged in the production of diverse items such as bamboo handicrafts, furniture, packaging, bamboo bins for composting, construction, bamboo fishing trap, bamboo beehives, and bamboo laminated products. Through FTA training, 5,072 women developed skills to produce high-quality bamboo-based charcoal for clean household energy.

In Ethiopia, where a bamboo industry already existed, FTA improved primary processing and quality of raw materials, as well as improved production management and adherence to quality control, and standard processes at factories. As a result of FTA technical guidance (e.g., production manuals) and enhanced access to construction and operation technologies for bamboo charcoal production (e.g., brick and metal kilns), bolstered by governmental support (e.g., Ethiopian Ministry of Water and Energy) to adapt such technologies to local contexts, farmers and SMEs had more technical support available to scale up adoption of enhanced processing techniques across Ethiopia and move up in the value chain. In Ethiopia, the participation in the bamboo value chain is becoming streamlined with various individuals and SMEs creating niches that are translating into industrial scale production of quality products. SMEs have increased their involvement in charcoal production, local transportation, distribution and trade. In Kenya and Uganda there are early signs of interest in the bamboo value chain indicating potential for increased availability for income-generating activities in the sector over time.

Participation of women in FTA activities in bamboo value chain development were limited due to deep-rooted patriarchal structures across African countries albeit with different layers of conservatism. Few women enterprises owned and managed by women were observed in Ethiopia, Ghana, Kenya, and Uganda. There was an observation (by external evaluators) that in Ethiopia women face difficult hurdles to participate in the bamboo value-chain owing to the structural and cultural context of the country. Despite difficulties, there were positive examples of women led and managed enterprises in Ethiopia (e.g., Ms. Kidist Alameyu enterprise). With INBAR's technical support, inclusive social enterprises were set up with communities to benefit women. For instance, the Ghanaian company (Global Bamboo Products Limited) trained some 400 people in alternative livelihood activities, and over 10,000 farmers in bamboo cultivation, management, and primary processing of bamboo and bamboo charcoal. In December 2019, this women-led company won a UNDP award grant (USD 26,000) to initiate sustainable bamboo charcoal development promotion and adoption for effective energy in line with SDG 7, for 24 months. In Tanzania, over 1,000 women bamboo charcoal briquette producers benefit from the increased value with annual revenue of USD 20,000.

In Ethiopia and Ghana, 4,000 individuals developed capacities in bamboo cultivation, carbonization, and briquette production and use, resulting in the production of 550 tons of bamboo charcoal and allowing more than 10,000 households to start using bamboo for fuel reducing household expenses to purchase wood. Residents of villages near the pilot communities in Ethiopia have adopted the technology, indicating that self-perpetuating value chains for bamboo charcoal are starting to take hold.

FTA facilitated the establishment of 216 SMEs in Ethiopia and Ghana. By 2013, 1,480 tons of bamboo charcoal had been produced by SMEs in both countries. SMEs have also taken up new technology for the production of enhanced energy saving stoves (e.g., metal kilns), resulting in a total of 426,400 stoves (374,400 in Ethiopia and 52,000 in Ghana) purchased for household use by 2014. For instance, a Ghanaian SMEs (e.g., Man and man Cook Stove) produces over two thousand energy saving stoves monthly to supply local market and export to Ivory Coast. At household level, there is evidence of uptake of energy saving stoves and use of bamboo for firewood and/or charcoal by 20,500 households in Ethiopia and Ghana.

SMEs were also influenced to further collaborate through the establishment of bamboo charcoal enterprise associations at the district and regional levels to further promote and support bamboo charcoal business sustainability and trade. FTA facilitated the establishment of seven primary associations (e.g., Ethiopia, Ghana, Kenya, Uganda), and the development of reliable supply chains for improved efficiency and trade to benefit 686 individuals (45% women). In Kenya and Uganda, producers' associations such as Bamboo Association of Kenya (BAK) and Uganda Bamboo Association (UBA) have enhanced institutional capacity through FTA's provision of equipment and technical advice. The associations now can generate revenue and cover their operational expenses by themselves and exert increased influence over the bamboo sector of their respective countries.

An enabling environment has been created for smallholders and private companies' partnerships in the bamboo subsector (match sticks, bamboo biomass and charcoal) in Ethiopia, Madagascar and Tanzania. Communities in these countries taken up FTA-promoted NGO-Community-Public-Private (NCP) approach and established three inclusive social enterprises (e.g., Bamboo and Briquetting Company Limited (WODGRA) in Mbeya Tanzania; Chalachew and Teamer Briquette Charcoal Enterprise at Bahir Dar Ethiopia; and Volo Tsangana Cooperative at Tongarivo in Madagascar) with co-financed, modernized charcoal briquette machines for production efficiency laying the foundation for upscale the value chain after FTA research. The NCP business units on charcoal briquetting units are generating monthly revenues of USD 1,500-2,000 in Ethiopia, USD 1,800-2,000 in Madagascar, and USD 2,500-3,000 in Tanzania. In Tongarivo, Madagascar a 25kWh pilot gasifier produces electricity from bamboo biomass and agri-waste, further enhancing the quality of life of 173 households in the community and opening several new opportunities for the rural poor through agro-industry and off-farm enterprise development. A similar gasifier of 35kWh (e.g., Toamasina CPTC) will further support rural livelihoods in Madagascar. FTA pilot results in Madagascar also influenced an Indonesian private company adoption of bamboo power plant which now provides 700kWh of reliable energy for 1,200 households in three remote villages offering opportunities for development of income-generation activities and enhanced livelihoods.

To support international trade, FTA built capacities of East African producers and national standards authorities to use and meet new bamboo products/processes technical guidelines developed by FTA and local partners. Fifty East Africans from standards authorities and larger SMEs learned through an FTA/MoFCOM training program regarding new technical guidelines for bamboo processing and products influencing practice change. As a result, Kenya and Uganda became members of ISO TC 296 in an effort to facilitate major bamboo product trade to EU. FTA facilitated East African bamboo companies to display their products and meet with investors and consumers at five trade forums at international, regional and national scales held in China, EU, Ethiopia, Kenya and Uganda to pave the way for future international trade.

There is indication of uptake of FTA research by private companies with potential to generate employment opportunities within the bamboo value chain. In Ethiopia, bamboo plantations will be scaled-up by the Amhara Forestry Enterprise and the Amhara Pulp and Paper factory based on FTA successful results. Additionally, through a signed MoU FTA will provide technical expertise to a BoARD (Amhara) project for planting 30 million bamboo seedlings with potential benefit to 4,800 households around Lake Tana region. In Madagascar,

two entrepreneurs expressed interest in establishing bamboo plantations for production of biomass and energy. Other private companies (e.g., DREF Itasy, Boeny, and Haute Matsiatra) have expressed interest to set up bamboo nurseries and undertake large-scale bamboo initiatives to address the rural energy crisis with potential to generate diversified employment opportunities across the country. In Tanzania, there is indication of governmental support to scale up bamboo nursery and plantations established by FTA (SAO Hill Plantation, Eastern Zone plantation, and Londo Plantation). Tanzania Forest Service (TFS) initiated the process of approvals for establishing a model CPTC for production of school furniture and bamboo furniture items in Kibaha region which will further contribute to increased employment opportunities in a diversified bamboo bioenergy value-chain. In addition, Mbeya, Iringa and Kyela district councils will undertake bamboo plantations in water catchment areas for conservation and protection of drinking water further contributing to rural livelihoods

The establishment of farmer groups and cooperatives for bamboo growing that are linked to primary processor cooperatives (primary processing and commoditization), and to industry and enterprises is expected to continue creating markets for farmers and flow of quality bamboo raw materials in the value chain. Having a robust pool of skilled and enthused stakeholders is likely to have lasting economic impacts. FTA activities contributed to the realization of poverty related outcomes (e.g., smallholders have increased employment opportunities with clear indications of increased engagement and income among beneficiaries) within the impact pathway for this cluster of activities. However, poverty related impact is yet to be observed empirically at scale as impacts are expected to be observed far downstream of end-of-program outcomes (e.g., develop the industrial and SME value chain). Resulting impacts in this cluster will take time to manifest and hinge on several assumptions and external factors.

Research Influence

FTA's research influence has broadened understanding of bioenergy potential to contribute to the energy-mix required for sustainable development and contribute to overcoming poverty, especially in rural areas. FTA contributed for the advancement of research agenda on integrated food and energy systems and bioenergy value chains (including gender issues) through participation in international conferences. FTA has a respected expert position internationally having results of FTA research in Kenya on croton nut potential for bioenergy provision featured on international media (e.g., BBC, CNN and The Guardian). Working relationships and research partnerships were strengthened with universities across South America, Africa, and Asia, including partnership with University of Agricultural Sciences, Bangalore (UASB) to improve rural livelihoods in 20 villages in India through adoption of efficient small-scale oil-producing machines designed and manufactured by UASB. TVET-CDACC agency in Kenya and Makerere University in Uganda have committed to develop academic curriculum on bamboo to further build capacity of researchers and practitioners. Government authorities in India, Botswana and Japan expressed interest in FTA research on improved non-toxic high yielding jatropha (*Jatropha curcas*) varieties with shorter maturation periods. The partnerships also provided 52 graduate students with applied research-to-practice opportunities related to integrated food and energy systems and bioenergy value chains and enhanced their research skills to prepare them for future careers as researchers or practitioners.

Table 16. Bioenergy (Global) Cluster Results: Key results of policy, practice, and research influence and impacts

Policy Influence	<p>Brazil:</p> <ul style="list-style-type: none"> • Declared intentions to scale up sustainable biofuels production and agroforestry systems as key components of INDCs • Enhanced collaboration for the sustainable development of pro-poor biofuel models in Brazil and worldwide <p>Ethiopia:</p> <ul style="list-style-type: none"> • Included bamboo into <ol style="list-style-type: none"> (1) National Development Strategy and Action Plan for 2019-2030 (2) Ethiopian Energy Policy (3) National Policy on Growth and Transformation including regulations for bamboo charcoal trade <p>Ghana:</p> <ul style="list-style-type: none"> • Adopted bamboo-based charcoal into its national Renewable Energy Policy • Included bamboo in the Forest and Wildlife Policy • Forestry Commission adopted Ghana's Bamboo and Rattan Development Strategic Plan- 2020-2024 • BARADEP established for enhanced multi-stakeholder collaboration on the bamboo sector development
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	<ul style="list-style-type: none"> • Forestry Research Institute of Ghana (FORIG) integrated bamboo into sustainable development programs <p>India:</p> <ul style="list-style-type: none"> • Government of Karnataka supports growing oilseed trees to meet the local energy needs of the rural poor <ul style="list-style-type: none"> • NABARD and the Working Group on Biofuels at the Ministry of Petroleum and Natural Gas supported the scaling up of food-energy agroforestry models into Maharashtra and other states • Declared intentions to scale up sustainable biofuel production and agroforestry systems for INDCs <p>Kenya:</p> <ul style="list-style-type: none"> • Enacted National Bamboo Policy legalizing bamboo growing and exploitation for timber, biochar, and other by-products • Kenya Bioenergy Strategy 2020–2027 provide a national road map sustainable use of bioenergy resources <p>Madagascar:</p> <ul style="list-style-type: none"> • Madagascar Bamboo Policy and Strategy emphasizes bamboo for land restoration and industrial development for national socio-economic development <p>Tanzania:</p> <ul style="list-style-type: none"> • Ministry for Agriculture, Natural Resources, Livestock and Fisheries express intentions to include bamboo into the Zanzibar Action plan 2030 <p>Uganda:</p> <ul style="list-style-type: none"> • Adopted a ten-year National Bamboo Strategy and Action Plan (Ministry of Water and Environment) <p>Across the region:</p> <ul style="list-style-type: none"> • Enhanced multi-stakeholder collaboration for bamboo sustainable management (TFSBM) and the development of bamboo for renewable energy (TFB4RE)
Practice Influence	<p>Across the region:</p> <ul style="list-style-type: none"> • 2,686 households (~10,744 individuals) in Cameroon, Ghana, Ethiopia, and Madagascar reduced household expenses adopting bamboo plants for feed, fodder and biomass • 3,384 household (~13,536 individuals) micro-nurseries established in Ethiopia, Madagascar and Tanzania • 1,363 youth (~5,452 individuals) secured employment through 49 model enterprises in Ethiopia, Tanzania and Madagascar • 4,000 individuals (~16,000 individuals) benefit from bamboo charcoal value chains in Ethiopia and Ghana • 686 individuals (~2,744 individuals) benefit from participation in bioenergy value chains through SMEs associations in Ethiopia, Ghana, Kenya, Uganda • 1,200 rural households (~4,800 individuals) have reliable energy with bamboo power plant in Indonesia • Communities establish 20 charcoal social enterprises in Cameroon, Ethiopia, Ghana, Kenya, Madagascar, Tanzania, and Uganda • Women-led social enterprises established in Ethiopia, Ghana, Kenya, and Uganda • Communities establish 216 SMEs in Ethiopia and Ghana • SMEs uptake technology for energy-saving stoves (>426,000 sold in Ethiopia and Ghana) • Smallholders establish 7 associations in Ethiopia, Ghana, Kenya, Uganda supporting bioenergy value chains <p>Brazil</p> <ul style="list-style-type: none"> • 1 CBO upscale macaúba (<i>Acrocomia aculeata</i>) value chain <p>Cameroon:</p> <ul style="list-style-type: none"> • Households adopt enhanced management practices in integrated food-energy systems • CBOs support equitable & sustainable bioenergy production <p>Ethiopia</p> <ul style="list-style-type: none"> • Smallholders adopt high-quality germplasm in community nurseries • Households adopt enhanced management practices in integrated food-energy systems • SMEs diversify production, develop and improve industrial bioenergy value chains for women and youth • Inclusive social enterprises (NCP model) established <p>Ghana</p> <ul style="list-style-type: none"> • Smallholders adopt high-quality germplasm in community nurseries • Households adopt enhanced management practices in integrated food-energy systems • CBOs support equitable & sustainable bioenergy production • SMEs diversify production, develop and improve industrial bioenergy value chains for women and youth <p>India</p> <ul style="list-style-type: none"> • 5 villages (Karnataka state) adopted biogas for cooking in replacement of firewood to benefit women and children • 80 scheduled caste landless women (~384 individuals) generate increased income oilseed value chain in India • 10,000 households (~48,000 individuals) benefited from additional income, access to clean energy products and

	<p>other valuable co-products</p> <p>Kenya</p> <ul style="list-style-type: none"> • 5,000 croton collectors engaged in the bioenergy value chain • CBOs support equitable & sustainable bioenergy production, create/upscale value chains • ISO TC 296 membership facilitate bamboo products trade to EU • 5,000 croton collectors (~19,500 individuals) have increased income from biofuel value chains <p>Madagascar</p> <ul style="list-style-type: none"> • Households adopt enhanced management practices in integrated food-energy systems • SMEs diversify production, develop and improve industrial bioenergy value chains for women and youth • Inclusive social enterprises (NCPP model) established • 173 rural households (~813 individuals) have reliable energy with bamboo gasifier <p>Tanzania</p> <ul style="list-style-type: none"> • SMEs diversify production, develop and improve industrial bioenergy value chains to benefit women • Inclusive social enterprises (NCPP model) established • Indication of government support to upscale bamboo nursery plantations and adoption of CPTC model for value chain development • 1,000 women (~4,900 individuals) benefit from increased value captured from bamboo charcoal briquette <p>Uganda</p> <ul style="list-style-type: none"> • SMEs diversify production, develop and improve industrial bioenergy value chains for women and youth • CBOs support equitable & sustainable bioenergy production, create/upscale value chains • ISO TC 296 membership facilitate bamboo products trade to EU <p><u>POTENTIAL</u></p> <ul style="list-style-type: none"> • 500 farmers (~1,650 individuals) benefit from macaúba value chains in Brazil • 6,000 farmers (~28,800 individuals) received high-quality planting material of native or locally adapted oilseed trees in India • 5 villages in Karnataka, India, have enhanced livelihoods (availability of productive hours and decrease in health issues) in smokeless villages • 10,000 households (~40,000 individuals) use bamboo for fuel in Ethiopia and Ghana • 5,000 individuals (~20,000 individuals) built capacities on bamboo cultivation and community nurseries in Cameroon, Ghana, Kenya, Madagascar, Tanzania, and Uganda • 17,100 individuals (~68,400 individuals) enhanced capacities for bamboo planting and use for bioenergy in Ethiopia, Ghana, Madagascar, and Tanzania • 5,072 women (~20,288 individuals) developed skills to produce high-quality bamboo-based charcoal for clean household energy in Cameroon and Ghana • 400 individuals (~1,400 individuals) trained in alternative livelihood activities by SMEs in Ghana • 10,000 farmers (~35,000 individuals) trained in bamboo cultivation, management, and primary processing of bamboo and bamboo charcoal by SMEs in Ghana • BoARD (Amhara) project interest in adopting bamboo planting to benefit 4,800 households (~22,080 individuals) around Lake Tana region in Ethiopia • Potential to benefit 500,000 individuals with green jobs (~2,300,000 individuals) from policy change in Ethiopia • Potential to benefit 100,000 individuals (~460,000 individuals) with employment opportunities in SMEs and large-scale bamboo industry from policy change in Ethiopia • Potential to benefit 700,000 individuals with full-time jobs (~3,290,000 individuals) in a diversified bamboo value-chain from policy enacted (National Bamboo Strategy and Action Plan) in Uganda
Research Influence	<ul style="list-style-type: none"> • 21 publications (18 peer-reviewed papers published in scientific journals, 2 book chapters, graduate theses) • 21 conference contributions • 8 tailored products (including policy briefs, a corporate strategy) • Built graduate student's research capacity • FTA (ICRAF) and Institute for Advanced Sustainability Studies (IASS) engaged regional experts to advance research agenda on Biomass and Energy crops • Government authorities in India, Botswana and Japan express interest in FTA research on improved non-toxic high yielding jatropha (<i>Jatropha curcas</i>) varieties with shorter maturation periods • Enhanced collaboration with Higher Institute of Environmental Science (HIES), University of Dschang, National Forest Development Support Agency (ANAFOR), and FODER to advance research agenda on agroforestry and bamboo propagation • Ongoing collaboration with Wageningen University for the development of bamboo composite from waste arising out of industrial processing

	<p>Brazil</p> <ul style="list-style-type: none"> • Ongoing collaboration with Instituto Federal de Educação, Ciência e Tecnologia do Ceará -IFCE • Built under-graduate student research capacities <p>Ethiopia</p> <ul style="list-style-type: none"> • Ongoing collaboration with Ethiopian Institute of Agricultural Research (EIAR); Kwame Nkrumah University of Science and Technology on bamboo leaves as fodder for animal <p>India</p> <ul style="list-style-type: none"> • Strengthened partnership with several universities and research institutions (e.g., University of Agricultural Sciences –Bangalore (UASB); Karnataka State Biofuel Development Board (KSBDDB); Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV) university in Akola; Maharashtra, and the Jawaharlal Nehru Agricultural University (JNKVV) in Jabalpur; Madhya Pradesh State) • FTA (ICRAF) collaboration with University of Agricultural Sciences, Bangalore (UASB) aim to improve rural livelihoods in 20 villages <p>Kenya</p> <ul style="list-style-type: none"> • FTA research on croton nut potential for bioenergy provision featured on international media • TVET-CDACC agency committed to develop bamboo curriculum <p>Madagascar</p> <ul style="list-style-type: none"> • Enhanced collaboration with the Centre for Rural Development and Applied Research, Madagascar (FIFAMANOR) <p>Uganda</p> <ul style="list-style-type: none"> • Makerere University in Uganda committed to develop bamboo curriculum
Impact	<p>Low-end estimate: 126,873 individuals directly and indirectly (of those, 29,572 people directly and 97,301 household members indirectly)</p> <p>High-end estimate: 6,287,618 individuals directly and indirectly [potential double counting] (of those, 1,358,872 people directly and 4,928,746 household members indirectly)</p>
Underlying Assumptions	<ul style="list-style-type: none"> • Assumes farmers/smallholders have property or land tenure secure • Smallholders/farmers plant all received trees and seedlings in their own farms • Assumes perfect adoption and scaling of agroforestry systems and other practices promoted by the project to sustain/increase production over the years • Smallholders/farmers adopt management practices learned in training • Selected priority species for AFS have high market potential • Smallholders/farmers learn and adopt recommended flexible and context-specific marketing strategies • Product prices remain attractive, with risk mitigated by diversification of products

6.2 Discussion of Outcomes Achieved Per Actor Group

FTA influenced governments (e.g., national, subnational, and local) through the provision of evidence-based data, support to establishment of multi-stakeholder fora for better decision making, and provision of guidance and recommendations for policy revision, enactment, and implementation in varied contexts. Some examples include PFES mechanisms at subnational and national level (e.g., China, Indonesia, Philippines, Vietnam), financial incentives for adoption of agroforestry practices (e.g., Vietnam), revision of policy frameworks to enable use of priority species (e.g., Kenya), support to forest-dependent communities' access to natural resources through rights-based mechanisms such as land-tenure and community forests (e.g., Peru, Uganda), and co-development of national agroforestry policies and strategies (e.g., India, Rwanda), among others. Such policy influence has potential to support farmers' adoption of agroforestry at scale. Impact estimates rely on the effective implementation of FTA-influenced policies, strategies, and action plans at multiple levels. For example, while National Agroforestry Policies have the potential to stimulate wider adoption of FTA solutions and recommendations to benefit thousands of people in a country, further efforts to effectively implement such policies at sub-national and local levels are needed to support the realization of poverty-related outcomes over time.

Influence on NGOs, partners, and allies was achieved through the provision of evidence-based data, supporting enhanced advocacy for policy and practice change, and wider dissemination of tree planting and enhanced management practices to communities. It was not always clear if NGO partners have integrated FTA solutions and innovations in other non-FTA funded activities. Moreover, it was unclear if NGOs leveraged funds to

maintain FTA-informed activities post-project, in particular for the provision of capacity-building opportunities and/or extension services to producers and smallholders to support the adoption of FTA innovations at scale.

FTA also achieved influence in CBOs via enhanced local stakeholders' capacity to formalize, access inputs, processing timber and produce for value addition, participate in tree- and agroforestry-based income-generating activities, and development of pro-poor and equitable value chain models. With increased capacity, most of the farmers organizations improved the quality of services delivered to their members such as improving agroforestry produce storage, linkages with input suppliers and markets, and insurance services. Formalization can enable poor and forest-dependent communities to add value to their products (i.e., accessing credit for processing machinery), potentially increasing household income. However, strategies for group buying and selling (via cooperatives, associations) presented variable levels of success across contexts. There is scope for multi-stakeholder support to offset initial capital investments for CBOs.

FTA's influence on practitioners' practices (e.g., extension agents) was achieved through capacity-building on co-created, climate-smart, and context-appropriate seed management and agroforestry systems. Developing and targeting knowledge products to enhance practitioners' extension services to farmers and producers was also successful in several countries (i.e., Burkina Faso, Colombia, Ethiopia, India, Indonesia, Kenya, Mali, Malawi, Niger, Tanzania, Uganda, Vietnam, and Zambia). In some projects, it was observed that adequate and frequent provision of extension services increased the likelihood of adoption of FTA's solutions and positive yield outcomes (e.g., FTA trials). However, the provision of ongoing extension services to farmers by local stakeholders was found to be relatively weak, mainly due to external factors such as limited availability of human resources. Provision of adequate, on-going, and long-term extension services is a critical condition for the realization of FTA-influenced outcomes, such as the actual adoption of agroforestry systems and management practices by all FTA-reached smallholders and beyond. Farmer-to-farmer extension was a cost-effective and successful approach to support adoption and productivity in some FTA projects. There is scope for enhanced participation of women in extension and collaboration with private and voluntary extension institutions to increase the availability of extension services to farmers and producers at local level.

FTA's influence on smallholders/farmer practices was achieved through the introduction of resilient and context-adapted species, the implementation of demonstration trials, support to seed system infrastructure, nursery establishment, and building capacities for participatory management of communities' natural resources and smallholders' on-farm practices, which enhanced capacities for uptake of FTA innovations and improved practices at the local level. However, guaranteeing communities' adoption of agroforestry practices at scale (for timber, fruit-tree, and NTFP production) is not straightforward. Poor farmers are more vulnerable to shocks and have narrower economic margins, which prevent them from investing in long-term economic returns as they must prioritize immediate food security and other household expenses. The provision of adequate and on-going extension services to smallholders and communities in the long-term is a critical condition for the realization of high-end impact estimates, whereby promoted agroforestry systems and management practices are actually adopted by farmers on-the-ground. FTA's interventions to encourage technology adoption, sustainable land use and natural resource management, and practice change focused on demonstrating increased yields and productivity, as well as potential returns from trees and agroforestry-based production and value-addition in the long-term. Agroforestry systems require upfront investment costs to establish, maintain, and manage effectively. For poor farmers, these high costs are not economically viable in the short-term and can potentially generate net losses in the first few years. Time lags, uncertain tenure security, unclear availability of long-term extension services for optimal production, and under-developed market linkages present additional obstacles to adoption. Successful adoption of agroforestry practices at scale has been observed in several African countries with adoption of fast-growing woody species (e.g., bamboo) for fodder and household bioenergy production (earlier or lag-free returns) and nutri-gardens in India.

Influence on private sector was achieved through provision of evidence-based data informing the revision of international commitments to support more equitable business practices (e.g., RSPO), and technical guidance for implementation of certification and incentive schemes (e.g., Cameroon, Ghana, Indonesia, Philippines, Nepal, Vietnam). In the evidence sources consulted, it was not clear if certification schemes have translated in SMEs' better access to markets or if these actors have acquired higher revenues than they would obtain on informal markets as a contribution for the realization of poverty-related outcomes at scale. FTA also achieved influence in individuals and communities' business practices by building capacities for SMEs establishment, processing and diversification of production, and/or enhanced market links for pro-poor value chains. Sustainable demand for legal timber, NTFPs and agroforestry products, and effective implementation of equitable institutional arrangements may present obstacles for the sustainability of FTA-established SMEs.

FTA's influence on donors supported additional funding for new or follow-up projects. In some cases, this helped bring more alignment, continuity, and sustainability to FTA's interventions and integration of FTA's approaches and solutions into projects in other regions. For example, building on FTA's successful approach on Rewards for Environmental Services (RES) in Indonesia, 18% (6 out of 33) of new IFAD Asia projects in 2013 integrated RES in their strategies. Since then, several development projects (e.g., CIDA, FAO, DIDA, UNDP-GEF, ADB) adopted FTA-developed RES model and applied it in other regions across Indonesia, the Philippines and Vietnam.

FTA achieved influence via the research pathway by building capacities of researchers and advancing the global research agenda on forests and poverty. FTA engaged researchers to develop new methods to better assess the importance of forests and trees for livelihoods and household income, concluding that forests function as a safety net for poor and forest-dependent communities during economic downturns, and can be a direct pathway out of poverty. FTA successfully informed the research decisions and strategies of multi-lateral actors (e.g., World Bank, UNEP, IFAD, FAO) to better acknowledge the contribution of forests to livelihoods.

Overall, we assessed that FTA contributed to outcomes for all actor groups within Challenge 4, with varied levels of success across geographies. The pathway for impact in poverty-related indicators is long and complex, thus a holistic approach should be used in future research. For example, while the achievement of right-based outcomes (e.g., secure access to land and forest resources) is a first step for forest-dependent poor to have increased means to exit poverty, the effectiveness of tenure reform to change poverty status relies on other enabling conditions (e.g., access to inputs, extension services, markets, etc.) to reduce risk of failure. Similarly, while market levers such as certification of timber products may help producers to improve productivity, reach dedicated markets, and fetch higher prices for its products, there was no robust evidence that certification has contributed to increased profits and income. Several projects demonstrated that with training and extension, the adoption of agroforestry practices can lead to increased and diversified yields, food security, and household income for improved livelihoods. However, further research is needed to fully understand and address barriers for adoption at scale.

In the following section we present impact estimation for each cluster of work under Challenge 4. The section that follows concludes with lessons for future research on poverty alleviation and resilience and MELIA.

6.3 Impact Estimation

FTA made notable contributions to awareness-raising, policy, and practice change, as well as research over the past ten years in an effort to reduce poverty and enhance resilience through sustainable livelihoods. This assessment illustrates how FTA's contributions to outcomes have already resulted in realized impacts on-the-ground in Africa, Asia, and Latin America and are likely to catalyze further impacts in the future. Table 17 presents the aggregated impact estimates of the number of people with enhanced means to exit poverty influenced by FTA for all clusters under Challenge 4.

Table 17. Estimations of total impact for Challenge 4

Cluster	Low-end estimate Impact Estimates	High-end estimate Impact Estimates
<i>FLEGT (Congo Basin)</i>	(Not possible to derive)	300,000 people
<i>Timber Markets (Central Africa)</i>	(Not possible to derive)	(Not possible to derive)
<i>Diversification of Agroforestry-based Income (Sub-Saharan Africa)</i>	446,418 people directly 1,382,513 people indirectly Total: 1,828,931 people	1,099,976 people directly 3,479,784 people indirectly Total: 4,579,760 people
<i>Sustainable Forest Enterprises (Cameroon)</i>	503 people directly 2,113 people indirectly Total: 2,616 people	1,955 people directly 8,211 people indirectly Total: 10,166 people
<i>Agroforestry Concessions (Peru)</i>	33 people directly 92 people indirectly Total: 125 people	123,700 people directly 317,157 people indirectly Total: 440,857 people
<i>Forestry and Tree Value Chains (Latin America)</i>	380 people directly 1,444 people indirectly Total: 1,824 people	45,500 people directly 127,400 people indirectly Total: 172,900 people
<i>Gender and Oil Palm Issues (Indonesia)</i>	(Not possible to derive)	(Not possible to derive)
<i>Furniture Value Chains (Indonesia)</i>	6,120 people directly 18,360 people indirectly Total: 24,480 people	1,500,000 people directly and indirectly
<i>Diversification of Agroforestry-based Income (Asia)</i>	200,893 people directly 626,311 people indirectly Total: 827,204 people	664,567 people directly 2,731,763 people indirectly Total: 3,396,330 people
<i>Payment for Environmental Services (Asia)</i>	595,149 people directly 1,670,416 people indirectly Total: 2,265,565 people	(Not possible to derive) ¹¹
<i>Climate-resilient Livelihoods (Asia)</i>	668 people directly 1,968 people indirectly Total: 2,636 people	(Not possible to derive) ¹¹
<i>Tenure Mechanisms (Global)</i>	279 people directly 1,032 people indirectly Total: 1,311 people	250 people directly 925 people indirectly Total: 1,175 people
<i>Forest-based Livelihoods (Global)</i>	(Not possible to derive)	(Not possible to derive)
<i>Bioenergy (Global)</i>	29,572 people directly 97,301 people indirectly Total: 126,873 people	1,358,872 people directly 4,928,746 people indirectly Total: 6,287,618 people
Total	1,280,015 people directly 3,801,551 people indirectly Total: 5,081,566 people	5,690,637 people directly 13,266,370 people indirectly Total: 18,957,007 people¹²

Based on these global estimates, FTA contributed to supporting between **5.1 million** (low-end estimate, rounded) and **19 million people** (high-end estimate, rounded) with additional means to exit poverty and reduce their vulnerability as a result of policy mechanisms, participation in market value chains, and changes in on-the-ground agricultural practices. While there is potential that FTA could meet the target of 19 million people with additional means to exit poverty or increased resilience in the future (i.e., if all conditions/impact assumptions are met), FTA fell vastly short of actually achieving its fourth end-of-program targets laid out in the Phase II proposal (FTA, 2016) at the time the program concluded.

¹¹ Low-end estimates added in total high-end potential impact

¹² Total high-end potential estimated impact includes low-end estimates for Payment for Environmental Services (Asia) and Climate-resilient Livelihoods (Asia) clusters

The majority of FTA's impact contributions were localized in Africa and Asia. In Africa, FTA contributed with increased means to exit poverty or with reduced potential to fall into poverty through adoption or diversification of tree- and/or agroforestry-based income of a range of nearly 1.9 million to 11.1 million of people, in particular in Malawi via practice pathway and Ethiopia and Uganda via practice and policy pathway. In Asia, FTA contribution to poverty alleviation range from 3.2 million and 7.2 million people with increased means to exit poverty or with reduced potential to fall into poverty, in particular in Indonesia and Vietnam through policy pathway and India through practice pathway. In Latin America, FTA had the weakest contribution supporting a range from 1.9 thousand to 615.4 thousand of people through policy pathway in particular in Peru and Guatemala.

The realization of impacts relies on several conditions, including the effective enforcement of policies, the full adoption and implementation of new practices, the scaling of initiatives, and continuity of collective action post-project and post-FTA. While FTA holds a credible position as an independent producer of scientific knowledge that is useful to inform governance decisions and actions to enhance tree-based livelihoods, formalize markets and commodity value chains, and reduce vulnerabilities, FTA is one contributor among many organizations that aim to address this complex challenge. Impact estimates are also sensitive to a number of key assumptions that vary on the basis of the research initiative, contextual factors in which the research is taking place (e.g., geography), and specific contributions of the research, including the notion that research outputs are relevant, appropriately translated for the target audience, adapted to fit the needs of boundary partners, and positioned for use. For example, research projects based in countries in which FTA is well-established, where key scientists have connections to decision-makers, and where decision-makers are interested in and actively looking for evidence-based information and guidance, had a higher likelihood for impact achievement. There are also limits to FTA's influence. The relative control and influence of a program declines as it progresses from its intervention (sphere of control) to its impact (sphere of interest) as more contextual and external influences become prevalent. This exercise attempted to trace specific program contributions to intended impacts across intervening geographies to specify how and where FTA made contributions to reduce poverty and enhance resilience through sustainable livelihoods.

6.4 Assumptions

There are a number of key assumptions underpinning FTA's contribution to livelihoods globally. Table 18 aims to answer the evaluation questions: *What key assumptions are required to estimate the impact?*; *were the ToC assumptions valid?*; and *how sensitive is the estimation (of impact) to varied assumptions?* by assessing these assumptions and their potential effect on the realization of future impact for addressing rural poverty and vulnerabilities.

Table 18. Assessment of Assumptions for Challenge 4

Assumption	Assessment
FTA holds a credible position in the academic and research-for-development realms, and is therefore able to exert influence over the way research agendas and policies advance	Sustained. Numerous evidence sources documented stakeholders' perceptions and testimonies of FTA and its partner research institutions as credible source of information on topics related rural development issues and a trusted partner. FTA researchers' positions as experts allowed for greater access to relevant fora to build relationships with stakeholders (e.g., policy-makers, partner organizations, NGO advocates, local research institutions, etc.) and share findings, which supported the uptake and use of outputs to advance research agendas and stimulate evidence-based decision-making and policy-making.
The policies to which the research contributed are effectively implemented and enforced to reach intended targets (i.e., policy changes are sufficient to influence practice change and support smallholder's access to natural resources, financial inputs and co-financing	Sustained (dependent on geography and country context). FTA demonstrated varying degrees of successful policy influence targeted at rural development, forest management, climate change and renewable energy. FTA has the greatest policy influence in African and Asian countries (e.g., Cameroon, Ghana, Kenya, Uganda, India, Indonesia, Vietnam, etc.). FTA also appears to have had greater success at influencing sub-national policy processes and their implementation; though there were also notable contributions to national policies. There was extensive evidence to link FTA's involvement in the noted policy processes, though it was not always clear what FTA's exact knowledge contributions were to all policies and whether those inputs had sufficient bearing to claim the associated policy impact targets. FTA often held a convening role to facilitate multi-stakeholder and participatory policy dialogue and decision-making; likely stakeholders' changes in

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

schemes that enables access to income-generating opportunities)	attitude and uptake of FTA knowledge were a subtle part of the learning and engagement process, making it difficult to draw direct connections to explicit changes in policy. Moreover, many external factors exert influence within the policy sphere, including political will, global events, and market pressures, among others, or effective implementation and enforcement. Some of the policies that FTA helped co-develop have been enacted in the last couple of years with unclear pathway for its implementation. Some policies have indications of implementation, though these will need to be continuously monitored over time.
NGOs, partners, and organizations with sustainability objectives are actively seeking out evidence to support their campaigns and programs to continue to work with policy-makers, communities, and the private sector in efforts to enhance women and marginalized groups' participation in natural resources governance frameworks and adoption and scale up of pro-poor agroforestry and management practices	Sustained. Evidence shows that key stakeholders are actively seeking out evidence-based information to support their work, many relying on research produced by FTA. This applied most strongly for actors campaigning for sustainably- and ethically-sourced timber and NTFP. FTA supported local and international NGOs, farmers and producer organizations, and partner organizations by filling knowledge gaps and providing targeted information in accessible and fit-for-purpose formats to ensure the uptake and use of findings. FTA also helped equip these actors through dialogues, events, and training workshops to ensure they had the knowledge and skills to utilize, share, and leverage FTA's research through their networks and exert influence on other stakeholders. There were also some examples of NGOs and partner organizations that continue to support capacity-building, policy influence, pilot activities, and scaling of innovations post-project in the contexts where FTA intervened. Some of FTA's partners continue to champion the work and maintain momentum for adoption of FTA innovations and agroforestry management practices in other regions at local level.
The public is aware and informed of possible ways to support top-down and bottom-up equitable and sustainable market and value-chains, and is actively demanding change at policy, practice, and individual levels	Partially sustained. FTA target the public through various knowledge-sharing strategies, such as making outputs publicly accessible (e.g., via brochures, newspapers, blogs, websites, YouTube videos, etc.) and by promoting FTA knowledge via national media outlets like television and radio (e.g., FLEGT Congo Basin and Bioenergy clusters) to influence public awareness of sustainability issues. There was some success in increasing awareness of value-chain members (e.g., urban sellers) for sourcing raw materials of legal origin as well as influencing communities for adoption of technologies for more sustainable livelihoods.
Large companies uphold commitments to climate action and international certification standards as a result of policy, market pressures, and consumer demand	Partially sustained (dependent upon geography and country context). Evidence shows commitments in Indonesia by large companies to comply with international certifications such as RSPO are underway. Evidence within the FLEGT cluster suggests that the practice of large companies in Cameroon is expected to eventually change to adhere to recent policy change for domestic timber markets as well as increased international market demand for legally-sourced timber; though current evidence of this change is limited and too early to observe.
Smallholders and SMEs gain access to natural and financial resources (i.e., tenure, PFES, etc.) via enabling policies that reduce barriers, and these groups are better equipped to comply with sustainability requirements, change practices, and access to financial inputs & markets	Sustained. FTA engaged smallholders and SMEs across various contexts to build understanding of policy mechanisms; provide opportunities to voice community needs in policy processes; equip communities with knowledge and skills for self-governance and more sustainable practices for natural resources management; and support tenure processes. Current evidence indicates that progress on enabling policies had been made for smallholders in Latin America (via AFCs in Peru, community forest concessions in Guatemala), Africa (via forest tenure schemes in Uganda, CFE in Cameroon), and Asia (via PFES in Vietnam, RES and social forestry schemes in Indonesia, reward schemes in the Philippines). Some of FTA's efforts to enhance opportunities for smallholders via policy are still in progress (e.g., India, Indonesia, Rwanda, Uganda) or yet to be realized (e.g., Ethiopia, Ghana, Kenya). The policies that were most successful built in benefits and incentives to attract and encourage compliance (i.e., PFES, tenure, market access, etc.).
All individuals of relevant actor groups who receive training from FTA interventions, either directly or from FTA-supported training programmes, benefit and obtain new knowledge, skills, and relationships as a	Partially sustained. Capacity-building is a key strategy within FTA's work rural poverty and resilience to influence changes across multiple impact pathways. By providing new knowledge and training on context-appropriate agroforestry systems, management practices, processing techniques, participatory governance, and business, FTA equipped multiple levels of governments, practitioners and NGOs, communities and CBOs, farmers and producer groups, companies, and researchers to make better informed decisions, uptake of FTA's innovations, and change practices. Training and capacity-building engagements also served to enhance FTA's relationships with different stakeholder groups. Training that involved multiple stakeholder groups also created opportunities

result, and are motivated and capable of leveraging and applying these in their work	for participants to build connections with other stakeholders. A considerable number of smallholders that has enhanced capacities to adopt FTA's innovations and solutions are yet to change their practices. Some NGOs and local governments have taken over the capacity-building role to continue momentum and scaling post-project.
Evidence sources containing impact estimates (i.e., targets, achieved impacts, potential impacts) consulted in the review are valid, accurate, credibly-derived, and reliable	Partially sustained. We continuously interrogated the impact estimates found in our review to test the plausibility of FTA's contributions to the reported impacts. It was necessary to query the corresponding evidence supporting the estimates to classify each impact estimate as either an impact target, impact that has been achieved to date, or impact that has potential to be achieved in the future. This enabled the evaluators to determine the likelihood that FTA contributed to the realization of the impact in question and produce more realistic low- and high-end potential estimates. However, we acknowledge that the impact ranges still reflect considerable margins of error as projects' reporting on impacts was often vague, not transparent (i.e., lacking explanation of the methods used to derive impact estimates or where reported numbers were procured), not quantifiable, and not always scientifically-derived. In some cases, these factors led the evaluators to doubt the accuracy of reported impacts and whether numbers reflected double-counting.

7. Conclusions

Over the course of ten years, FTA clearly contributed to diverse changes in knowledge, attitudes, skills, relationships, and behaviours through diverse impact pathways to support the realization of impacts on-the-ground and increase the likelihood for further impacts in the future. Table 1 lists achieved policy and practice influence and shows the extent to which FTA's intended end-of-program outcomes were realized across Africa, Asia, and Latin America through concentrated efforts on poverty alleviation and increased resilience.

Within Challenge 4 mapped projects, FTA fell short in the first end-of-program outcome target, contributing to several policies, strategies, action plans and governance arrangements at multiple levels (i.e., international, regional, national, sub-national and local) to support poverty alleviation and increased resilience across 20 countries. FTA's technical inputs, data and tools, evidence-based recommendations, and involvement in working groups supported context-appropriate decision-making, improved governance mechanisms, and strengthened institutional capacities for policy revision, enactment and implementation to contribute to poverty alleviation and resilience outcomes.

FTA exceeded the second end-of-program outcome target, contributing to the establishment of over 650 SMEs across Africa and Asia. FTA also influenced the formalization of over 1,500 farmer/producer cooperatives/associations mainly in Africa to support knowledge-sharing, capacity-building and market of agroforestry produce. Moreover, FTA contributed with establishment of market links among input providers, financial institutions, and private companies supporting the establishment of over 170 agroforestry-based value chains via farmer-trader partnerships in Africa and Asia. FTA influenced private companies' uptake of technology for rural energy production, climate-smart technology for more sustainable household bioenergy consumption, and investments in pro-poor value chains and climate-change related incentive frameworks. At the international level, FTA influenced practice change in at least 6 multinational companies and is expected to influence several others through private sector certification bodies (e.g., RSPO) for more equitable and sustainable business models.

FTA also fell short in the third end-of project outcome target to equip public and private sector actors to deliver more effective extension and pedagogical services to support poverty alleviation and increased resilience. Through capacity-building and technical support in 19 countries, FTA supported the establishment of several community nurseries, thousands of micro-nurseries at household level, close to 250 community agroforestry-seed banks and over 500 farmer demonstration trials and exemplar landscapes to enhance practice and extension delivery.

FTA did not meet the fourth end-of-program outcome through projects mapped to Challenge 4. Evidence suggests that FTA influenced 1,280,015 smallholders and other users' uptake of tree planting, agroforestry and/or enhanced management practices, or to access means to exit poverty such as tenure-security and direct participation in tree- and agroforestry based value chains contributing to an estimated total of 5,081,566 people (directly and indirectly) with additional means to exit poverty or reduced vulnerability of falling into poverty

across 22 countries. Through capacity-building activities and policy targets, there is potential for a total of 5,690,637 smallholders and other users' adoption of tree planting, agroforestry and or participation in tree-based value chains to benefit approximately 18,957,000 individuals directly and indirectly. This evaluative process uncovered unique challenges in assessing the contributions and impacts of a decade-long program; provided opportunities to test novel ways to assess collective research efforts (i.e., composite and nested ToCs); and procured new insights on how research contributes to and influences change processes to address complex, inter-related societal issues. Such learning informed a set of lessons for the design and implementation of change-making research on poverty, livelihoods, and resilience, as well as lessons to improve future MELIA practices of similar research-for-development projects and programmes.

7.1 Lessons Learned and Recommendations

Lessons Learned on Research on Forest- and Agroforestry-based Livelihoods and Resilience

This exercise also provided the opportunity to assess how research addressing poverty contributed to sustained outcomes and impacts and highlighted a series of lessons learned. Through FTA's research initiatives across Africa, Asia and Latin America, there is growing recognition of and interest in agroforestry for livelihoods and increased household income. FTA's research identified actors who would benefit directly and indirectly from its engagement activities and research outputs and encouraged these actors to participate in dialogue and decision-making processes, thereby supporting ownership over outputs and change processes. In a number of projects, FTA was particularly strong in engaging marginalized actors who would not normally have a voice in governance decision-making or participation in income generating activities (e.g., women and youth). FTA acted as a knowledge broker, trusted partner, and capacity-builder to contribute to intended outcomes. Valuable insights in what works well have been presented via the main impact pathways highlighted in Challenge 4.

Government Pathway:

- Contributing to international, national, and sub-national policies is a predominant means by which FTA contributes to alleviate poverty and reduce forest-proximate communities, farmers and producers' vulnerabilities to loss of means for income and livelihoods. Many of the other impact pathways intersect with and are influenced by cross-sector policy change to support poverty alleviation outcomes.
- Providing policy-makers with knowledge and training through collaborative processes was effective for sensitize local governments regarding local communities' needs and strengthened the capacities to implement sustainable change. Engaging policy-makers and decision-makers in multi-stakeholder dialogues fostered common understanding, co-generation of recommendations, and coalition-building. Ongoing support through training increased the likelihood for policy change and uptake of outputs. It was important to engage policy-makers at multiple levels to support policy alignment.
- Research projects led by scientists with established positive relationships with policy-makers were more likely to contribute to policy outcomes. Positive pre-existing relationships supported knowledge-sharing and trust in research outputs to support their uptake and use within sub-national and national policy.
- Aligning research on rural poverty and vulnerability issues with cross-sector environmental focused issues raised the profile of forest and trees' contributions to rural livelihoods and resilience to climate change, and supported the uptake of research outputs by policy-makers in cross-sectoral environmental and rural development political agenda.
- Policy outcomes rely on continuous promotion and use of research outputs by institutions and decision-makers to influence legislations and regulations for effective natural resources management. FTA supported this through ongoing institutional and individual relationships with government actors and departments, some of which were stronger in some geographies than in others.
- Supporting social process contributions are equally or more important than knowledge contributions for policy development and implementation. Projects and research initiatives that supported social processes (e.g., systems-thinking, more equitable/multi-perspective decision-making, collaborative problem-solving

and solution development, coordination, capacity-building, implementation processes, etc.) were more effective at sustaining momentum for policy change.

Donors/Investors Pathway

- FTA's influence on donors supported additional funding for new or follow-up projects. In some cases, this helped bring more alignment, continuity, and sustainability to FTA's interventions and integration of FTA's approaches and solutions into projects in other regions. There is scope for enhanced collaboration among projects within the same geographic region to support scaling.
- There is scope to more actively involve national and local financial institutions to reduce risks and support adoption and scaling of FTA solutions by smallholders and communities.

NGO and Allies Pathway

- Influencing NGOs was a reinforcing pathway to stimulate changes in other pathways, particularly governmental decision-making, private sector practice, smallholder and producers' practice.

Practitioner Pathway

- FTA did succeed in influencing practitioners' knowledge and practices. Knowledge-sharing on novel agroforestry systems and training were common strategies used to equip and influence practitioners for better adoption of agroforestry and enhanced management practices. Changes in practitioners' practices had onward effects for both private sector and farmer practices.
- Provision of continual extension services to farmers was relatively weak. Adequate and frequent provision of extension services increased the likelihood of adoption of FTA solutions and positive yield outcomes.
- Increasing women participation in extension activities holds high potential to strengthen women's role in communities and increase agroforestry adoption rate and productivity. However, extension activities and targeted knowledge products should consider local women's cultural context, interests, and needs.
- Farm size and household composition and economic status should be considered by policy-makers, researchers, and extension providers for the co-development of enhanced extension services. Size of land parcels and higher on- and off-farm incomes significantly influenced farmers' decision-making processes regarding adoption of FTA solutions.
- There is scope for increased collaboration between forestry, agricultural and fishery extension agents to support provision of agroforestry extension services to farmers. Partnerships with private and voluntary extension institutions can also increase the availability of extension services to farmers and producers at local level.

Community-based Organizations Pathway

- Community engagement, participatory activities, and presenting knowledge in ways that are appropriate for the target audience increased the utility of the research process and FTA's outputs for smallholders and communities to build understanding and apply learning in their local context.
- Short-term projects experienced more challenges in achieving behaviour change at community level. Investments in relationship-building and community buy-in are key, and communities need to be equipped to manage their natural resources post-project.
- Enhanced and transparent dialogue between communities and local governments enabled all parties to identify mutual benefits and shared understanding, while limiting conflicts over natural resources access and use for the development of social-forestry.

- FTA activities and outputs should consider communities' expectations and needs to support successful establishment of community-led business enterprises. There is scope for leveraging multi-stakeholder support to off-set initial capital investments for SMEs establishment.
- Increased engagement of communities and local government facilitated the development of social-forestry models providing communities with forest-management rights.

Smallholders and Producers Pathway

- Farmers' engagement, participatory activities, and presenting knowledge in ways that are appropriate for the target audience increased the utility of the research process and FTA's outputs for smallholders and communities to build understanding and apply learning in their local context. Farmer demonstration trials, participatory activities, and group discussions supported changes in farmers' attitude, learning, development of technical skills and facilitated collective action to influence other impact pathways.
- Ability of individual farmers to adopt FTA solutions and enhanced management practices is greatly influenced by land-ownership security, farm size, household socio-economic characteristics (e.g., education, access to extension services, membership in farmer groups, on-farm and off-farm income, awareness of government policies, etc.), and knowledge of and potential for accessing markets.
- Very poor farmers prioritize food security and the ability to increase household income in the short term rather than realizing economic benefits after long-term implementation of tree planting activities.
- Availability of disposable income from on- and off-farm activities increases the likelihood of farmer's uptake of timber and fruit-trees planting and management practices. Hence, subsidies and other long-term cross-sectoral financial incentives should be integrated in tree-planting designs to effectively support benefit-sharing and contribute to poverty alleviation outcomes.
- Accesses to on-going extension services, farmer groups, and knowledge of government policies increases the likelihood of adoption of silvicultural practices by smallholders. However, uptake is also influenced by the size of land managed per farmer or household and availability of land for growing timber and fruit-tree species.
- Farmer-to-farmer knowledge sharing was a successful approach to disseminate FTA technologies, support agroforestry adoption and productivity where governmental extension services were limited. There is scope for increased participation of women in knowledge sharing and provision of extension services at local level.
- Farmers' proximity to forest resources increases the likelihood of adoption of sustainable management practices.
- Agroforestry options and preferred tree/crop species are mostly driven by culture and market price. Therefore, participatory selection of suitable options for local communities and market support play an important role in scaling up agroforestry across geographies.
- Fruit tree-crop diversification trials have demonstrated potential to reduce farmers risks from market price fluctuations in agriculture commodities. However, sustainable market links for fruit produce needs to be developed.
- Baseline data on livelihoods and income levels before FTA research intervention along with a tracking and reporting system on beneficiary's income are paramount for future assessments of poverty-related outcomes.

Gender and Youth

- Women, men, and youth have different needs, abilities, and interests in handling natural resources. Tree establishment and management plans should integrate culturally specific aspects of adopting market-based agroforestry including differential preferences according to gender and age.

- Increased participation of women in policy dialogues, extension activities and training are more likely to occur when those activities are located close to areas where women normally go within their local communities.
- Women were more likely to access extension knowledge and information on markets via participation in well managed farmers' learning groups.
- Participation of women in FTA's activities enhanced their knowledge and confidence, and in some cases influencing their ability to lead community-based business enterprises.
- In cultures where patriarchal land ownership systems occur, women are more likely to benefit from agroforestry value chains in activities such as plant multiplication, low-technology processing, bio-energy production for household consumption and crafts. Hence, further multi-stakeholder support is needed to influence equitable benefit-sharing.
- Integration of technological tools for forest and farm management have positively influenced youth attitudes and participation in FTA activities.

SMEs and Markets Pathway

- Participatory market appraisals and market training facilitated the development of farmer-trader value-chains and farmers' enterprises linked to the chains.
- Partnership-based extension strategies linking production, processing and marketing increases the likelihood of sustainability of pro-poor value chains.
- Very poor farmers face challenges to participate in marketing strategies through aggregation (e.g., cooperatives) due to immediate income needs to cover household expenses in the short-term limiting their abilities to realize higher cash income from products. Hence, alternative business strategies should be adopted to support poor farmers establishing links with local markets.
- Developing integrated crop-trees value chains is an effective approach to increase the likelihood of farmers capture value from their products in the short- and long-term. However, enhanced and long-term silvicultural extension is needed to support adoption of management practices that result in higher productivity and profitability from such integrated systems.
- Cross sectoral political-legal and regulatory frameworks (e.g., permits for timber extraction and wood processing) are cumbersome in many countries and transaction costs often prohibitive for communities and poor-smallholders reducing the likelihood of adoption of certification schemes and the sustainability of timber-based enterprises.
- Baseline data on livelihoods and income levels of SMEs members before FTA research intervention along with a tracking and reporting system on SMEs' revenue and changes in SMEs' members income are paramount for future assessments of SMEs contributions to poverty-related outcomes at household level.

Private Sector Pathway

- Influence on private sector policy and practice was achieved in diverse sectors (e.g., oil palm, timber, and bioenergy). Some successful private sector change was often influenced by changes in other pathways, such as international commitments, national policy, or contracts with governments.
- Capacity-building in processing techniques and business management supported outcomes for SMEs development. However, lack of sustainable demand for products, limited human resources, and benefit sharing among members influenced the sustainability of some SMEs.

Public Pathway

- The public pathway was relatively weak. In few projects, targeted dissemination through local and national media, sensitization campaigns, and NGO advocacy garnered public attention on specific issues on sustainability and markets. Changes in consumer's behaviour may take time to realize and is conditioned to external and contextual factors. There may be more scope to leverage the public to influence change in other pathways.

7.2 Challenges to Overcome and Recommendations for Enhanced MELIA

The assessment of Challenge 4 provides opportunities for FTA and its research centres to reflect on and consider how to optimize MELIA to more strategically align the program and future research initiatives to more effectively address complex challenges. These challenges include:

- I. Inconsistencies in monitoring, evaluation, and impact reporting.** Varying levels of details in project documentation and data presented a challenge for the evaluation team to categorize projects to one or more of the five challenges, as well as identify projects with promising indications of outcomes and impacts. This made the categorization, selection, and assessment processes highly time-consuming and inefficient. Project selection was in part driven by the availability of project documentation, so it is possible that key FTA research efforts to address rural poverty and vulnerabilities may have been overlooked or omitted. These inconsistencies are further confounded by the differences between centres' systems and databases. For example, some centres have systematic and robust databases while others are less advanced and developed. In addition, the ways in which project reports and/or evaluations document evidence of outcomes and impacts are inconsistent. This is further reflected into the Managing Agricultural Research for Learning and Outcomes (MARLO) database (i.e., the database built for CRPs and where projects are referenced for FTA), which acts a repository but does not provide a consistent or specific format to report outcomes. Therefore, the evaluators needed to delve deeply into available project reporting and piece together supporting evidence from conversations with researchers or external sources. This difficulty was also particularly apparent in reporting for multi-country projects and programs, where reported evidence is often not disaggregated by study sites, let alone by country. This made the review and analysis of available evidence an arduous task and introduced difficulties in the testing of ToC logic and potential to misinterpret or misattribute evidence. Few evaluation reports and/or project documents quantify or estimate impacts in terms of the five challenges or the SLO targets. Often reporting focuses on documenting project activities and outputs, rather than contributions to outcomes, impacts, or other changes in the wider system (i.e., results-based reporting).
- II. Inconsistencies in the use of monitoring, evaluation, and impact terms.** There are inconsistent conceptualizations and uses of evaluation terminology across centres and projects. For example, the terms 'output', 'outcome', and 'impact' vary in reporting, which added to the time requirements of the document review. These keywords could not simply be searched and pulled from reports; the review involved much closer reading, review, and translation of content into the appropriate concept categories. Obtaining conceptual clarity of evaluation terminology within the evaluation team was also challenging. Fortunately, prior experience and distinct definitions were shared and established amongst the team to ensure common understanding and consistent application of these components throughout the evaluation.
- III. Diffusion of topics and geographies of research and engagement signals a lack of coherence in FTA's program strategy to address complex global challenges.** Building on discussions from the 2020 FTA Science Conference, many of FTA's research projects in fact are Type I projects that aim to address Type III 'wicked' problems (i.e., the five challenges)¹³. While FTA centres, partners, and researchers

¹³ All Type III problems can be broken down into several smaller Type I pieces, each tackling one or a few disciplinary foci with targeted and precise research questions. Individually, these pieces cannot address Type III problems, but collectively there may be some overlap with potential to bring the pieces together. This is precisely the role and function of a programmatic approach; to a great extent,

believe they are doing transdisciplinary research and make such claims in proposals and final reporting, this may not be the case in practice. Siloes often remain or attempts at transdisciplinary approaches fall short – both can be driven by internal or external factors. Moreover, research efforts are diffuse across geographies and topics. These are clearly missed opportunities, as many of the topics and geographies in which FTA operates are closely aligned and overlap in terms of the actors and external processes that FTA engages. Where new projects could leverage pre-existing personal and institutional relationships established by researchers within their own centre, other FTA centres, or FTA partners, too often many begin the process from zero. Overlooking these networks also overlooks the valuable institutional memory of the relationships and former engagements in those contexts, which can be a source of valuable learning and efficiency for new research initiatives as well as serve to reinforce and strengthen existing relationships. Moreover, research efforts inconsistently build on one another, affecting FTA's capacities to meaningfully and strategically address complex problems in a given country and/or region. Such diffuse contributions are insufficient to support the type of transformative change that FTA aims to realize. In part, this is a result of inconsistent and intermittent use of ToC across centres and projects, and likely an artefact of the diffusion and lack of coherence inherent to how centres have responded to bilateral donor demands. Effective, centrally-coordinated information management systems are critical to facilitate integration and coherence. Often the strengths that the ToC tool can provide for more strategic interventions (e.g., building shared understanding, negotiation, communication, consensus-building, adaptive project management, etc.) are not leveraged, and in many cases some impact pathways are likely to hold up and demonstrate greater potential than others. Effective integration mechanisms are required to ensure that research programs aiming to address complex Type III problems reach their full potential for influence within the scope of short-term project cycles. Therefore, research-for-development programmes need to clearly and explicitly link strategies and goals at both project and program scales.

IV. Setting targets for projects helps ground intended influence and impact, and makes researchers build impact into project design. Many of FTA's projects did not set or document impact targets (e.g., proposal stage, end-of-project reporting stage), making the evaluation and estimation of FTA's impacts on poverty alleviation challenging. One reason that might explain this is that projects' MELIA activities were often designed to fulfill proposal or final reporting requests from the respective project donor¹⁴; some donors require projects to set targets and report against them, while others do not. Many projects that did not set targets did not report impacts either, and were likely unable to do so. It can be daunting for researchers to lay claim to potential impact at the proposal stage (particularly when funding and other resources remain unclear), only to be held accountable to original (possibly overly ambitious) targets at project-end. More explicit documentation of impact targets, particularly as part of the ToC, requires researchers to be more realistic with the targets they set and also more intentional in how they design and implement projects to reach those targets.

Recommendations for MELIA

Based on the identified challenges described in the limitations section, the evaluators formulated recommendations to enhance MELIA, which can strengthen the design, monitoring, adaptive management, and learning, as well as reporting and final evaluation of future projects.

such integrative studies are a way by which the program tries to bring together multiple Type I answers to a Type III question. However, more efforts are needed for transdisciplinary research approaches, multi-pronged and multi-dimensional approaches, and integration. One of the outcomes of the integrative studies includes the lessons learned in terms of gaps in the (Type III) ToC that should trigger new research foci and initiatives going forward.

¹⁴ Donors are often an omitted stakeholder group from ToC processes (both at project- and program-level). Hence, FTA and its research centres missed opportunities to consider what donors could learn (i.e., in the research topic, study context, change processes, etc.), encourage donors to be explicit about their own agenda and mental models of how change happens, and strategize how the project or program could influence change in donors' priorities and practices.

- I. Aim for consistent documentation of projects and influence across centres.** A common theme throughout this exercise, and an identified bottleneck, was the need for a well-functioning, results-based data management system to support documentation, monitoring, and reporting and collate information in ways to support MELIA processes. Project (and program) management and MELIA would be much more efficient and effective with a common database structure for researchers and project managers to document, manage, track, and monitor project progress on ToC components (e.g., activities, outputs, outcomes, and impacts), and other relevant indicators¹⁵ (e.g., study locations, partners, stakeholder networks, stakeholders, gender and youth¹⁶, bibliometrics, altmetrics, etc.). The ability to document and link ToC components to observed changes is powerful for reporting, valuable to determine influence, and key to learning how change does or does not happen in different contexts (e.g., drawing connections between project activities or specific outputs to the realization of intended outcomes and impacts). Such a system would also serve to assist in the presentation of achievements and results to donors in a consistent and credible way. Having either a common program-level or similarly structured systems for each centre could help ensure consistent and relevant documentation, facilitate reporting, as well as assist inter-centre alignment between initiatives. In joint research programs like CRP FTA, MELIA teams should liaise with each other to ensure that documentation procedures are consistent across centres. In addition, we recommend MELIA be embedded into the research process from the outset. Too often, MELIA is relegated to the end-of-project phase. In many of the projects mapped to Challenge 4, final reporting gave the impression that MELIA was a box-ticking exercise and an afterthought. We recommend project managers seek support from their centre's respective MELIA teams from the beginning to support project design, ToC documentation, and proposal development during the inception phase. MELIA experts can also be involved during the course of a project to document progress, support adaptive management (e.g., ToC revision), and begin to collect MELIA evidence. The systematic collection of MELIA data along the entire project lifespan enhances the accuracy and comprehensiveness of measured results compared to an ex-post assessment and would be more cost-efficient. Yet, the up-front resource investment and the lack of a well-developed database management system are clear constraints at both the centre- and program-level. We recommend research centres integrate research and MELIA teams together. This could be done in different ways, such as providing a dedicated MELIA point person or team for each project to support such tasks throughout the project cycle and/or investing in researchers' MELIA capacity-building. Researchers and partners will need training, administrative support, and time to develop new skills to fully engage in more and better MELIA. Appropriate organizational structures will need to be built, as well. For example, more mechanisms for reflection and reflexivity would be beneficial to build on learning (i.e., what worked and why, learning from failure¹⁷, problem-solving for persistent challenges, risks and trade-offs, etc.). These need to be formal structured processes that inform research as well as institutional practice (i.e., embedded into transitions between programmatic phases/stage-gating).
- II. Strive for consistency in the application of monitoring and evaluation concepts.** We suggest the following definitions for terminology be adopted by FTA and across centres, and recommend enhanced capacity-building for FTA researchers on the use and implementation of these concepts for project planning, monitoring, and reporting:

¹⁵ A set of appropriate indicators could be co-identified with researchers, project managers, MELIA, donors, and other relevant stakeholders (e.g., longstanding government and NGO partners).

¹⁶ It is also recommended to collect disaggregated MELIA data on gender and youth promotion in projects where appropriate, in order to satisfy donors' interest in the centres' performance in these fields (in some projects, this data was not collected, though the evaluation team assumes this would have been both possible and promising).

¹⁷ Using failures as constructive and accountable learning; rather than hold researchers accountable to failed initiatives, research centres should hold researchers accountable to learning from those failures.

- a. “Outputs: The products, goods, and services of the research and the research process (i.e., knowledge, fora, and processes generated by the activities).
- b. Outcomes: Changes in knowledge, attitudes, skills, and relationships manifested as changes in behaviour.
- c. Impacts: Changes in flow (e.g., higher annual income, increased water discharge from a river) or state (e.g., socio-economic status, water quality in a reservoir), resulting wholly or in part from a chain of events to which the research has contributed.” (Belcher, Davel, & Claus, 2020, p.9)

III. Use of nested ToCs can support challenge-centric program and strategy design, including identifying targets for research projects and programs. Researchers and program managers should fully utilize ToC as a core element of strategic project planning and adaptive management. How FTA aims to contribute to complex social problems should guide program strategy, design, and implementation. There is a need for nested ToCs – with cross-comparability at the organizational level – for the program, its research portfolios, and the individual projects that fall within them. FTA did attempt to do this with the FPs during Phase II, but lacked program-wide implementation. A robust overarching ToC for each of the challenges that FTA aims to address would be a useful tool to guide strategic program design and management, and align centre and partner efforts in overlapping geographies and research topics to maximize intended contributions to outcomes, impacts, and SLO targets. Collaboratively developing ToCs for research projects would also build shared understanding, co-generation, and design research for impact. Target-setting encourages researchers to aspire for big impact through their research projects, but also guides researchers to set reasonable and feasible impact targets. More explicit target-setting and documentation makes it easier for researchers, project coordinators and managers, and MELIA to attract funding and report progress back to donors. Project-level impact targets should also align with program-level targets for impact and be reported on consistently in projects’ midterm and final reports. Projects that were guided by a ToC and/or set impact targets at inception were more successful at realizing outcomes, meeting targets, and realizing impacts on-the-ground. It is paramount that when quantifications of progress on targets or realized are reported, the method by which they were derived and their connection with project influence are clearly articulated with discussion of limitations and caveats to the results. Theory-based evaluation offers the opportunity for both summative and formative assessment, and can facilitate both continuous learning and accountability to intended outcomes and impact targets. ToC can also support and highlight opportunities for investment in long-term partnerships that continue to sustain themselves across projects. Future research-for-development programmes should be guided by the value offer of purpose-driven central coordination for impact, which can be informed by explicit and well-developed nested ToC. This holds great potential for sustaining funding and upholding commitments to a culture of learning. Furthermore, impact assessments of strategically designed research initiatives and innovations that ultimately aim to support livelihoods can help build a strong case for uptake and scaling, as the benefits of adoption are robustly measured and tested in different contexts.

8. References

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Appendix 1. Challenge 4 Cluster-level ToC Models¹⁸ and Narratives

Table 19. Cluster: FLEGT (Congo Basin)

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Governing Multifunctional Landscapes (GML) in Sub-Saharan Africa: Managing Trade-Offs between Social and Ecological Impacts	CIFOR ICRAF	2017-2021	USD 11,074,500	Cameroon, Ghana, Liberia, Democratic Republic of Congo, Gabon, Sierra Leone, Tanzania
Appui technique au Ministère des Forêts et de la Faune pour l'opérationnalisation de la page web et la collecte de données dans le cadre de la mise en œuvre de l'Annexe VII de l'APV/FLEGT	CIFOR	2015-2016	USD 27,048	Cameroon
Essor des demandes publiques et privées camerounaises en sciages d'origine légale	CIFOR	2017-2019	USD 109,947	Cameroon
PRO-FORMAL: Policy and regulatory options to recognise and better integrate the domestic timber sector in tropical countries	CIFOR	2010-2013	USD 3,870,000	Cameroon, Gabon, Ecuador, Indonesia, DRC

Purpose: Effective implementation of FLEGT to increase legal timber trade in the Congo Basin

Policy and market pressures are needed to promote legal timber trade and successfully implement FLEGT mechanisms to support forest-proximate communities' sustainable livelihood options and increase income. FTA's research on FLEGT in the Congo Basin (Cameroon, DRC, Ghana, Gabon, Liberia, Sierra Leone, and Tanzania) analyzed the domestic timber sector, investigated woodfuel value chains dynamics and regional priorities, conducted policy analysis of the FLEGT mechanism, and engaged diverse actors (i.e. government stakeholders and experts within the forest sector) in multi-stakeholder working groups to discuss cross-sectoral advocacy strategies in support of formal artisanal logging in public procurement and to draft policy recommendations. The research also offered training and technical capacity development and supported graduate student learning. FTA generated findings on the status of domestic timber sectors (i.e., legal or illegal, formal or informal, regulated or unregulated, small-scale or large-scale) to frame multiple countries' FLEGT/VPA progress to date, outlining existing opportunities and gaps. FTA facilitated the development of recommendations and strategies to formalize SMEs, implement FLEGT mechanisms, and improve the functioning of local, domestic, and international markets and value chains. FTA research supported local capacity building for research and participatory management of local forests and offered solutions for monitoring acceptance of FLEGT-licensed timber on the international market and trade-offs of licensed timber on markets (i.e. impact of VPAs on timber prices), innovative financing schemes for improved SME business models, and policy recommendations for the integration of the informal domestic timber markets into the formal economy. Academic researchers were expected to build on FTA's research, align research programs to national interests and dynamics, advance knowledge, and technical solutions on woodfuel issues, and devise better policy options adapted to local circumstances. Governments were expected to learn from FTA's research findings and be incentivized to create or adapt existing cross-sector policies on legal timber procurement, promote shared benefits in the domestic timber trade and export, and be better equipped to monitor FLEGT and VPA impact. NGOs and CSO partners were expected to use FTA findings in their advocacy efforts to support pro-poor policy reforms such as strengthening land tenure and access rights for marginalized rural communities and indigenous peoples, support increased SME participation in forest governance and SMEs' engagement with governments and the private sector to support policy change and compliance. Private companies were expected to comply with new FLEGT/VPA mechanisms as well as support smallholders and SMEs access legal timber value chains. Smallholders and SMEs were expected to have increased capacities and incentives to comply with legal requirements and formalize to access domestic timber markets. Collectively, these changes were expected to enhance economic opportunities for the forest-resilient poor.

Expected impact from the cluster: potential to benefit 300,000 people in Central Africa; potential to benefit 2,500,000 in Indonesia

¹⁸ An interactive version of the cluster-level ToCs for Challenge 4 can be found [here](#).

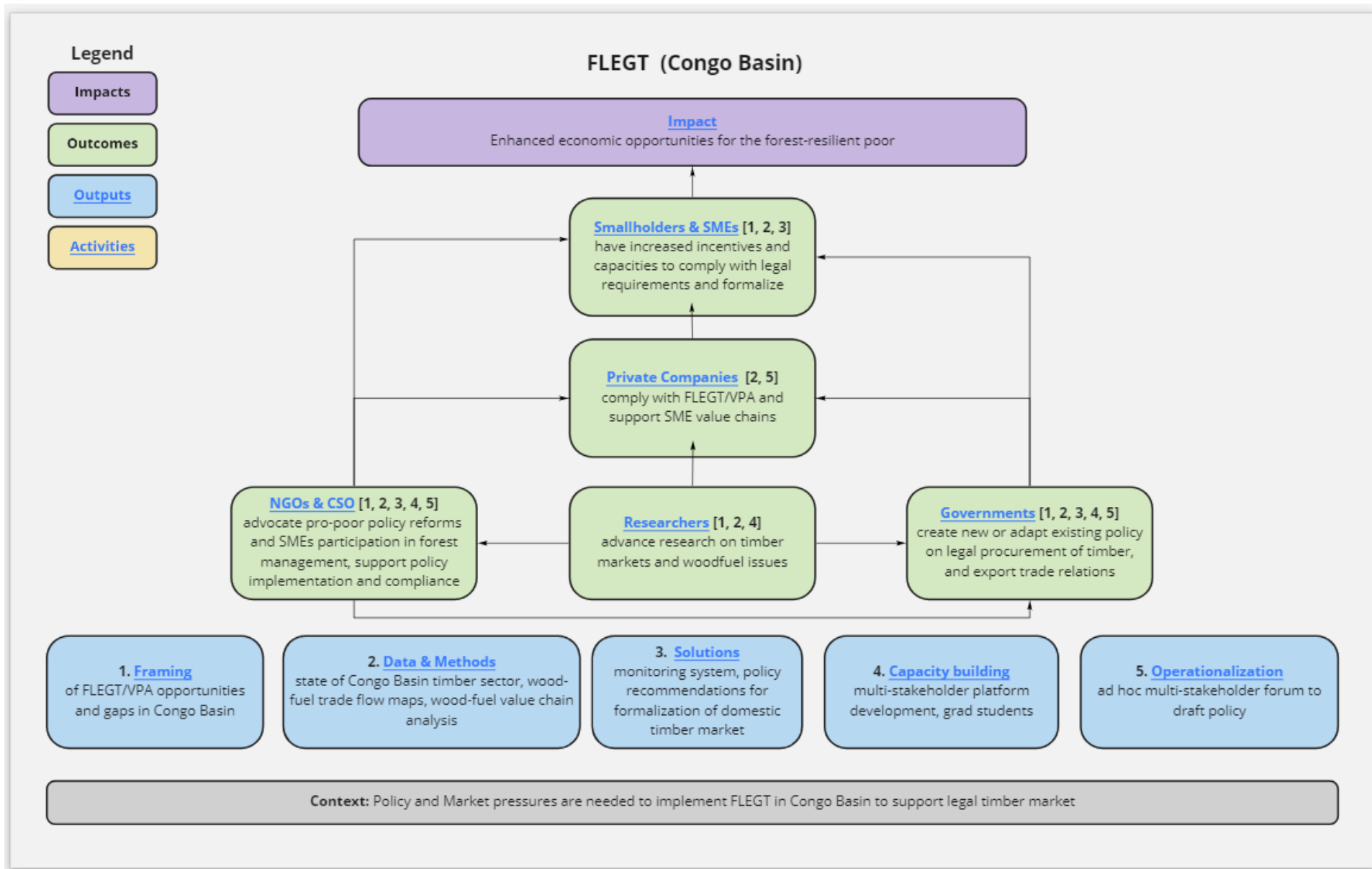


Figure 3. Cluster-level sub-ToC for FTA research on FLEGT (Congo Basin)

Table 20. Cluster: Timber Markets (Central Africa)

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
To take stock of community forestry enterprises involved in commercialization of timber in Africa – RTI35	CIFOR	2014-2015	USD 17,250	Cameroon, Gabon, DRC
DFID KNOWFOR 2: SMEs and Informal Sectors – RTI 142	CIFOR	2015-2017	USD 789,648	Cameroon, Gabon, DRC, Zambia, Indonesia
Promote and Formalise Artisanal Timber Production in Central Africa – <i>Promouvoir et Formaliser l'Exploitation Artisanale du bois en Afrique Centrale</i> (PROFEAAC) – RTI 251	CIFOR	2019-2023	USD 2,240,000	Cameroon, Gabon, DRC

Purpose: Increased income sustainability and resilience of forest dependent communities via public and private market demand for legal timber in Central Africa

In Central Africa, better understanding of timber markets dynamics and opportunities for value addition for timber products in local supply chains are needed to improve income, resilience, and sustainability of timber markets. FTA conducted a series of projects in Cameroon, Gabon, DRC, and Zambia to investigate current and potential national demands for legal artisanal and industrial sawnwood and explored community forestry and SMEs market opportunities and gaps. FTA investigated the extent of forest degradation linked to artisanal logging, enabling and impeding factors for CFE and SMEs timber trade, and contributions of community and small-scale logging enterprises to sustainable timber management. Additionally, FTA research assessed the potential of legal timber market expansion for diverse use (e.g., charcoal production), and supported capacity-building (e.g., regulation, technical skills, financial and commercial skills) to enable artisanal loggers to use timber resources more effectively and sustainably and to access formal markets. Also, FTA research supported nationwide marketing campaigns to promote domestic demand for legal sawnwood (DRC and Cameroon). FTA developed traceability solutions for monitoring the informal timber market (Cameroon) and protocols for estimating forest degradation for better natural resource management and sustainability. FTA engaged with multiple levels of government, timber associations, and traders in select countries to establish multistakeholder platforms to better manage, monitor & control artisanal logging permits in state forest areas. Based on FTA research and engagement activities, Governments would learn about the economic potential of legal artisanal logging, recognize the rights of local user groups to manage common forest resources, and improve regulations to better enable forest-dependent communities benefit directly and indirectly from forest products and services for subsistence and commercial purposes. Local communities, including artisanal loggers, would learn from capacity building activities and develop skills to sustainably use timber resources to reduce costs, add value to timber products (thereby increasing profits), as well as establish or join existing community forest enterprises to operate in legal markets and to be able to capture more value from existing markets. CFEs and SMEs were expected to become aware of FTA identified and promoted new market niches, actively seek to conduct their activities within existing or, where needed, improved legal frameworks, including through the adoption of FTA developed monitoring systems in their activities, and have better access to financial services (e.g., loans to reinvest in the enterprise) and markets. NGOs and CSOs were expected to use research findings on social and environmental contributions of CFEs to sustainable forest management and support local and international awareness campaigns to promote demand for sustainable timber products. Local and international consumers were expected to gain awareness of and demand sustainable timber products therefore increasing employment opportunities for local communities and SMEs. As a result, community forest enterprises and SMEs would formalize, gain certification, and abide by regulations to increase market access for diverse legal timber products. Together, these outcomes would support increased timber market opportunities and sustainable livelihoods and income for communities.

Expected impact from the cluster: [Not available/].

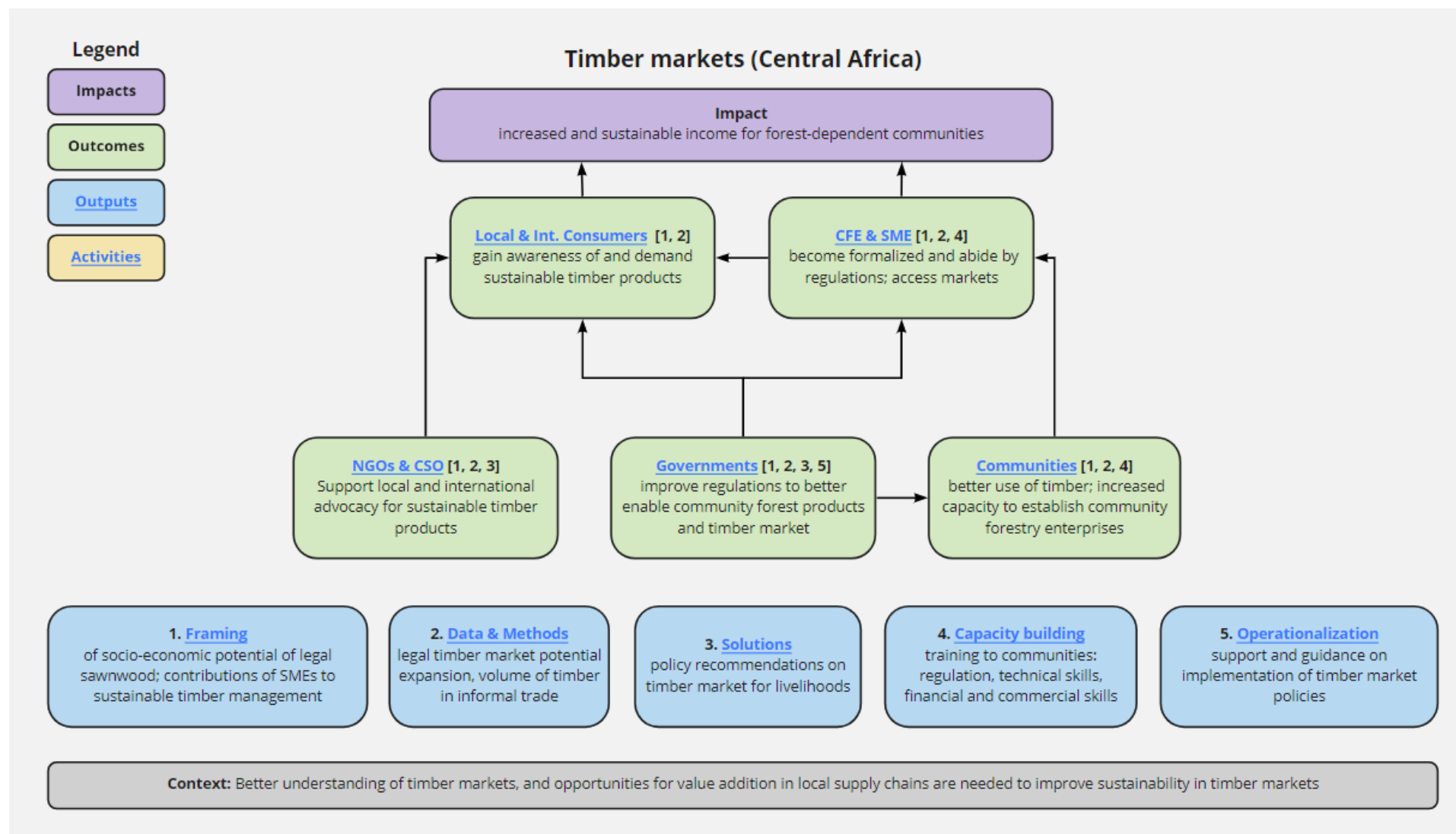


Figure 4. Cluster-level sub-ToC for FTA research on Timber Markets (Central Africa)

Table 21. Cluster: Diversification of Agroforestry-based Income in Sub-Saharan Africa

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
EADD: East Africa Dairy Development - Phase II (HFER-1088)	ICRAF	2013-2018	USD 1,696,681	Kenya, Ethiopia, Tanzania, Uganda
T4FS: Developing Integrated Options and Accelerating Scaling up of Agroforestry for Improved Food Security and Resilient Livelihoods in Eastern Africa - Trees for Food Security - II (ACAR-1211)	ICRAF	2017-2021	AU\$ 5.01M	Ethiopia, Rwanda, Uganda
PRUNSAR: Food Trees for Diversified Diets, Improved Nutrition, and better Livelihoods for Smallholders in East Africa under the Programme: Putting Research into Use for Nutrition, Sustainable Agriculture and Resilience (IFAD - 1187)	ICRAF	2016-2020	USD 1,102,118	Kenya, Uganda
SILMS: Sustainable Integrated Land Management Solutions for agricultural value chains in Zambia (SNDO - 1179)	ICRAF	2016-2019	USD 198,092	Zambia
DRYDEV: A Regional Programme in the Sahel and Horn of Africa, enhancing Food and Water Security for Rural Economic Development	ICRAF	2013-2019	USD 50,000,000	Ethiopia, Kenya, Mali, Niger, Burkina Faso
AFSP I: Agroforestry Food Security Programme (IRLD-1007) (Mzimba, Karonga, Salima, Dedza, Ntcheu, Ntchisi, Lilongwe, Chikwawa, Mulanje, Machinga and Thyolo)	ICRAF	2012-2016	€3.75m	Malawi
Bridging project between AFSP I and II - Evergreen Agriculture	ICRAF		€300,000	Malawi
AFSP II: Agroforestry Food Security Programme (BELG-1165. Phase II of IRLD-1007) (Thyolo, Dedza and Mzimba.)	ICRAF	2015-2019	€2m	Malawi
Extending AFSP II (Mzimba South and Kasungu in Malawi and Tsangano and Angonia in Mozambique)	ICRAF	2013-2015	€400,000	Malawi, Mozambique
Community Agroforestry Tree Seed (CATS) bank	ICRAF	2009-2012	€468,149	Malawi, Mozambique
SAIRLA - Bringing Evidence to Bear on Negotiating Ecosystem Service and Livelihood Trade-Offs in Sustainable Agricultural Intensification	ICRAF	2016-2020	885,294	Burkina Faso, Ethiopia, Ghana, Malawi, Tanzania and Zambia
EURU-1150 Empowering Forestry Dependent Communities through Commercialization of Small-Scale Forestry	ICRAF	2015-2018	1,284,881	Malawi
Regreening Africa: reversing land degradation by scaling up evergreen agriculture	ICRAF	2017-2022	EUR 20,689,655	Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Somalia, and Senegal

Purpose: Reduce poverty through enhanced diversification and production for agroforestry-based livelihoods

In Sub-Saharan Africa, equitable policies, context-appropriate agroforestry options, and sustainable delivery systems are needed to diversify and enhance productivity and increase income for agroforestry systems (AFS). FTA's research activities ranged from baseline surveys to collect biophysical and socio-economic data, development of suitable tree species selection tools (Rwanda and Ethiopia), identification of context-appropriate agroforestry systems, conducting tree-diversity trials (i.e. on farm and on-station experiments), co-development of sustainable and high-quality germplasm supply systems, development of training materials on agroforestry system (AFS) design and management, conducting training on AFS design and management, investigation of value chain dynamics for business model development, and provision of support to multi-stakeholder policy dialogues on agroforestry and to draft policy. FTA research framed the socio-economic and environmental benefits and potential of AFS for poverty alleviation, produced baseline data (i.e. socio-economics, demographics, land degradation dynamics, farm production, agrobiodiversity, food availability and household consumption patterns, etc.), maps, and resource repositories, and co-developed solutions (i.e. species selection tool, soil & water conservation technologies, climate smart production systems etc.) for enhanced production, supply chains and business models (e.g., SAI Dashboard). FTA research offered capacity-building and training to graduate students, farmers and extension agents on integrated soil

fertility (ISF), tree crop modelling, extension methods, and agroforestry practices (i.e., nursery production, tree establishment and management etc.) for increased on-farm production and resilience. FTA also created opportunities for multi-stakeholder engagement (e.g., SHARE approach) to reflect on SAI-relevant policies, interventions & their effectiveness, as well as to establish regional and nationwide communities of practice to support widespread adoption of locally appropriate regreening options (i.e., evergreen agriculture) and agroforestry practices. As a result of these contributions, researchers (e.g., graduate students) would build research capacities and skills by conducting field work with FTA support, and to advance the research agenda on dynamics of sustainable development and poverty reduction in Sub-Saharan Africa, equipping them to continue to work in either research or related careers. Governments at multiple levels were expected to increase understanding of the role of trees on farm for poverty alleviation, capacity to assess cost and monitor the potential socio-economic benefits of sustainable land management investments and be incentivized to create new or adapt existing policies to support wider adoption of optimal context-appropriate AFS for increased and sustainable production (e.g., bylaws, national plans, action plans, projects etc.) and invest in agroforestry development based on FTA research findings and recommendations. Through participation in FTA led training activities, Extension workers would learn novel extension methods and have increased capacity to provide enhanced extension services and technical support to farmers using FTA developed extension materials. NGOs and CSOs' engagement in the co-development of locally appropriate solutions (e.g., genetic diversity for food security, farmer-managed natural regeneration (FMNR), scaling up agroforestry practices) would incentivize them to enhance advocacy for context appropriate AFS and support farmers adoption sustainable management and agroforestry practices through local awareness campaigns, or linking producers to buyers. FTA and partner-led training activities would enhance farmers and producer groups' knowledge and skills on Sustainable Agriculture Intensification (SAI) and other agroforestry practices (e.g., fertilizer trees, fodder trees and fruit trees, ISFM). Farmers and producer groups would have easier access to high-quality germplasm of priority species at low or no cost via FTA-supported nurseries and have increased incentives and capacities to adopt AFS for increased yields and diversified production. Farmers and producer groups were also expected to engage with NGOs, private sector, and local level government officials to co-develop solutions through FTA research activities (e.g., SHARED, SAI Dashboard) and have increased incentives and capacity to adapt business models and access market opportunities. Private sector was expected to learn about the socio-environmental performance of FTA promoted value chain models through participation on project activities and be sensitized to make more sustainable and pro-poor investment decisions (e.g., inclusive finance and business models). Donors & partners were expected to learn from FTA research results and support scaling solutions. With increased knowledge of SAI and access to enhanced extension methods, an enabling policy environment, and private sector support, farmers were expected to adopt AFS and more sustainable management practices for increased yields and diversified production; thereby positively impacting farm-level profitability, which often translates into improved household income and (financial) well-being. Collectively, these outcomes would improve farmer livelihoods and resilience through enhanced, diversified, and sustainable agricultural production and income for poor communities.

Expected impact from the cluster: Low-end estimate potential of 1,886,277 people and High-end estimate potential of 3,513,557 people across Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Niger, Rwanda, Tanzania, Uganda, Zambia.

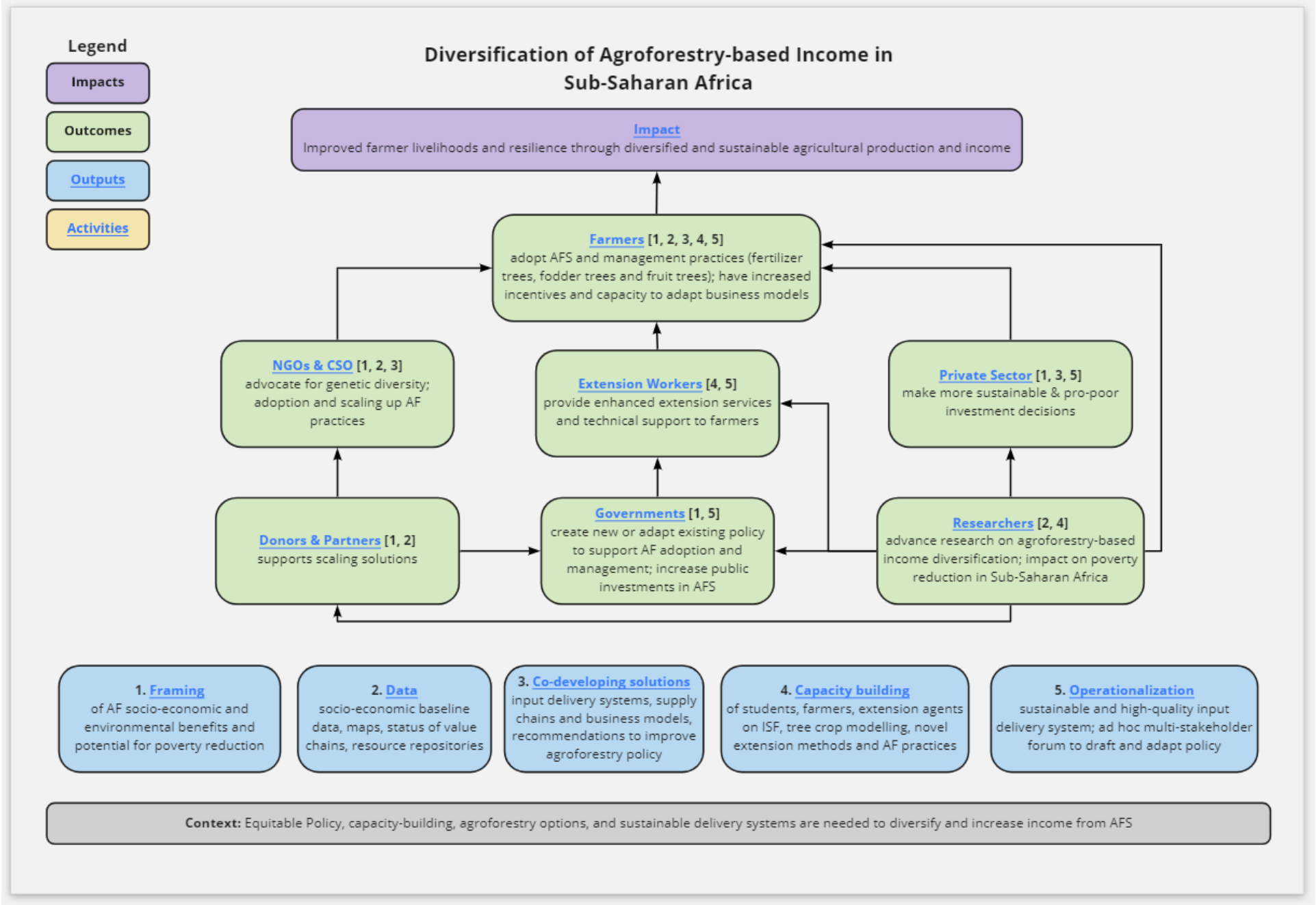


Figure 5. Cluster-level sub-ToC for FTA research on Diversification of Agroforestry-based Income in Sub-Saharan Africa

Table 22. Cluster: Sustainable Forest Enterprises in Central Africa

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
DRYAD: Improving Livelihoods and Land Use in Congo Basin Forests - Financing Sustainable Community Forest Enterprises in Cameroon	ICRAF	2015-2020	USD 8,941,462	Cameroon

Purpose: Reduce poverty and support sustainable livelihoods through viable community forest enterprises in Cameroon

Community forestry in Cameroon faces many challenges, including access to finance. Better access to finance can catalyze viable and sustainable enterprises around forest products and services for the benefit of forest communities. Increased public investments as well as technical and capacity support are needed to establish and maintain sustainable community forest enterprises (CFE) in Cameroon. FTA's research activities identified community forest enterprises in Cameroon (i.e., location, development stage and incorporation), assessed financial and operational viability of existing communities' business plans (due diligence), and examined the efficiency and effectiveness of public-private financing mechanisms in promoting sustainable community forest enterprises and conducted performance-based finance experiments in several community forest enterprises. FTA research framed the potential of community forest enterprises to raise the profile of CFE as a contributor to economic, social and environmental development in Cameroon. FTA research developed capacity-building guidelines and offered training for communities on technical and business skills such as data collection and reporting through appropriate innovative technology and proper record keeping, and by co-developing investment portfolios to enable communities to be credit-worthy. Additionally, FTA developed financing and monitoring systems for community enterprise performance against select environmental, social, and economic indicators, disseminated the results for diverse stakeholders and multiple levels of government, and provided guidance and recommendations on good practice, scaling up co-investment, and performance-based public finance and support mechanisms. Public officials would learn about CFEs socio-economic and environmental performance from FTA research findings and engagement activities, and incentivize changes towards an enabling policy environment (e.g., obtention of waybills, permits, environmental impact notices, etc.) and increased public investments in CFEs (e.g., SME-Bank) to enable community enterprises to overcome initial capital constraints. Local NGOs and CSOs were expected to take up FTA developed guidelines and provide training and technical advice support for CFEs draft performance-based business plans and facilitate CFEs access to financial inputs and market opportunities for NTFP. By adopting FTA developed financing and monitoring systems, local NGOs would be better equipped to support monitor progress once the CFEs started operating. Forest-dependent communities were expected to have increased capacity organize themselves, enhanced support to develop performance-based business plans, access financial inputs to invest in CFEs thereby increasing community employment opportunities and/or profits, and access market for more stable and diversified sources of income.

Expected impact from the cluster: Low-end estimate potential 2,458 people in Cameroon; High-end estimate potential - TBD

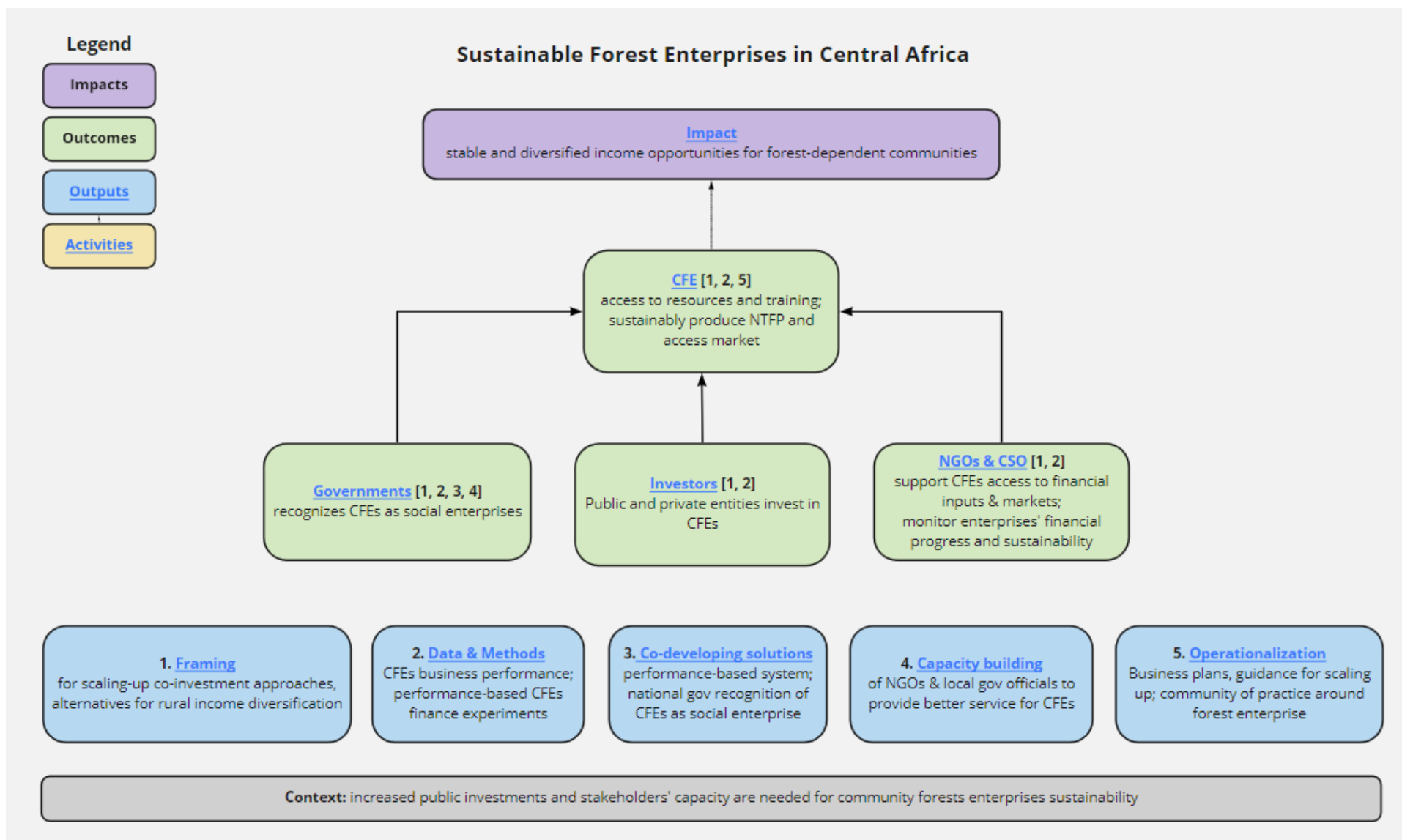


Figure 6. Cluster-level sub-ToC for FTA research on Sustainable Forest Enterprises in Central Africa

Table 23. Cluster: Agroforestry Concessions in Peru

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
SUCCESS: Support to the Development of Agroforestry Concessions in Peru (SUCCESS)	ICRAF	2016-2017	€125,000	Peru
GGGI: Peru's Agroforestry Concessions Scheme: Collaborative Action to secure Multi-level Readiness for Implementation of an Innovative, Transformative Policy Project - (GGGI-1467)	ICRAF	2020-2023	USD 3,260,000	Peru
PARA: Piloting approaches to rural advisory services in support of scaling of the Agroforestry Concessions scheme in Peru - (PARA-GTZG-1395)	ICRAF	2019-2022	USD 1,343,930	Peru

Purpose: Improved livelihood opportunities through agroforestry concessions

Policy is needed to create formalized opportunities for smallholders' use of land for agroforestry-based livelihoods in the forest margins of the Peruvian Amazon. FTA research aimed to support the implementation of agroforestry concessions for eligible smallholders in Peru that would lead to new and formal livelihood opportunities. FTA engaged governments, NGOs, and local communities to frame challenges and opportunities for the agroforestry concession mechanism (AFC) (e.g., compliance barriers for eligible smallholders, tenure benefits, potential to reduce poverty), expanded definitions of smallholders and concepts of smallholder heterogeneity, as well as promoted the existence of the AFC mechanism across Peru. FTA's research also mapped zones eligible for AFCs, developed RAS models and proposed a new and more accurate approach for zoning. Along with training for local researchers and communities, FTA research co-produced guidance to implement and operationalize the AFC mechanism and its technical guidelines. As a result of these interventions, it is expected that the government at the national and sub-national levels would revise existing policy and effectively implement the mechanism, and NGOs would support these processes to ensure smallholders can benefit from and comply with the mechanism's requirements. Eligible smallholders would be incentivized to apply for and receive a concession, develop and maintain their capacities to comply with the provisions of the concession, and adopt agroforestry practices. With access to loans and extension services through the mechanism, smallholders would be able to invest in their concession to maximize benefits, enhance their productivity and yields, and access formal markets to sell their produce. Over time, it is expected that the culmination of these outcomes would improve smallholders' livelihood opportunities and income.

Expected impact from the cluster: Potential to benefit >123,000 households (440,857 people) in the Peruvian Amazon.

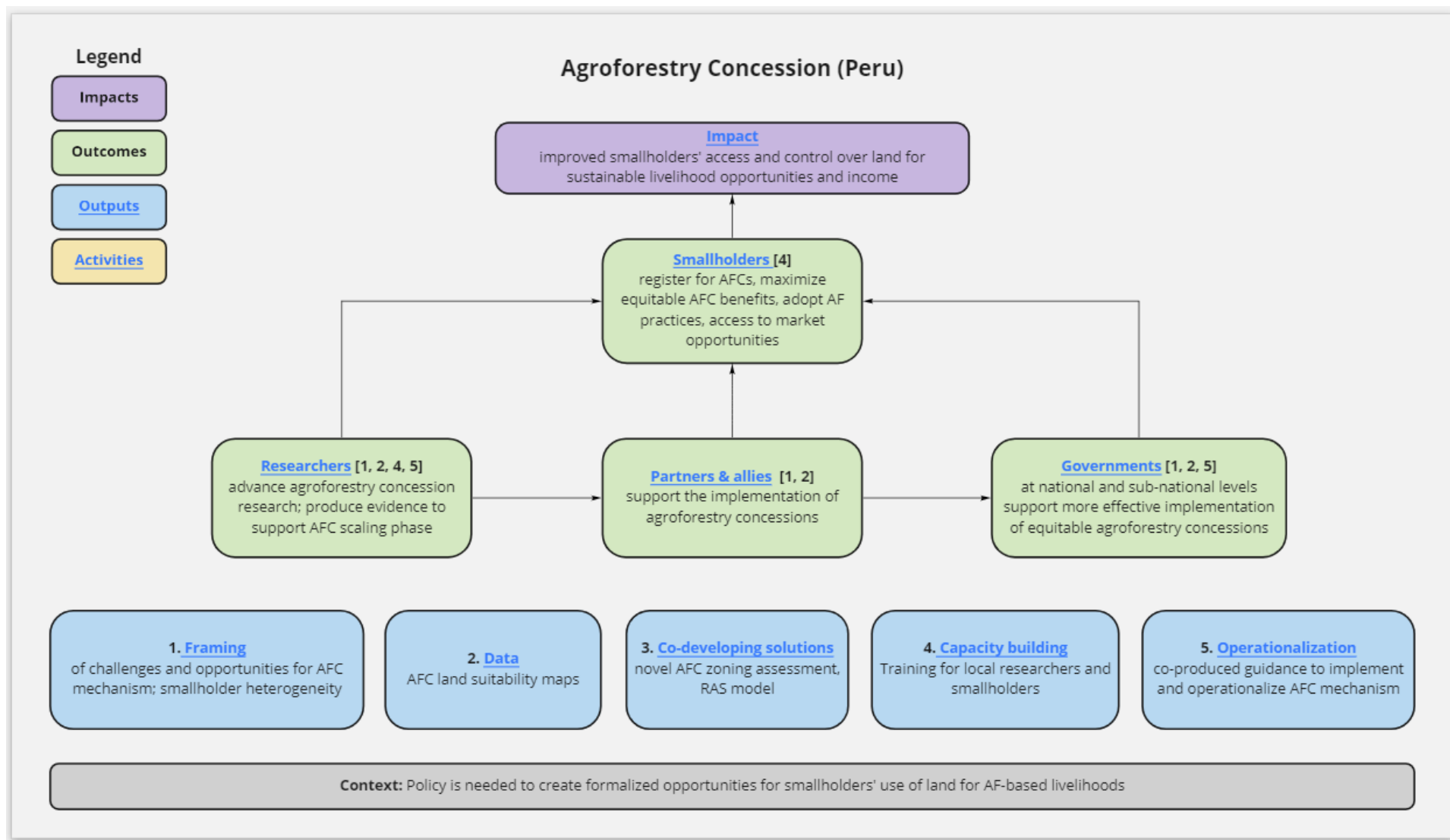


Figure 7. Cluster-level sub-ToC for FTA research on Agroforestry Concessions in Peru

Table 24. Cluster: Forestry and Tree Value Chains in Latin America

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Forestry to enhance livelihoods and sustain forests in Mesoamerica: How institutional arrangements and value chains affect benefits and resources	Bioversity International	2013-2017	USD 643,150	Guatemala, Nicaragua
Enhancing the competitiveness of Peruvian cocoa via the identification and commercialisation of fine and diverse flavour quality (<i>Mayor competitividad del cacao peruano Chunchu, mediante la identificación, evaluación, caracterización y comercialización de variedades finas de calidades altamente identificadas y diferenciadas</i>)	Bioversity International	2011-2017	USD 150,000	Peru
Integrated Approach to Improving Yield Efficiency and Resilience to Climate Change through Better Use of Cacao Genetic Resources	Bioversity International	2018-2019	€220,580.13	Brazil, Colombia, Cote D'Ivoire
Follow-On Project: Research on heat and drought tolerant cocoa planting material for: An integrated approach to improving yield efficiency and resilience to climate change through better use of cacao genetic resources)	Bioversity International	2013-2015	USD 100,000	Colombia, Costa Rica, Brazil

Purpose: Poverty alleviation and increased resilience through forestry and tree values chain in Latin America

In Latin America, policy and market pressures for sustainability are needed within forestry and tree value chains to increase farmers' resilience and income. To encourage participation in planning and project implementation, FTA's research engaged with farmers, producers, forestry cooperatives, and NGOs to explore the socio-economic benefits of community forests for livelihoods and investigated community forest governance opportunities and gaps. FTA conducted genetic characterization studies and developed a geo-referenced genetic catalogue of target species to facilitate the development of genetic improvement plans for tree-resource sustainability. Additionally, the research conducted yield efficiency, drought tolerance and tree ring analysis to determine growth rates and validate small- and large-scale crop renewal technologies and management plans. In Guatemala, FTA also facilitated participatory germination pilots with communities to demonstrate genetic diversity/population viability. In Peru, FTA developed technologies for industrial processing of NTFPs; explored market opportunities and supported market campaigns for fine quality NTFPs. FTA's research framed socio-economic benefits derived from community forests and market opportunities for NTFP value chains to encourage local communities (i.e., farmers and producers) participation in research activities, produced priority species maps and a catalogue for better tree genetic diversity management, validated solutions for sustainable tree harvesting and increased farm yields through genetic gain (e.g., tree-crop renewal technology, density rehabilitation and management technologies), and developed processing technologies so farmers could raise their incomes through value-addition. FTA research offered capacity-building and training to graduate students, farmers and producers in forestry and tree crop management that would support increased and sustainable production in pilot areas. Additionally, FTA developed recommendations on policy, regulations, and management of natural resources (Nicaragua and Guatemala) to enhance natural resource sustainability and resilience, as well as farmers' access to benefits. As a result of project engagement and uptake of FTA outputs, researchers would build capacities and advance the research agenda on forestry and tree value chains in Latin America and disseminate scientific evidence to wider audiences (i.e., other cacao-producing countries, international development organizations, etc.). Local NGOs would uptake FTA evidence on market opportunities, socio-economic benefits derived from community forests and governance frameworks to advocate for policy change for better forest management, increase knowledge and skills via training to provide technical support to community forests for long-term sustainability of forest, and facilitate increased market opportunities for NTFP producers. Through participation in research activities and training, Government officials would increase understanding of community forestry's potential to simultaneously provide rural development benefits while conserving forest and tree biodiversity, up take FTA policy recommendations and develop new or adapt existing policies and practices to enhance those dual benefits (e.g., facilitate renewal of community forest contracts, support sustainable value chains etc.). Forestry cooperatives were expected to be better equipped for and have increased capacity to develop and support the implementation of forest improvement and management plans for natural resources sustainability and resilience to climate-change. With increased access to technical support and information, farmers and producers were expected to adopt better management practices for increased on-farm productivity, forest resources

FTA’s Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

sustainability, as well as adopt value-addition technologies for increased income. Together these changes would improve agronomic practices (i.e., use of genetic diversity and fine quality commercial varieties) for increased resilience and income for forest-based communities in Latin America.

Expected impact from the cluster: potential to benefit 35,000 people in Colombia and 10,880 people in 9 active concessions in Guatemala

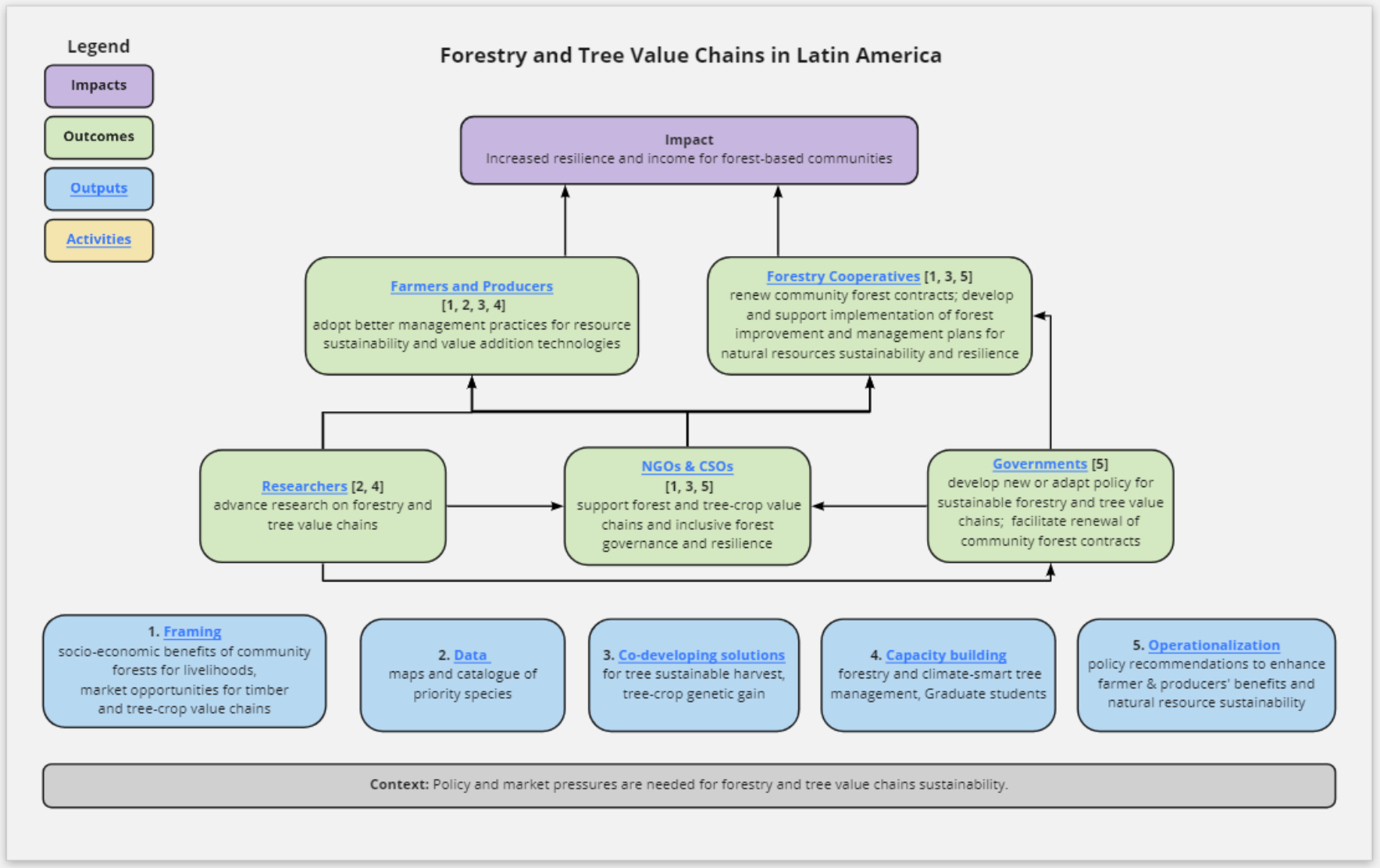


Figure 8. Cluster-level sub-ToC for FTA research on Forestry and Tree Value Chains in Latin America

Table 25. Cluster: Gender Issues in the Oil Palm Sector in Indonesia

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Engendering RSPO Standards	CIFOR	2016-2017	USD 20,000	Indonesia
Impacts of Large-Scale Land Acquisitions on Local Women's Land and Forest Tenure Rights: Case Studies from Indonesia	CIFOR	2016-2017	USD 67,556	Indonesia

Purpose: Improved livelihood opportunities through oil palm value chain in Indonesia

Policy and governance are needed to promote the equitable participation of women and indigenous groups in the oil palm sector in Indonesia. FTA research activities engaged with representatives of the Roundtable on Sustainable Palm Oil (RSPO), accredited RSPO social auditors/certification bodies, corporate sector, NGOs, and smallholder associations, to elicit knowledge on gender issues within the Indonesian oil palm sector. FTA conducted household surveys, interviews, focus group discussions (FGD), field visits, gender analyses, and assessed oil palm investments that foster gender equality. Within these case studies, FTA produced data on challenges faced by women in oil palm communities to frame gender issues (e.g., gender blindness of oil palm labour policy and RSPO certification standards) to raise the profile of gender issues as a priority for private sector collective action (e.g., establishing gender committees, contract innovation). FTA research facilitated opportunities for multi-stakeholder engagement (i.e., field visits, FGD, gender dialogue, meetings, etc.), contributing to the exchange of information, co-development of solutions for increased participation of women in decision-making in the oil palm sector and recommendations for policy change (i.e., Indonesian Sustainable Palm Oil -ISPO) to support indigenous groups' access to productive assets (i.e., land) to unlock further productive potential for communities. As a result of project engagement and uptake of FTA outputs, Government actors would learn from oil palm research processes and findings, build their capacities and relationships within the oil palm sector, create new or adapt existing policy informed by FTA research (e.g., ISPO) to support an equitable share of benefits in the oil palm sector, and hold companies accountable to ISPO regulations. FTA research evidence on oil palm would inform NGOs and CSOs' advocacy and lobby efforts with RSPO, governments and private oil palm companies to address issues facing women and indigenous groups and to hold public and private actors accountable. RSPO was expected to learn from FTA research and have a better understanding of the role of sustainability standards in driving gender transformative change in value chains, take up recommendations for improved RSPO policy and practice, and implement and monitor companies' practices and adherence to RSPO regulation. In turn, companies committed to RSPO were expected to reflect and respond to challenges women face working in the sector by adopting revised RSPO gender standards and change corporate policies to support women and indigenous groups' access to oil palm governance and market opportunities. As a result, it was expected that women and indigenous groups would have their rights adequately represented in policy and practice, creating enabling conditions for safe and equitable employment opportunities in the oil palm sector in Indonesia.

Expected impact from the cluster: To be determined.

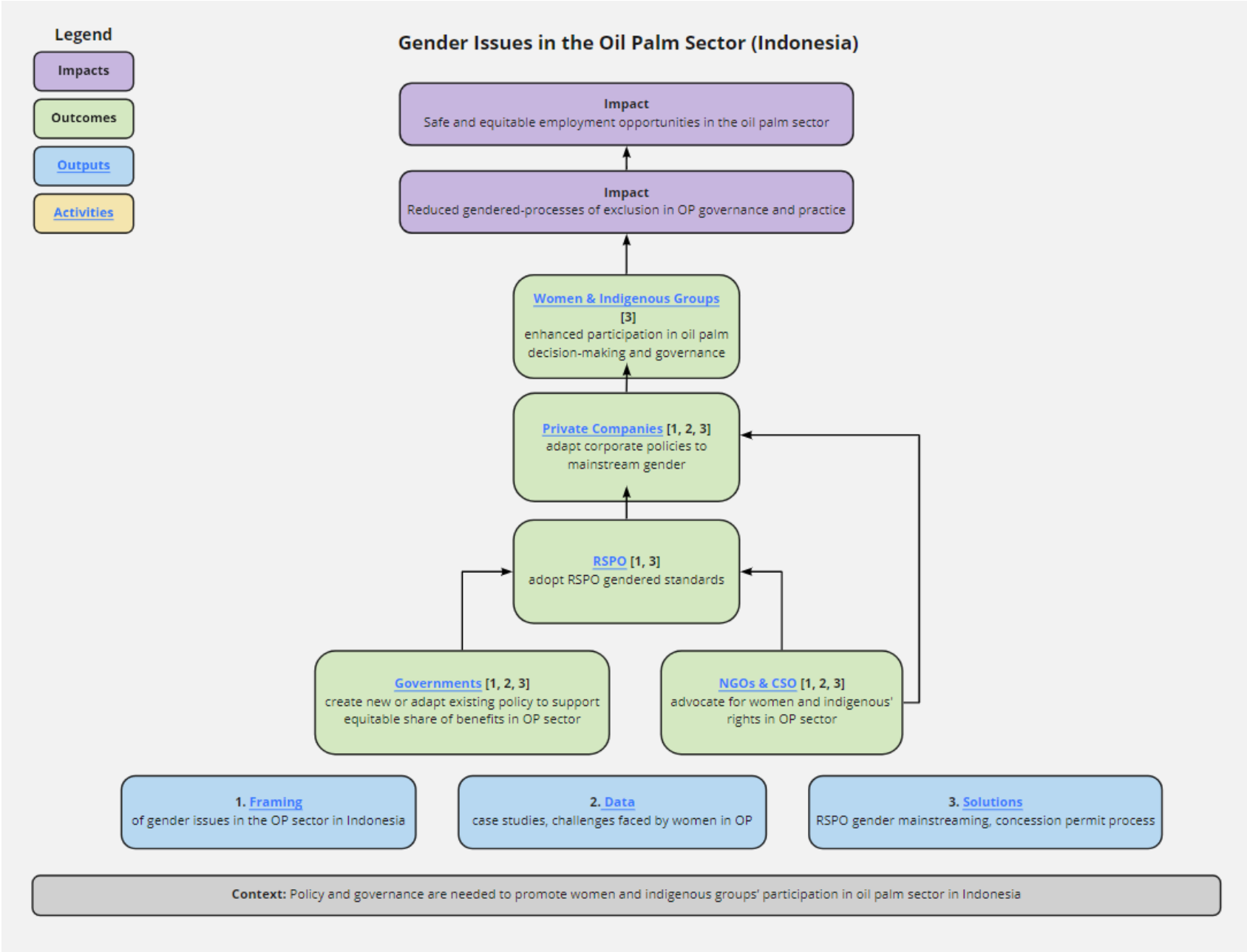


Figure 9. Cluster-level sub-ToC for FTA research on Gender Issues in the Oil Palm Sector in Indonesia

Table 26. Cluster: Furniture Value Chains in Indonesia

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Assessing Furniture Value Chains Research ("Mahogany and teak furniture: action research to improve value chain efficiency and enhance livelihoods") - RTI 93	CIFOR	2008-2013	USD 1,031,021	Indonesia
FLEGT License to leverage the capacity of small and medium scale furniture enterprises in Indonesia to access global markets - RTI 259	CIFOR	2019-2020	USD 57,126	Indonesia

Purpose: Poverty alleviation and increased resilience through furniture value chains in Indonesia

Policy and institutional capacity are needed to incentivize sustainable furniture industry and promote job opportunities for poor communities in Indonesia. FTA research engaged with *Asosiasi Pengrajin Kayu Jepara* (APKJ) members and furniture makers to explore the furniture value chain in Indonesia and identify constraints and opportunities for the development of an equitable and sustainable furniture sector. FTA research analyzed natural resources use, from unprocessed timber to final product, based on empirical evidence and characterized actors' linkages along the furniture value chain to raise the profile of micro and small-scale furniture producers and co-developed alternative solutions for action adapted to the region's context and needs (e.g., small-scale furniture producers (i) moving up the value chain, (ii) collaborating down with wood traders and producers, (iii) forming local associations, and for the (iv) production of certified/green furniture). FTA facilitated workshops and training for APKJ members and furniture makers (i.e., natural resources sustainability, SMEs compliance on *Sistem Verifikasi Legalitas Kayu* - SVLK, global market, etc.), enabled opportunities for dialogue and sharing of good practices among stakeholders, and supported micro and small-scale furniture makers' institutional development and participation in trade exhibitions and an online market to enable producers reach a wider market. FTA developed methodology to assess *Sistem Verifikasi Legalitas Kayu* (SVLK) uptake by micro and small-scale furniture companies (Jepara and Pasuruan), produced data (e.g., reports, policy briefs, peer-reviewed publications) on SVLK's compliance and disseminated the information to varied audiences (i.e., books and book chapters, media coverage, CDs, guidelines, briefs, newsletters etc.). Additionally, FTA co-developed recommendations (e.g., roadmap) to inform local policy process development and/or change. As a result of FTA engagement and research contributions, sub-national governments (Jepara and Pasuruan) gained a new understanding of the importance of micro and small-scale furniture making and its contributions to the local economy and be incentivized to revise or enact policies that support small-scale furniture producers' access to financial resources and ability to establish furniture associations. Through FTA-led training, small-scale furniture producers gained a better understanding of the market, developed new or expanded linkages with other local stakeholders, and were incentivized to associate, access to formal financial credit, and adopt FTA's institutional development and market solutions appropriate to the local context and needs. Furniture associations were then expected to support SMEs' and producers' optimal use of natural resources (to increase profit and sustainability) and have increased capacity to comply with legal requirements (SVLK) and obtain certification (i.e., FLEGT license) for enhanced access to domestic and international market opportunities. It was expected that local and international consumers would gain awareness of and demand sustainable timber products from the Indonesian market, leading to increased job opportunities within local furniture value chains. With a revised policy framework and support from furniture associations, small-scale producers would have increased incentives and capacities to comply with legal requirements, access domestic and international market opportunities, and increase value captured from certified products that would contribute to livelihood improvement. Together, these changes would increase job opportunities and income for poor communities in Indonesia.

Expected impact from the cluster: According to the Indonesian National Statistics Bureau (BPS) data on small-scale wood and handicraft enterprises, there could be up to 686,000 businesses of this kind, employing up to 1.5 million people nationally (BPS 2011b)

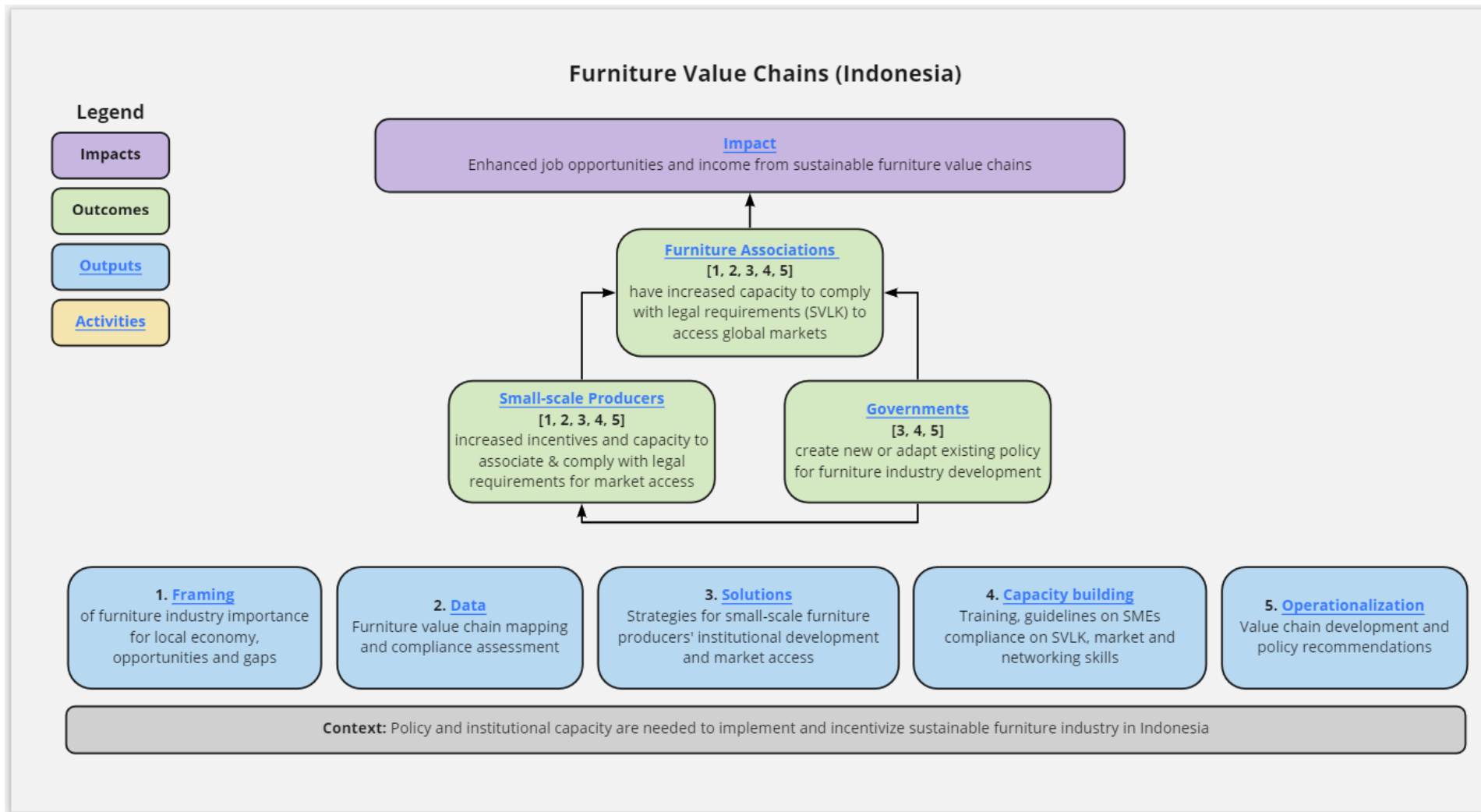


Figure 10. Cluster-level sub-ToC for FTA research on Furniture Value Chains in Indonesia

Table 27. Cluster: Diversification of Agroforestry-based Income in Asia

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
KANOPPI (Phase 1)	ICRAF	2013-2017	AUD 1,799,805	Indonesia
KANOPPI 2: Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia	ICRAF	2017-2021	AUD 2,400,003	Indonesia
Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action (AgFor)	ICRAF	2012-2017	USD 9,003,409	Indonesia
Indonesian Rural Economic Development	ICRAF	2016-2018		Indonesia
Agroforestry for livelihoods of smallholder farmers in Northwest Vietnam (AFLI-I)	ICRAF	2011-2016	USD 1,494,465	Vietnam
Developing and Promoting Market-based Agroforestry and Forest Rehabilitation Options for Northwest Vietnam (AFLI-II)	ICRAF	2017-2021	USD 2,043,442	Vietnam
Enabling smallholders in Odisha to produce and consume more nutritious food through Agroforestry System	ICRAF	2018-2021	USD 3,000,000	India
Green Growth Action Plan	ICRAF	2018-2019	EUR 165,000	Vietnam

Purpose: Reduce rural vulnerabilities and increase smallholders' income through diversification of agroforestry systems

In Asia, equitable and integrated management of natural resources, improved market-based agroforestry options, and the development of market linkages are needed to increase and sustain employment opportunities and income from agroforestry and non-timber forest products (NTFPs) for poor communities. FTA's research engaged with smallholders, farmers groups, community-based organizations (CBOs), and representatives of private companies and multiple levels of government (i.e., extension workers, policymakers) through diverse research activities such as ethnographic studies, participatory mapping, gender analyses of land-use governance frameworks, pilot farms, as well as for developing, field testing and quantifying the productivity of agroforestry systems. FTA and local stakeholders identified contextual factors (i.e., gender, culture) influencing the design and adoption of agroforestry systems, improved natural resources management alternatives, conducive institutional arrangements, enabling policies and regulations, as well as inclusive market opportunities and challenges for the realization of value chains socio-economic and environmental full potential. The research offered training to and involved extension agents and communities in participatory field trials developing local skills and capacity for climate-smart priority-species seedling production (i.e., household micro-nurseries, germplasm and nursery management, farmer group nurseries, etc.), planting (i.e., laying out contour lines), forest and agroforestry management (e.g., fertilizer trees, pruning techniques, etc.), and marketing. FTA also created new insights on climate-smart agroforestry and forest rehabilitation options, incentive strategies, and cross-sector policy recommendations to incentivize the adoption of agroforestry practices by farmers for optimal land conservation and livelihoods benefits. As a result of FTA engagement and research contributions, researchers (e.g., graduate students, national research institutes) were expected to advance the research agenda and increase scientific understanding on smallholder agroforestry (including agroforestry innovations), and market opportunities and constraints for timber products and NTFPs, as well as to provide technical support (e.g., models for forecasting economic and environmental benefits of integrated timber and NTFP production systems) and science-based evidence for stakeholder's decision making and investment in agroforestry development. Government officials learned from FTA research finding and engagement opportunities, developed and implemented cross-sector policy and strategies to support and incentivize farmers' adoption of integrated NTFP and sustainable tree-based production and trade. Extension agents were expected to learn alternative options for climate-smart agroforestry and forest rehabilitation and deliver effective extension services for smallholders and CBOs. NGOs and CSOs learned from FTA findings and data on gender issues and were expected to increase advocacy and support for equitable and integrated sustainable community planning and management of natural resources aiming increased participation of women and traditional groups in land governance. Community-based organizations were then expected to adopt gender-aware governance models and develop or adapt gender-inclusive participatory governance mechanisms to guide future development and investments affecting land and natural resources benefit sharing. Through FTA participatory research and engagement activities, private companies increased awareness of priority-species for

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

community development based on FTA field-trials and economic forecast model results, adopted and advance priority-species processing technologies for increased demand for agroforestry products, which in turn would generate sustainable employment opportunities for smallholder communities. With increased access to high-quality germplasm and effective technical and extension support, smallholders were expected to adopt agroforestry systems and optimal management practices for increased and diversified yields, manage natural resources equitably and sustainably, as well as access new markets and pursue agroforestry-based value chains for equitable share of benefits. These changes were intended to reduce rural vulnerabilities and increase smallholders' income through the diversification of agroforestry systems in Asia.

Expected impact from the cluster: potential to benefit 2,239,384 people in India; 1,089,000 people in Vietnam; 701,589 people in Indonesia [potential High-end estimate TBD]

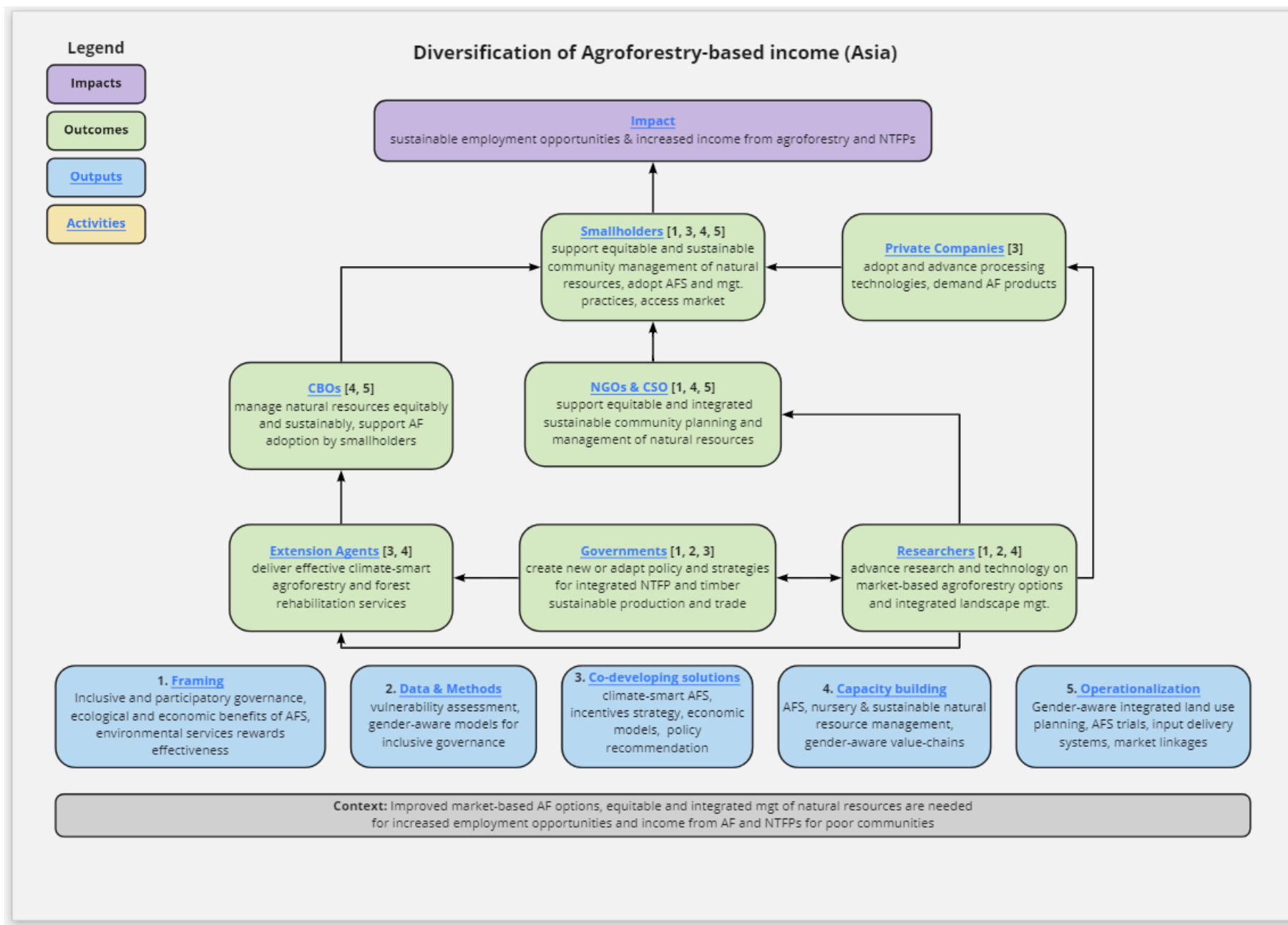


Figure 11. Cluster-level sub-ToC for FTA research on Diversification of Agroforestry-based Income in Asia

Table 28. Cluster: Payment for Environmental Services (Asia)

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Vietnam Forests and Deltas project to support implementation of Payments for Forest Environmental Services (PFES)	CIFOR	2016-2018	USD 26,323	Viet Nam
Rewards for, use of and shared investment in pro-poor environmental services, phase 2 (RUPES 2)	ICRAF	2008-2012	USD 1,500,000	China, India, Indonesia, Nepal, Philippines, Viet Nam
Integrated Natural Resource and Environmental Management Program (INREMP)	ICRAF	2018-2020	USD 2,078,641	Philippines
Opportunities and Challenges to Developing REDD+ Benefit Sharing Mechanisms in Developing Countries (accompanying phase 2 of GCS REDD+ program)	CIFOR	2012-2016	USD 6,556,500	Brazil, Cameroon, Indonesia, Peru, Tanzania, Viet Nam ¹⁹
Sustainable, Low Carbon Emission Agriculture and Water Resource Co-Investment of Rejoso Watershed (Gerakan Rejoso Kita)	ICRAF	2016-2018 / 2019-2022	USD 534,911	Indonesia
Climate smart, tree-based co-investment aka smart tree invest (STI)	ICRAF	2014-2017		Indonesia, Philippines, Vietnam

Purpose: Alleviate poverty and vulnerability through pro-poor rewards mechanisms for environmental services

In addition to international and national climate change policy mechanisms (e.g., REDD+), changes to national and sub-national policy and smallholder practices are needed to support smallholders' access to income from Payment for Environmental Services (PFES). Through diverse research activities such as multilevel governance processes assessment (e.g., revenue-raising sectors, local government rights), quantification of associated costs for smallholders' access to PFES mechanisms (e.g., REDD+) in multiple countries, cross-regional comparative policy and governance assessments (Indonesia, Peru, Tanzania and Vietnam), facilitation of South-South exchanges for knowledge-sharing, and development of curricula and best practice guidelines. FTA developed tools for data collection (e.g., tenure, rights, and benefit-sharing), and a GIS database to support PFES implementation, conducted trial plots to test climate-smart crop alternatives, and provided guidance and facilitated training opportunities on PFES design and implementation. Additionally, FTA research proposed policy recommendations and PFES benefit-sharing schemes based on FTA research findings on multi-country PFES experience and best practices, and co-developed improved PFES national-level policy frameworks. FTA engaged with representatives from provincial funds, communes, and district people's committee, private sector, government, agencies, research institutes and CSOs in a multi-stakeholder forum (e.g., Forum Peduli DAS Rejoso or FPDR) to discuss and design PFES M&E system. FTA's research framed PFES opportunities and gaps to raise the profile of PFES co-investment models and governance arrangements for equitable benefit-sharing. As a result of FTA research findings and engagement activities, multiple levels of governments enhanced understanding of local socio-political, technical and financial complexities around PFES implementation, and had increased capacity and technical support to develop and implement more effective and informed PFES policies, governance frameworks, and monitoring systems based on empirical data and evidence, and were expected to integrate PFES into rural poverty alleviation strategies and programs. Partners, allies, and international funding organizations were expected to be aware of and support design and implementation of PFES co-investment models and governance arrangements for equitable benefit-sharing at local, sub-national, and national levels. Practitioners were expected to gain awareness of and adopt benefit-sharing models to develop PFES proposals, implement and monitor PFES projects in accordance with national policy, and use best practices informed by research and empirical evidence. Private companies were expected to be involved in the design of PFES M&E systems and be incentivized to support and increase co-investment in benefit-sharing and PFES models based on PFES pilot results. Through participation in the co-development of improved PFES national-level policy frameworks, community-based organizations were better equipped to support farmers' organization and involvement in self-regulating the use of natural resources, as well as support farmers' access to PFES incentive schemes. FTA trial plots results and training increased smallholder communities'

¹⁹ Only the activities in Asia were assessed in this cluster for project Opportunities and Challenges to Developing REDD+ Benefit Sharing Mechanisms in Developing Countries

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

awareness of alternative income generation opportunities, incentivized access to PFES schemes with lower transaction costs and compliance. As a result, smallholders were expected to leverage technical and extension support, build capacities to adopt improved agronomic practices (increased yields for consumption or trade), comply with PFES regulations, and access benefits through PFES frameworks. Ultimately, it was expected that household vulnerability would reduce and incomes would increase through successful implementation of PFES.

Expected impact from the cluster: Potential to benefit 1,326,351 people in Asia

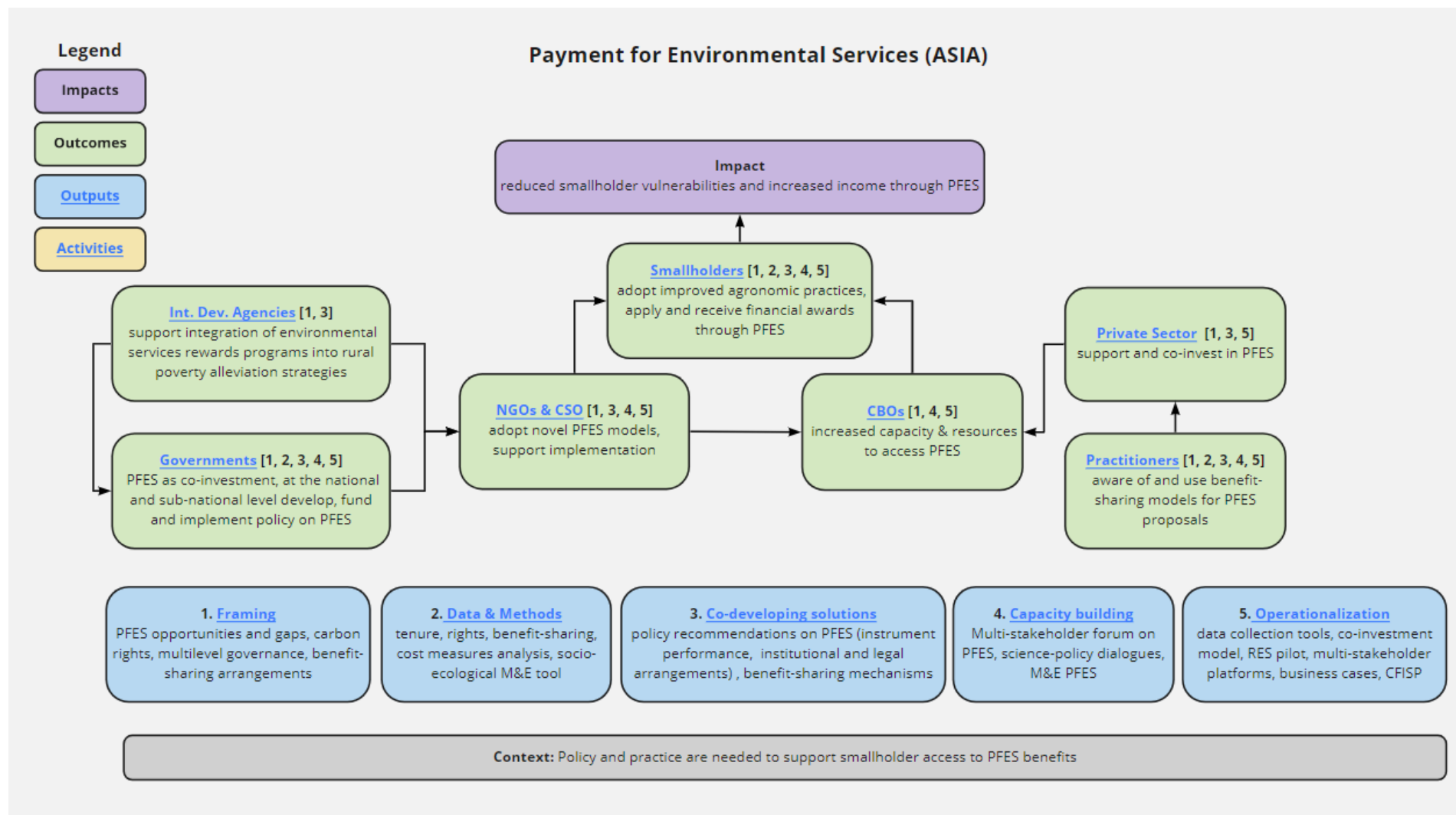


Figure 12. Cluster-level sub-ToC for FTA research on Payment for Environmental Services (Asia)

Table 29. Cluster: Climate-resilient Livelihoods (Asia)

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Climate-smart, Tree-based, Co-investment in Adaptation and Mitigation in Asia (STI)	ICRAF	2014-2017	USD 1,470,957	Indonesia, Philippines, Viet Nam
Green Rubber: Alleviating poverty and enhancing environmental integrity through re-storing ecosystem services in a tropical plantation crop in the Upper Mekong Region	ICRAF	2014-2017	USD 1,394,623	China, Laos, Myanmar and Thailand

Purpose: Reduce livelihood vulnerability to climate change

Across Asia, policy and climate-smart crop alternatives are needed to reduce smallholders' vulnerability to climate change. FTA research engaged with different agents in the rubber market chain from smallholders to government agencies (e.g., surveys, meetings, focus groups, SWOT analysis) to elicit knowledge on socio-economic impact of rubber monoculture in smallholder household revenue and livelihood. FTA applied the Capacity Strengthening Approach to Vulnerability Assessment (CaSAVA) framework to map and analyze farm and communities' vulnerabilities associated with climate change, assessed production potential and sustainability over time, conducted crop feasibility studies and participatory on-farm field evaluation trials with priority-species, and assessed crop resilience to climate variations and yield efficiency. FTA explored land-use dynamics, produced climate-aware data on crop tolerance, and developed tools and methods to estimate and monitor environmental services (e.g., carbon sequestration, biodiversity conservation, watershed function, etc.). FTA framed gender issues that influence smallholders' vulnerabilities, proposed concepts that help understand and address these issues and raise the profile of gender-sensitive environmental services incentive frameworks among stakeholders. Additionally, FTA developed adaptation and mitigation strategies for different country contexts and recommendations of alternative sustainable management practices (agroforestry) based on field-trial results. FTA provided training and capacity development opportunities to smallholders on tree-farming practices and market development and supported network-building and good practice exchange between researchers and farmers. Results of CaSAVA increased government officials' awareness about the gender-sensitive impact of climate change on livelihoods and incentivized them to create or adapt cross-sectoral policy and regulations, in response, to promote equitable access and benefit-sharing from environmental services incentive frameworks. With field-validated crop production data, technical support, and skills developed for tree-based farming and market, smallholders increased awareness of crop vulnerability to climate change and were expected to respond by changing on-farm management practices (e.g., tree-farm management, home-garden enrichment, enrichment of monocropping land with agroforestry) to reduce yield vulnerability to climate risks, and have the capacity to comply with environmental services incentive frameworks and adopt AF practices to diversify household income. These changes were intended to reduce climate change-driven impoverishment and vulnerability.

Expected impact from the cluster: Potential to benefit 2M people across China, Thailand, Myanmar, Laos and 2M people in Nepal

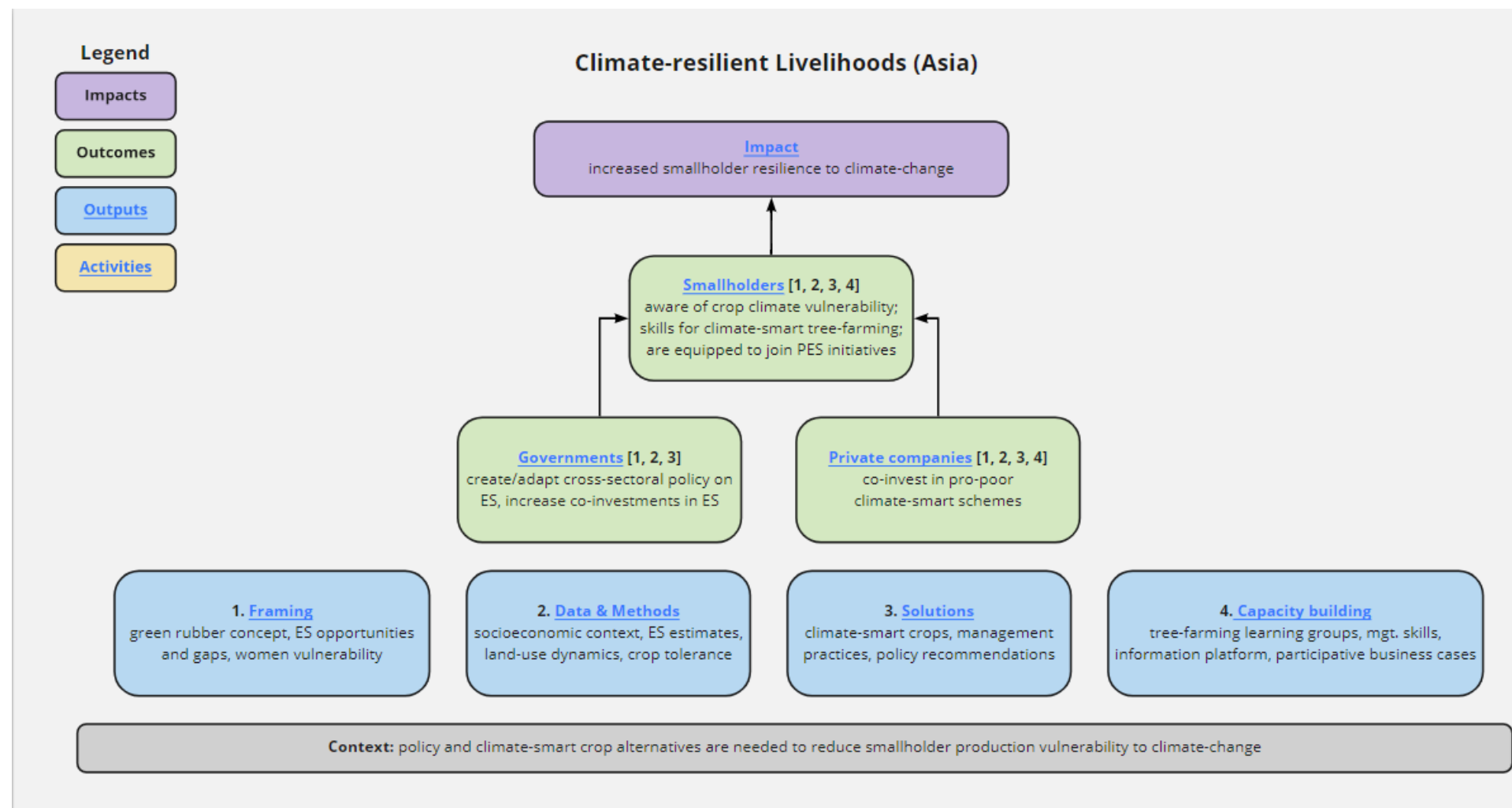


Figure 13. Cluster-level sub-ToC for FTA research on Climate-resilient Livelihoods (Asia)

Table 30. Cluster: Tenure Mechanisms (Global)

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
GCS Tenure	CIFOR	2014-2018	USD 1million - 2 million	Peru, Uganda, Indonesia (Tier I countries); Colombia, Kenya, Nepal (Tier II countries)
Addressing the gender gap in participation and representation in community forestry: Consolidation of research and action on gender, tenure and community forestry in Uganda and Nicaragua - 69	CIFOR	2013-2016	USD 664,200	Uganda, Nicaragua, Peru
Assessment of Natural Resource Governance Including Land and Forest Tenure in Coastal Mangrove Forests of Southeast Asia and Africa - 128	CIFOR	2015-2016	USD 144,084	Indonesia, Tanzania

Purpose: Improved livelihood opportunities through tenure mechanisms

Participation has long been viewed by development scholars and practitioners as a crucial element in enabling poor and marginalized groups to exert greater influence over institutions and decisions that critically affect their lives. There is still relatively little information on gender differentiated use of forest resources and women's role in decision making; there is even less guidance, or agreement, on how to promote women's participation. Broader awareness, capacity, and empirical data (i.e., gender-disaggregated, marginal groups) are needed to inform existing national policies for tenure mechanisms to increase equitable participation and benefit-sharing for forest-dependent communities across the world. FTA research conducted household surveys, interviews, FGD in target countries to explore gender differentiated forest use, benefits, perceptions, as well as women's and indigenous groups' participation in decisions across different tenure regimes and varying forest ecological conditions to better inform stakeholders on equitable participation in tenure mechanisms. FTA framed opportunities, gaps, and institutional conditions under which equitable and sustainable participation in tenure mechanisms can be achieved to raise the profile of women and indigenous groups, aiming increased representation and participation in land governance at national and international fora. FTA provided gender-disaggregated data to support national-level stakeholders in developing solutions for equitable land access and governance frameworks adapted to the country's context and needs. FTA offered capacity-building and training to graduate students and opportunities for diverse stakeholders (e.g., community leaders, NGOs, government officials) to engage in discussions on equitable participation and shared benefits derived from tenure mechanisms. In addition, FTA proposed options and recommendations to promote women's roles in community forest decision-making processes. As a result of FTA findings and engagement, researchers were expected to build capacities and advance the research agenda on women's and indigenous groups' rights to natural resources and tenure and disseminate synthesis of findings for a global audience (e.g., journal articles, conferences, policy briefs, reports). National research institutes built and improved research skills and were expected to adopt gender and intercultural lenses in their practices. Researchers were also expected to play a more direct role as knowledge translators to disseminate country-specific analyses to national and international audiences. At the international level, donors and international institutions were expected to gain awareness on tenure issues and increase funding to support national governments to develop, update, and implement national legislative frameworks that promote women's and indigenous groups' participation in sustainable forest management. At the local level, NGOs and CSOs learned from FTA research findings on equitable participation in tenure mechanisms to support policy revisions and implementation to ensure women and indigenous groups can benefit from and comply with the mechanism's requirements. With increased funding, pressure from local organizations, and access to gender-disaggregated data, governments would engage representatives from women's and indigenous groups to participate in decision-making processes and be better equipped to develop new or adapt policy to facilitate their access to tenure mechanisms. As a result, forest communities were expected to learn about tenure mechanisms and their respective compliance requirements, change practices to comply with tenure requirements, obtain formal tenure rights, and foster inclusion and participation of women and indigenous people in leadership positions. With formal tenure contracts, smallholders (including women and indigenous peoples) would be able to legally produce from their allotments, access loans to reinvest into land productivity, and access formal markets, ultimately improving their opportunities for sustainable livelihoods.

Expected impact from the cluster: potential benefit 4,840 people in Peru –other countries TBD – Six forest communities in Uganda increased % of women in leadership positions (from 11 to 54%) - (Addressing gender gap project)

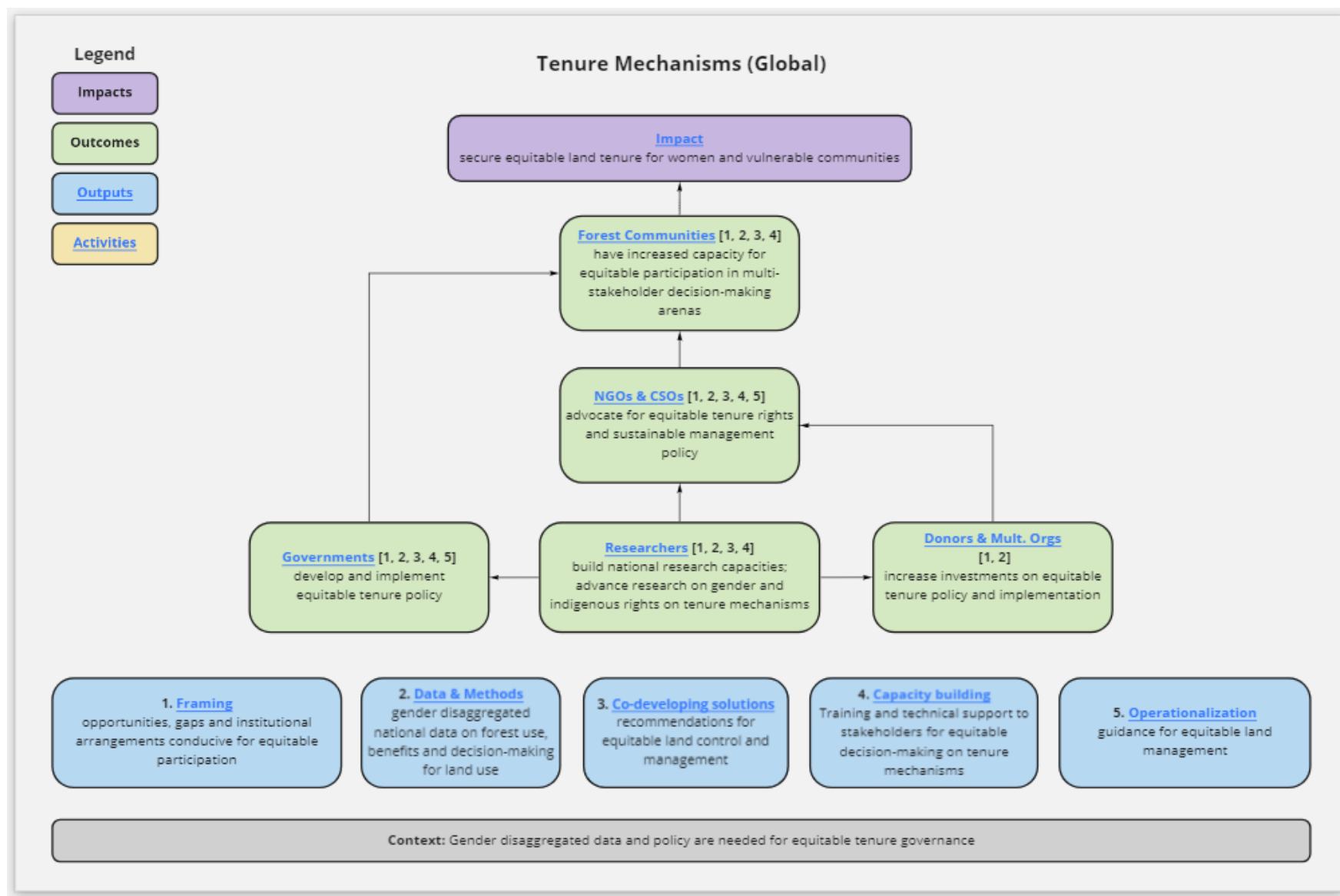


Figure 14. Cluster-level sub-ToC for FTA research on Tenure Mechanisms (Global)

Table 31. Cluster: Forest-based Livelihoods (Global)

<i>Project</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Poverty Environment Network (PEN)	CIFOR	2004-2015		24 countries across Central America, South America, Africa, and Asia
DFID Know-for 2: Poverty Environment Network (PEN)	CIFOR	2016-2017	USD 636,010	Global

Purpose: Reduce rural poverty through increased awareness of forest contributions to livelihoods globally

At the global level, tools, methods, and reliable data are needed to increase global awareness of forest contributions to poverty alleviation and livelihoods. FTA conducted household surveys and country case studies on forest-dependent livelihoods, analyzed factors influencing forest and environmental incomes, and engaged national and international audiences to share results and raise awareness. FTA produced knowledge and a global dataset on environmental income, tenure, safety nets, and gender roles to raise the profile of forest contributions to rural livelihoods throughout 24 developing, tropical and sub-tropical countries across three continents. FTA developed tools and methods for socio-economic forestry data collection, established a scientific network for knowledge-sharing, and supported capacity-building for local and international researchers and national research institutes to measure and monitor environmental income contributions to livelihoods. As a result of these contributions, national and international researchers were expected to have enhanced capacity, tools, and reliable data to build and advance the research agenda on forest-based livelihoods and become proponents of the findings within national and international fora, informing policy decisions regarding forest protection, management and use, and to ensure that the socioeconomic benefits from forests and trees are duly recognized in the global agenda. Multi-lateral organizations were expected to learn about forest-based livelihood contributions and adapt poverty measurement indicators for country assessments and global comparisons based on empirical data. Based on revised country assessments of poverty levels and uptake of FTA data, it was expected that donor organizations would acknowledge and further support the research agenda and relevant cross-sectoral initiatives for forest-based poverty reduction and increase funding to support national governments to develop, update, and implement national legislative frameworks for livelihoods dependent on forest resources. With increased international development funding, a new understanding of forest and livelihood dynamics, and access to reliable data on the contribution of forests and natural habitats to household welfare at a national scale and quantification methods, national governments were expected to be better equipped to assess environmental income and better inform decision-making for poverty alleviation strategies at scale. Ultimately, it was expected that the culmination of these outcomes would incentivize governments across the globe to improve poverty alleviation policy and strategies at national and sub-national levels to benefit forest-dependent rural livelihoods.

Expected impact from the cluster: address a strategic knowledge gap on the contributions of forest and environmental income in rural livelihoods for enhanced decision-making at national and international level

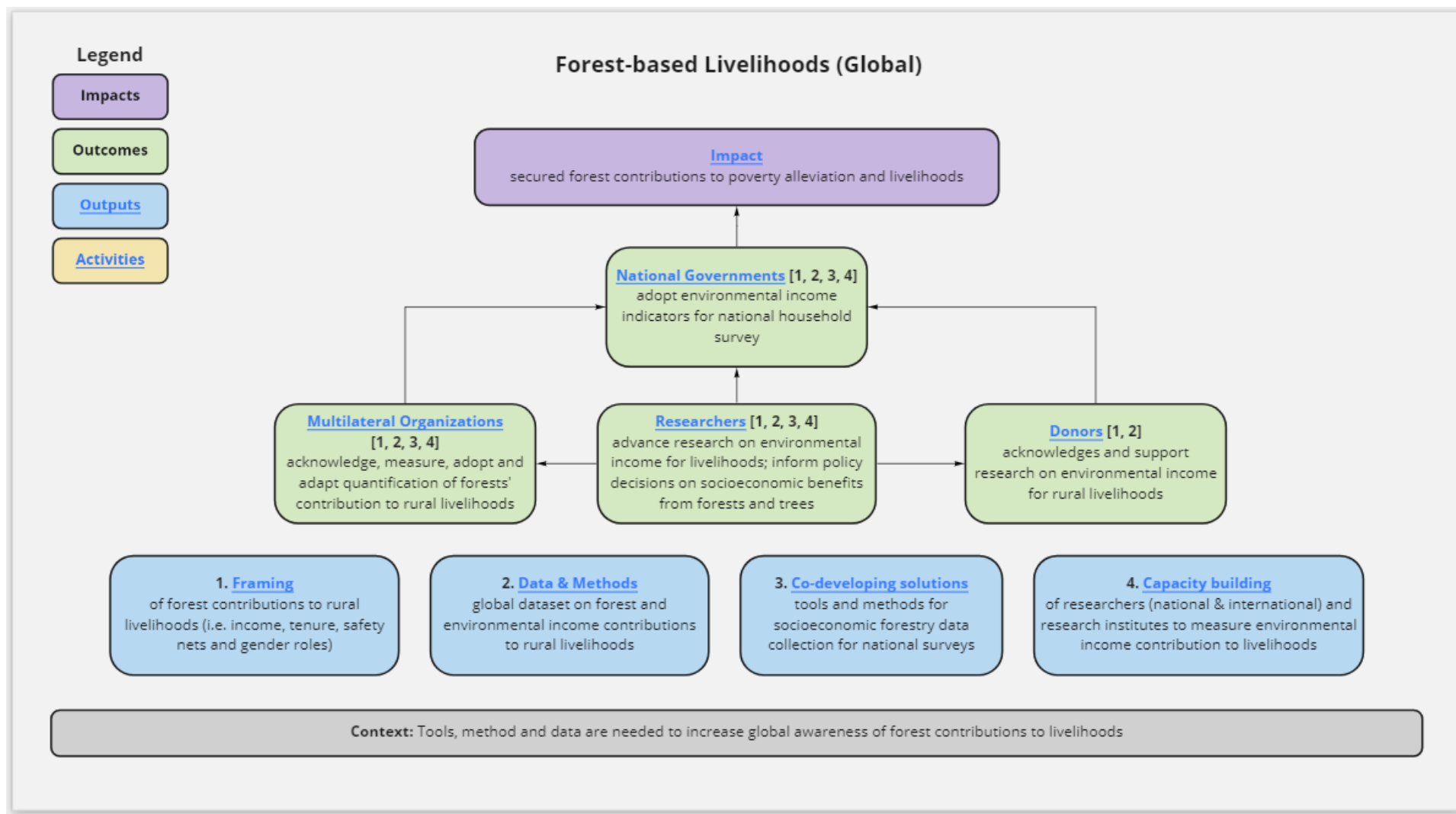


Figure 15. Cluster-level sub-ToC for FTA research on Forest-based Livelihoods (Global)

Table 32. Cluster: Bioenergy (Global)

<i>Projects</i>	<i>Centre</i>	<i>Duration</i>	<i>Budget</i>	<i>Countries</i>
Programme for the Development of Alternative Biofuel Crops - IFAD 1043	ICRAF	2012-2016	2,500,000 USD	India, Brazil, Kenya
Bamboo as Sustainable Biomass Energy	INBAR	2009-2013		Ethiopia, Ghana
South-South Knowledge Transfer Strategies	INBAR	2014-2018	EUR 1,000,070	Tanzania, Ethiopia, Madagascar
Dutch-Sino East Africa Bamboo Development Programme	INBAR	2016-2019 / 2020-2023	EUR 2, 029, 688	China, Ethiopia, Kenya, Uganda
Inter-Africa Livelihood Development Programme	INBAR	2018-2021		China, Cameroon, Ghana, Ethiopia, Madagascar

Purpose: Reduce poverty through bioenergy value-chains

In rural and peri-urban areas of Africa and Southeast Asia, many households rely on wood as the primary energy source, especially for cooking. Wood extraction for charcoal production is a significant driver of forest degradation and deforestation. Simultaneously, large natural reserves of indigenous and planted bamboo within these regions remain untapped as an energy source. Globally, limited knowledge on socio-economic benefits of alternative sustainable biomass for energy production (e.g., bamboo, oilseed trees), policy, and market opportunities hinder the development of equitable and pro-poor sustainable bioenergy value chains. In response, FTA and partners have introduced in several African countries (e.g., Ethiopia, Ghana, Madagascar, and Tanzania) findings from research previously conducted in China demonstrating the calorific value and benefits of using bamboo as a fuel source, and bamboo bioenergy products (i.e. brick kilns and metal kilns) via various market campaigns (i.e., market analysis, fairs, bamboo garden exhibitions, films, leaflets, piloting bamboo charcoal production, study tour, policy consultancy workshops, etc.) aimed at promoting wider awareness of alternative biomass energy source and support uptake. These campaigns increased local stakeholders' (e.g., policy makers, communities, public and private sectors) awareness of the advantages of bamboo biomass production and influenced uptake in practice. In India, Brazil and Kenya, FTA engaged with multiple stakeholders, including government, private sector, and civil society, to develop sustainable agroforestry systems with integrated food and energy production (e.g., multifunctional silvopastoral and AFS with oil-bearing trees). FTA co-developed training curricula, value-added technical guidelines targeted to smallholders, and delivered diverse training and capacity-building opportunities for smallholders and CBOs. FTA engaged local communities in capacity-building activities across several projects via training in farm field schools and workshops, increasing local communities' capacities to cultivate, manage, and procure alternative biomass sources (e.g., bamboo, oilseed trees). FTA assessed the viability of alternative biomass for energy production, value chains, and processing technologies; conducted pilot farm trials; offered capacity-building and support for establishing micro- and community nurseries; and co-developed community-led enterprise models. FTA analyzed the influence of bioenergy production on gender equality and empowerment to raise the profile of issues faced by women in the bioenergy production sector among government stakeholders. Additionally, FTA provided solutions for market-based farming systems (e.g., organized household charcoal and smallholder waste biomass aggregation) inclusive SME development, and value chain models to smallholders and CBOs. FTA generated accurate, up-to-date, and spatially explicit data and maps of priority-species natural resources to inform decision-making, planning, and cross-sectoral policies for sustainable management and use. Additionally, FTA provided cross-sector policy recommendations on bioenergy for livelihoods at the national and sub-national level. As a result of FTA research findings and engagement activities, government officials would learn about bamboo as an alternative biomass source for energy production, have increased awareness of the untapped natural reserves available in their respective regions, and be incentivized to take up policy recommendations derived from FTA findings to create or adapt cross-sector policy on bioenergy to support the integration of poverty reduction strategies at national and sub-national levels, as well as be incentivized to increase public funding to implement revised or new policy. Market campaigns and bamboo charcoal production pilots increased CBOs awareness of the advantages of alternative bioenergy production, and CBOs participants' skills and support to equitable and sustainable bioenergy production and SMEs, as well as create or upscale community-led bioenergy value chains. With access to FTA-developed processing technology and technical support, SMEs diversified production by developing and participating in industrial bioenergy value chains to benefit women and youth. Smallholders would then have increased capacity to cultivate, manage, and procure alternative biomass sources (e.g., bamboo, oilseed trees) and be incentivized to adopt high-quality germplasm, integrated food-energy systems, and biocarbon production in their

FTA’s Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

practices, as well as access bioenergy incentives for household income diversification and resilience. These changes were intended to increase employment opportunities for communities and income through bioenergy value chains.

Expected impact from the cluster: there is evidence of 64,492 people as direct and indirect beneficiaries of FTA projects (Low-end estimate) [requires follow up to estimate impact potential]

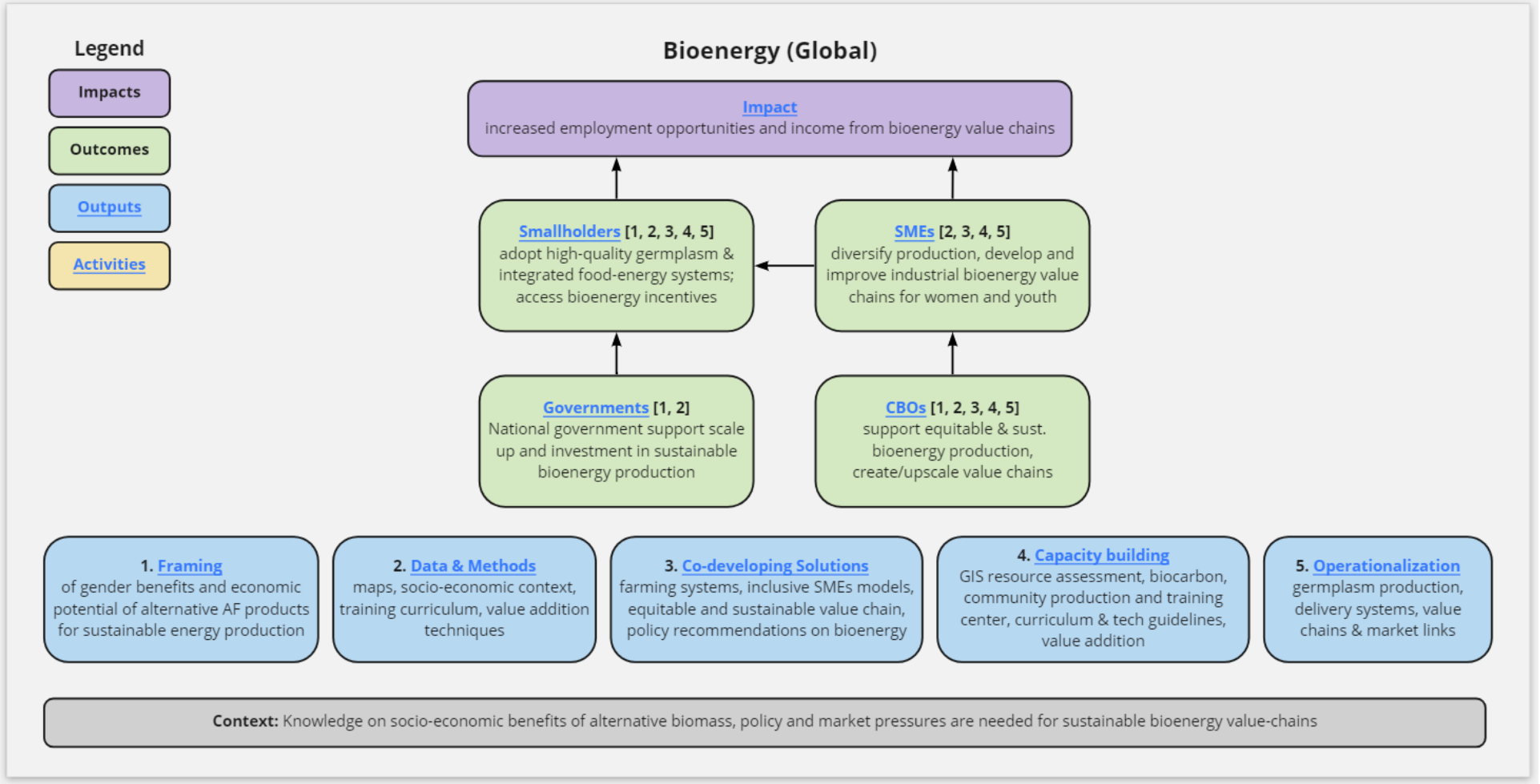


Figure 16. Cluster-level sub-ToC for FTA research on Bioenergy (Global)

Appendix 2. Disaggregated Cluster Appraisal of Existing and Available Evaluation Evidence (by Project)

1. FLEGT (Congo Basin) Cluster

Prioritization: low-medium

- CIFOR-ICRAF representation
- Representative of FTA and bilateral investment (budget ~\$15M USD)
- Preliminary outcome evidence is limited with key gaps
- Impact estimations may be possible with policy analysis (Cameroon only), but require supporting evidence of outcome realization and projects' contributions to achievement of policy targets (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment ²⁰ , & Confidence ²¹	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
<p>Governing multifunctional landscapes (GLM) in Sub Saharan Africa: Managing trade-offs between social and ecological impacts (CIFOR, ICRAF)</p> <ul style="list-style-type: none"> • Cameroon • Congo (DRC) • Gabon • Ghana • Liberia • Sierra Leone • Tanzania 	<ul style="list-style-type: none"> • 1 midterm report (2020) • 1 CIFOR annual report (2019) • 1 FTA annual report (2019) • 2 CIFOR press releases (2021, 2021) <p>*ongoing project (may be too young)</p>	<p>*self-reported – lower reliability</p> <p>*confidence: low</p> <ul style="list-style-type: none"> • Governments outcomes (L): only expected outcomes discussed • Researcher outcomes (L): only expected outcomes discussed • NGOs/CSO outcomes (L): only expected outcomes discussed • Private Companies: (L) indication of support SMEs value chains • Smallholder/SME outcomes (L): only expected outcomes discussed 	N	<ul style="list-style-type: none"> • Government's outcomes: need evidence of learning, policy change, uptake and use of outputs, practice change • Researcher outcomes: evidence of uptake and use of project findings • NGO/CSO outcomes: need evidence of learning, uptake and use of outputs, practice change • Private companies: need evidence of learning, policy change, practice change • Smallholder/SME outcomes: need evidence of learning, uptake and use of outputs, practice change <p>Impact estimations: N/A</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with policymakers, NGOs, CSOs, research team, timber companies, smallholders/SMEs</i> • <i>Bibliometric analyses</i> 	<p>Outcome level: TBD. Likely requires intensive data collection and should consider that the project is in progress (availability of preliminary evidence/outcome realization).</p> <p>Impact level: Unsure if possible/feasible to collect</p>

²⁰ The reliability of evidence sources was determined by an assessment of whether the source was internally produced (lower reliability) or conducted by an external source (higher reliability). It was thought that external reports provide an additional level of quality control of the evidence. The confidence of evidence sources was determined by an assessment of the quality of the evidence source and its assessment (criteria included methodological approach (e.g., theory-based evaluation, quasi-experimental design), primary versus secondary/tertiary data collection, level of detail, indications versus clear realization, triangulation of evidence, etc.).

²¹ A set of criteria was used to inform the prioritization assessment to enable strategic selection of clusters (and/or projects within a cluster) for additional evidence collection. These criteria include: potential overlap of cluster/project(s) for other challenges; geographic overlap and representation; FTA centre representation; pathway overlap; proportion of FTA and bilateral investment of cluster/project (i.e., prioritizing clusters/projects with larger budgets); likelihood for availability of outcome evidence; and likelihood for availability and/or feasibility to assess and quantify the scale of impact.

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>Appui technique au Ministère des Forêts et de la Faune pour l'opérationnalisation de la page web et la collecte de données dans le cadre de la mise en œuvre de l'Annexe VII de l'APV/FLEGT (CIFOR)</p> <ul style="list-style-type: none"> Cameroon 	<ul style="list-style-type: none"> 1 output report - State of timber sector in Cameroon (2015) 1 external website (2020) 	<p>*self-reported – lower reliability</p> <p>*confidence: low</p> <p>No evidence (reports emphasize outputs; main project contribution appears to be VPA website Annex VII)</p>	<p>N</p> <p>[project report indicates 79 forestry concessions had approved management plans & 19 licenses issued for council forests – does not quantify # of potential beneficiaries]</p>	<ul style="list-style-type: none"> Government's outcomes: need evidence of learning, evidence of policy change, evidence of uptake and use of project findings, evidence of practice change Researcher outcomes: evidence of uptake and use of project findings <p>Impact estimations: N/A</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews with policymakers, research team</i> <i>Bibliometric analyses</i> Quantification of impact estimation: TBD 	<p>Outcome level: Likely not, very limited initial evidence base and small project budget (<\$50 000 USD)</p> <p>Impact level: Not possible to derive</p>
<p>Essor des demandes publiques et privées camerounaises en sciages d'origine légale (CIFOR)</p> <ul style="list-style-type: none"> Cameroon 	<ul style="list-style-type: none"> 1 midterm report (2018) 1 final report (2019) 1 CIFOR press release (2017)^c 	<p>*self-reported – lower reliability</p> <p>*confidence: low</p> <ul style="list-style-type: none"> Governments outcomes (L): only intended outcomes discussed Researcher outcomes (L): does not report related outcomes NGOs/CSO outcomes (L) Private company outcomes (L) Smallholder/SME outcomes (L) 	<p>Y</p> <p>(Expected policy change)</p>	<ul style="list-style-type: none"> Governments outcomes: need evidence of learning, policy change, uptake and use of project findings, practice change Researcher outcomes: uptake and use of outputs NGOs/CSO outcomes: need evidence of learning, uptake and use of outputs, practice change Private companies' outcomes: need evidence of learning, policy change, practice change Smallholders & SMEs outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change <p>Impact estimations: Derive from policy targets (?)</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media, review)</i> <i>Interviews/surveys with policymakers, NGOs, CSOs, research team, timber companies, smallholders/SMEs</i> <i>Bibliometric analyses</i> Quantification of impact estimation: policy review 	<p>Outcome level: TBD. Likely requires intensive data collection.</p> <p>Impact level: Possible</p>
<p>Policy and regulatory options to recognize and better integrate the domestic timber sector in tropical countries (PRO-FORMAL) (CIFOR)</p>	<ul style="list-style-type: none"> 1 outcome story (2016) 1 evaluation report (2014) 3 FTA annual reports (2013, 2014, 2015) 	<p>*external evaluation commissioned – higher reliability</p> <p>*confidence: low-medium</p> <ul style="list-style-type: none"> Government outcomes (M) Researcher outcomes (M) NGOs/CSO outcomes (L): does not report outcomes Private company outcomes 	<p>Project target: Potential to reach about 71,000 timber operators involved in small-scale logging and milling, which contribute to the livelihoods of about 300,000 people in Central Africa.</p>	<ul style="list-style-type: none"> Governments outcomes: need evidence of learning, evidence of governmental uptake and use of project findings Researcher outcomes: more detail of graduate student capacity-building, uptake and use of outputs <p>Impact estimations: Possibly project contributions can be connected to other projects' impact logic</p> <ul style="list-style-type: none"> <i>Additional document review (project documents,</i> 	<p>Outcome level: Possibly, preliminary evidence is promising though key gaps exist</p> <p>Impact level: Not possible?</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<ul style="list-style-type: none"> Cameroon Congo (DRC) Gabon Ecuador Indonesia 		(L): does not report outcomes • Smallholder outcomes (L): does not report outcomes		<i>trip reports, external media)</i> • Interviews/surveys with policymakers, research team, timber companies • Bibliometric analyses	
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2. Timber Markets (Central Africa) Cluster

Prioritization: low

- CIFOR representation
- Overlap with Challenges 1 & 3
- Overlap in regional representation
- Representative of FTA and bilateral investment (budget ~3M USD)
- Preliminary outcome evidence is limited with key gaps
- Impact estimations not possible with current available evidence

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? Suggestions for additional data collection (for both outcomes and impact).	Prioritization for additional evidence?
DFID KNOWFOR 2: SMEs and Informal Sectors – RTI 142 (CIFOR) <ul style="list-style-type: none"> Cameroon DRC Gabon Indonesia Zambia 	<ul style="list-style-type: none"> 1 Annual report (2016) 1 Technical Report for scientists (2017) DFID Cost-extension (2016-2017) 1 External evaluation 	*reliability: low (self-reported sources) *confidence: medium <ul style="list-style-type: none"> Governments outcomes (L) limited evidence for Cameroon and Zambia only NGOs and CSO outcomes (L) evidence for Cameroon only Communities (L) no evidence CFE & SMEs (L) indication of evidence for Zambia only Local & international consumers outcomes (L) no evidence 	N	<ul style="list-style-type: none"> Governments outcomes: needs updated and detailed evidence for Cameroon and Zambia. Needs evidence for DRC and Gabon NGOs and CSO outcomes: needs updated and detailed evidence for Cameroon and Zambia. Needs evidence for DRC and Gabon Communities outcomes: need evidence for all countries CFE & SME outcomes: needs detailed and updated evidence for Zambia. Need evidence for Cameroon, DRC, and Gabon Local & international consumers outcomes: needs evidence for all countries Impact estimations: not possible to derive • Additional document review (project documents, trip reports, external media) • Interviews/surveys with policymakers, research team, timber companies • Bibliometric analyses	Outcome level: Possible that more evidence is available. Impact level: Not possible to derive
To take stock of community forestry enterprises involved in commercialization of timber in Africa – RTI35	Same as above	Same as above	Same as above	Same as above	Same as above

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

(CIFOR)					
<ul style="list-style-type: none"> Cameroon DRC Gabon 					
<p>Promouvoir et Formaliser l'Exploitation Artisanale du bois en Afrique Centrale (PROFEAAC) (CIFOR)</p> <ul style="list-style-type: none"> Cameroon DRC Gabon 	<ul style="list-style-type: none"> 4 midterm reports (2021, 2021, 2021, 2021) <p>*ongoing project (may be too early to collect evidence)</p>	<p>*reliability: low (self-reported sources [e.g., partner reports])</p> <p>*confidence: medium</p> <ul style="list-style-type: none"> Government outcomes (L): limited evidence NGO & CSO outcomes (L): limited evidence CFE & SME outcomes (L): limited evidence Community outcomes (L): no evidence Consumers outcomes (L) 	N	<p>All pathways need further detailed evidence to assess outcome realization</p> <p>Impact estimations: Not possible to derive (too early in the research process)</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, NGOs, timber companies, research team, communities</i> 	<p>Outcome level: No evidence (need to consider the infancy of the project and value of preliminary evidence)</p> <p>Impact level: Not possible to derive</p>

3. Diversification of Agroforestry-based Income in Sub-Saharan Africa Cluster

Prioritization: medium-high

- ICRAF representation
- Overlap with Challenge 2& 5
- Overlap in regional representation
- Representative of FTA and bilateral investment (budget >\$80M USD)
- Preliminary outcome evidence is promising with key gaps
- Impact estimations are available (missing for 3 projects only) but require supporting evidence of outcome realization

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? Suggestions for additional data collection (for both outcomes and impact).	Prioritization for additional evidence?
<p>EADD: East Africa Dairy Development – Phase II (HFER-1088) (ICRAF)</p> <ul style="list-style-type: none"> Ethiopia Kenya Tanzania Uganda 	<ul style="list-style-type: none"> Project proposal (2013) Final project report (n.d.) 2 manuscripts ICRAF's Project page Partner (Heifer) webpage 	<p>*reliability: (L) for internal sources, (M) for academic article and external source</p> <p>*confidence: L/M</p> <ul style="list-style-type: none"> Researcher outcomes (L): no evidence Government outcomes (L): limited evidence for Uganda Donor & Partner outcomes (L): no evidence 	<p>Y</p> <p>Sustainable livelihoods for 216,000 farmers - or 1.22 million people - in Ethiopia Kenya, Tanzania and Uganda by 2018</p>	<ul style="list-style-type: none"> Researcher outcomes: N/A Government outcomes: needs evidence for Ethiopia, Kenya and Tanzania Donors & Partners outcomes: N/A Private Sector outcomes: N/A NGOs & CSO outcomes: needs evidence for Ethiopia, Kenya and Tanzania <p>Impact estimations: already have</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports,</i> 	<p>Outcome level: possibly, but likely require extensive data collection</p> <p>Impact level: already have</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

		<ul style="list-style-type: none"> Private Sector outcomes: (L) limited evidence Extension Worker outcomes: (M) NGO/SO outcomes: (M) Farmers outcomes: (H) 		<i>external media</i> <ul style="list-style-type: none"> Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities Bibliometric analyses 	
<p>T4FS: Developing Integrated Options and Accelerating Scaling up of Agroforestry for Improved Food Security and Resilient Livelihoods In Eastern Africa - Trees for Food Security - II (ACAR-1211)</p> <p>(ICRAF)</p> <ul style="list-style-type: none"> Ethiopia Rwanda Uganda 	<ul style="list-style-type: none"> FTA annual report (2019) Project Overview and Progress report (2019) 1 academic article 	<p>*reliability: (L) for internal sources, (M) for academic article</p> <p>*confidence: L/M</p> <ul style="list-style-type: none"> Researcher outcomes: (M) Gov't outcomes: (H) Donors & Partners outcomes: (M) Private Sector outcomes: (L) no evidence Extension Workers outcomes: (L) evidence for Uganda only NGOs & CSO outcomes: (L) limited evidence Farmers outcomes: (H) 	<p>Y</p> <p>Improved productivity and household income, through uptake of locally adapted agroforestry options by 50,000 households to benefit of 222,000 people</p>	<ul style="list-style-type: none"> Researcher outcomes: evidence of uptake and use Private Sector outcomes: N/A Extension Workers outcomes: needs evidence for Ethiopia and Rwanda NGOs & CSO outcomes: needs evidence of uptake and use <p>Impact estimations: already have</p> <ul style="list-style-type: none"> Additional document review (project documents, trip reports, external media) Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities Bibliometric analyses 	<p>Outcome level: TBD: ongoing project</p> <p>Impact level: already have</p>
<p>PRUNSAR: Food Trees for Diversified Diets, Improved Nutrition, and better Livelihoods for Smallholders in East Africa (IFAD - 1187)</p> <p>(ICRAF)</p> <ul style="list-style-type: none"> Kenya Uganda 	<ul style="list-style-type: none"> Final Report – Annex 1 (2020) 1 donor report (2019) 	<p>*reliability: (L) for internal sources, (M) for donor report</p> <p>*confidence: L/M</p> <ul style="list-style-type: none"> Researcher outcomes: (M) Government outcomes: (L) no evidence Donors & Partners outcomes: (L) no evidence Private Sector outcomes: (L) no evidence Extension Workers outcomes: (L) limited evidence NGOs & CSO outcomes: (M) Farmers outcomes: (M) 	<p>N</p>	<ul style="list-style-type: none"> Government outcomes: N/A Donors & Partners outcomes: N/A Private Sector outcomes: need evidence of learning, uptake, and use Extension Workers outcomes: needs evidence for Uganda; needs evidence of uptake and use in Kenya NGOs & CSO outcomes: needs evidence for Uganda; needs evidence of uptake and use in Kenya Farmers outcomes: needs evidence for Uganda; needs evidence of enterprise development/access to markets in Kenya <p>Impact estimations: not possible to derive</p> <ul style="list-style-type: none"> Additional document review (project documents, trip reports, external media) Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities 	<p>Outcome level: possibly, but likely require extensive data collection</p> <p>Impact level: not possible to derive</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

				<ul style="list-style-type: none"> • <i>Bibliometric analyses</i> 	
<p>SILMS: Sustainable Integrated Land Management Solutions for agricultural value chains in Zambia (SNDO - 1179) (ICRAF)</p> <ul style="list-style-type: none"> • Zambia 	<ul style="list-style-type: none"> • 3 annual reports (2016, 2017, 2018) 	<p>*reliability: M [self-reported sources]</p> <p>*confidence: M [data corroborates across reports]</p> <ul style="list-style-type: none"> • Government outcomes (L): limited evidence • Donors & Partners outcomes (M) • Private Sector outcomes (M) • Extension Workers outcomes (M) • NGOs & CSO outcomes: (H) • Farmers outcomes: (H) 	<p>Y</p> <p>[Project target]</p> <p>15,000 farmers practicing ISFM and/or agroforestry</p> <p>15% increase in income from commodities sold annually.</p>	<ul style="list-style-type: none"> • Government outcomes: needs evidence of learning and policy change to support adoption • Private Sector outcomes: needs evidence of support for scaling solutions • NGO & CSO outcomes: triangulation would strengthen • Farmer outcomes: triangulation would strengthen • Extension worker outcomes: details on Private sector extension services would strengthen <p>Impact estimations: already have</p> <ul style="list-style-type: none"> ◦ <i>Additional document review (project documents, trip reports, external media)</i> ◦ <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> ◦ <i>Bibliometric analyses</i> 	<p>Outcome level: Possible availability of additional evidence</p> <p>Impact level: already has project target</p>
<p>DRYDEV: A Regional Programme in the Sahel and Horn of Africa, enhancing Food and Water Security for Rural Economic Development (ICRAF)</p> <ul style="list-style-type: none"> • Burkina Faso • Ethiopia • Kenya • Mali • Niger 	<ul style="list-style-type: none"> • 1 external evaluation (2018) • 1 final report (2020) • 1 internal webpage (n.d.) • 1 external webpage (2021) • 3 ICRAF annual reports (2015, 2017, 2018) • 3 FTA annual reports (2017, 2018, 2019) 	<p>*reliability: medium (self-reported & external)</p> <p>*confidence: medium</p> <ul style="list-style-type: none"> • Government outcomes (M) • Partner outcomes (M) • Donor outcomes (L) • Private actor outcomes (L) • Farmer outcomes (H) 	<p>Y</p> <p>[target]</p> <p>250,000 farmers will benefit from DRYDEV by the time the project comes to an end in 2018</p> <p>[achieved]</p> <p>>100,000 farmers practice landscape-level NRM</p> <p>[achieved]</p> <p>143,067 farmers applying SWC to 105,592 ha</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence of government learning; need evidence of specific output uptake into policy • Partner outcomes: need evidence of partner learning; need evidence of partner output uptake; need evidence of partner scaling • Donor outcomes: need evidence of donor support for scaling • Private actor outcomes: need evidence of changes in investment decisions <p>Impact estimations: Already have.</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, forest cooperatives, partners, graduate students/research team</i> • <i>Bibliometric analyses</i> 	<p>Outcome level: Possibly not because of recent evaluation and additional evidence may take time to materialize (i.e., may not be available)</p> <p>Impact level: already have project target</p>
<p>Agroforestry Food Security Programme –</p>	<ul style="list-style-type: none"> • Internal evaluation (2019) 	<p>*moderate-high reliability: external validation through</p>	<p>Y</p>	<ul style="list-style-type: none"> • Researcher outcomes: needs evidence of learning, uptake and use 	<p>Outcome level: Possibly, but likely</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>AFSP I & II (IRLD-1007)</p> <p>Bridging project between AFSP I and II - Evergreen Agriculture</p> <p>AFSP II: Agroforestry Food Security Programme (BELG-1165. Phase II of IRLD-1007)</p> <p>Extending AFSP II (ICRAF)</p> <ul style="list-style-type: none"> Malawi 	<ul style="list-style-type: none"> Project webpage 1 academic article FTA Annual report (2018) 	<p>evaluation, but variable specificity in reporting</p> <p>*moderate-high confidence: multiple sources corroborate claims</p> <ul style="list-style-type: none"> Researcher outcomes (L) no evidence Government outcomes (M) Donors & Partners outcomes: (L) no evidence Private Sector outcomes (L) limited evidence Extension Worker outcomes (M) NGOs & CSO outcomes: (L) limited evidence Farmers outcomes (H) 	<p>200,000 farmers</p> <p>[as per AFSP II internal evaluation]</p>	<ul style="list-style-type: none"> Government outcomes: needs evidence of learning, uptake and use Donors & Partners outcomes: N/A Private Sector outcomes: Extension Workers outcomes: needs evidence of uptake and use of enhanced extension techniques NGOs & CSO outcomes: needs evidence of support adoption and scaling up AF practices by farmers <p>Impact estimations: already have</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> <i>Bibliometric analyses</i> 	<p>require extensive data collection</p> <p>Impact level: already have</p>
<p>Community Forestry Tree Seed Banks (CATS Banks)</p> <p>Building Agroforestry Scaling up Platform for Diversifying Livelihood Opportunities in Malawi & Mozambique (ICRAF)</p> <ul style="list-style-type: none"> Malawi Mozambique 	<ul style="list-style-type: none"> 1 internal evaluation (2014) 1 final report (2012) 1 presentation (2021) 	<p>*moderate-high reliability: external validation through evaluation, but variable specificity in reporting</p> <p>*moderate-high confidence: multiple sources corroborate claims, representative sample taken</p> <ul style="list-style-type: none"> Farmer outcomes (H) Private sector (H) NGO & CSO (H) Extension workers (H) Government outcomes (M) 	<p>N</p>	<ul style="list-style-type: none"> Government outcomes: needs evidence of support scaling Extension workers outcomes: needs evidence of provision of enhanced extensions services <p>Impact estimation: Possible to derive from number of users of CATS Banks</p> <ul style="list-style-type: none"> <i>Additional document review (e.g., trip reports, training materials)</i> <i>Interviews/surveys with scientists, project partners, NGO and extension agents' representatives</i> 	<p>Outcome level: Possibly – low input to fill gaps</p> <p>Impact level: Possible but likely require extensive data collection form CATS Banks</p>
<p>SAIRLA: Bringing evidence to bear on negotiating ecosystem service and livelihood trade-offs in sustainable agricultural intensification (ICRAF)</p> <ul style="list-style-type: none"> Burkina Faso 	<ul style="list-style-type: none"> 1 final report (2020) 1 FTA annual report (2019) 	<p>*low reliability: limited self-reported evidence base</p> <p>*low confidence: limited self-reported evidence base</p> <ul style="list-style-type: none"> Farmer outcomes (L): not disaggregated Private sector (L) no evidence NGO & CSO (L): limited 	<p>N</p>	<p>All outcomes require more precise critical analysis of achievement, outcomes are not reported in an actor-specific way.</p> <p>Indications that stakeholder disaggregated dataset exists to specify who accessed which knowledge for what use, and how relationships changed.</p> <p>Impact estimations: Require further evidence collection</p>	<p>Outcome level: Possible that more evidence is available.</p> <p>Impact level: Not possible</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<ul style="list-style-type: none"> Ethiopia Ghana Malawi Tanzania Zambia 		<p>evidence</p> <ul style="list-style-type: none"> Extension workers (L) no evidence 		<ul style="list-style-type: none"> <i>Collection of mid-line and end-line surveys used to report stakeholder use of research</i> <i>Interviews/surveys with scientists, partners, participating (lead) farmers.</i> 	
<p>EURU-1150 Empowering Forestry Dependent Communities through Commercialization of Small-Scale Forestry</p> <ul style="list-style-type: none"> Malawi 	<ul style="list-style-type: none"> 1 project brochure n.d. 1 final report 	<p>* reliability: low-medium [self-reported sources]</p> <p>* confidence: low-medium</p> <ul style="list-style-type: none"> Farmer outcomes (H) Private sector outcomes (M) NGO & CSO outcomes (H) Extension workers outcomes (M) 	<p>Y</p> <p>[project target] 140,000 people from 28,000 households in 140 forest-dependent communities</p> <p>[reported potential] 280,000 people from 56,000 households in 280 forest-dependent communities</p>	<ul style="list-style-type: none"> Farmer outcomes: needs evidence of increased production and access to markets Private sector outcomes: needs evidence of support to value chains <p>Impact estimations: Already have</p> <ul style="list-style-type: none"> <i>Additional document review (e.g., trip reports, training materials)</i> <i>Interviews/surveys with scientists, project partners, NGO and extension agents' representatives</i> <i>Bibliometrics analyses</i> 	<p>Outcome level:</p> <p>Farmers outcomes likely require time for planted trees full maturation</p> <p>Impact level: already have</p>
<p>Regreening Africa: reversing land degradation by scaling up evergreen agriculture (ICRAF)</p> <ul style="list-style-type: none"> Ethiopia Rwanda Somalia Mali Niger Ghana Senegal 	<ul style="list-style-type: none"> 1 annual report (2019) 1 FTA annual report (2019) 1 project log (2018-2019) 3 internal blogs (2019, 2020, 2021) 1 ICRAF final report (2018) 	<p>* medium reliability: multiple internal sources corroborate targets, achievements and strategies employed, but limited critical assessment on outcomes</p> <p>* medium confidence: triangulation of information from multiple internal data sources, however, no primary data collection or externally commissioned reports</p> <ul style="list-style-type: none"> Farmer outcomes (L) limited evidence Private sector outcomes: (L) no evidence NGO & CSO outcomes (L) limited evidence 	<p>Y (low reliability, adoption data will be collected on an ongoing basis via app)</p> <p>145,274 households* across eight African countries adopted farmer managed natural regeneration through options by context</p> <p>High-end estimate target 500,000 households (2M people) across 8</p>	<p>All outcomes require more precise critical analysis of achievement, outcomes are not currently reported in an actor-specific way.</p> <p>Impact estimations: Require validation/updating.</p> <ul style="list-style-type: none"> <i>Interviews/surveys with scientists, partners, participating (lead) farmers.</i> 	<p>Outcome level: Yes – annual reporting reports against intended outcomes, so data to serve multiple needs appears promising.</p> <p>Impact level: Yes – preliminary figures are available that require external validation/updating</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

		<ul style="list-style-type: none"> Extension worker outcomes (L) limited evidence Government outcomes (M): project contributions not clear Donors & partners outcomes (L): no evidence Researcher outcomes (L): limited evidence 	African countries (Ethiopia, Ghana, Kenya, Mali, Niger, Rwanda, Senegal, Somalia) by 2022		
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4. Sustainable Forest Enterprises in Central Africa Cluster

Prioritization: medium

- ICRAF representation
- Overlap in Challenge 1 & 3
- Representative of FTA investment (budget <\$10M USD)
- Feasible (1 project, though had recent reporting)
- Preliminary outcome evidence is promising (strong for 1 pathway), but notable gaps exist
- Impact estimations may be possible, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
<p>DRYAD: Improving Livelihoods and Land Use in Congo Basin Forests - Financing Sustainable Community Forest Enterprises in Cameroon (ICRAF)</p> <ul style="list-style-type: none"> • Cameroon 	<ul style="list-style-type: none"> • 1 CIFOR-ICRAF annual report (2020) • 1 internal blog (2020) • 1 end-of-project presentation (2020) • 1 final report (2020) • 1 ICRAF annual report (2017) • 3 FTA annual reports (2017, 2018, 2019) 	<p>*reliability: medium (self-reported, but based on FMS data)</p> <p>*confidence: high</p> <ul style="list-style-type: none"> • Government outcomes (L) no evidence of public investments • NGOs & CSO outcomes (L): limited evidence • Investors (L): no evidence • CFE outcomes (H) 	<p>Y – self reported, but based on FMS data</p> <p>[Low-end estimate potential 2,458 people in Cameroon</p> <p>[Target] scaling of CFEs in 260 community forests covering >1.3m ha of secondary forest in Cameroon</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence of policy change, evidence of uptake and use of project findings, evidence of changes in decision-making, uptake of performance data in decision-making, intentions for future scaling investment • NGOs & CSO outcomes: need evidence of learning and capacity-building, evidence of support to CFEs • Investors outcomes: evidence of uptake and use of project findings, evidence of changes in decision-making, evidence of investment in CFEs <p>Impact estimations: Possible to derive from estimate of forest-dependent population within target area for scaling community forests covering >1.3m ha of secondary forest in Cameroon</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments,</i> 	<p>Outcome level: Possibly not as there is already substantial recent evidence</p> <p>Impact level: Possible from project target and reported achievement (sensitive to conditions)</p>

				<i>implementing organizations, research team, participating CFEs</i> • <i>Bibliometric analyses</i>	
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5. Agroforestry Concessions in Peru Cluster

Prioritization: medium

- ICRAF representation
- Overlap in Challenges 1, 2, and 3
- Under-represented region
- Representative of FTA and bilateral investment (budget <\$5M USD)
- Feasible (projects are closely interlinked, but some may be too recent)
- Outcome evidence for 1 project is substantial (e.g., SUCCESS), but key gaps remain or require updated evidence
- Estimations of impact are possible, but require supporting evidence for future outcomes and policy implementation (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
Support to the Development of Agroforestry Concessions in Peru (SUCCESS) (ICRAF) • Peru	<ul style="list-style-type: none"> • 1 OICR (2019) • 1 outcome evaluation report (2019) • 1 peer-reviewed article (2015) • 2 external press releases (2018, 2018) • 1 ICRAF annual report (2018) • 1 FTA annual report (2019) • 1 internal webpage (n.d.) 	*reliability: high (external sources) *confidence: high <ul style="list-style-type: none"> • Government outcomes (H) • Partner & allies' outcomes (H) • Researcher outcomes (M/H): low evidence of external researcher uptake • Smallholder outcomes (L): low primary evidence from smallholders/ farmers associations 	Y (derived from project data – reliable as it was scientifically calculated) [potential] 123,000 households eligible for AFCs	<ul style="list-style-type: none"> • Government outcomes: need update on governmental support for and implementation of AFCs, need update on San Martín pilot • Partner & allies' outcomes: update on partner involvement in AFC issues • Researcher outcomes: need update on external uptake of SUCCESS outputs • Smallholder outcomes: need more detail on smallholder learning and changed practices, need update on San Martín pilot Impact estimations: Already have. <ul style="list-style-type: none"> • <i>Interviews/surveys with governments, partners, research team, smallholders (e.g., those involved in San Martín pilot)</i> • <i>Bibliometric analyses</i> 	<i>Outcome level:</i> Possibly; recent evaluation provides substantial evidence and collecting an update could be low-hanging fruit (though additional evidence may take time to materialize) <i>Impact level:</i> Possible from calculated project projection (sensitive to assumptions)
PARA: Piloting approaches to rural advisory services in support of scaling of the Agroforestry Concessions scheme in Peru	No evidence *ongoing project (may be too early to collect evidence)	No evidence	Same as above	<ul style="list-style-type: none"> • Government outcomes: need evidence on governmental attitudes/support for AFCs and pilots, need evidence of research uptake/use • Partner & allies' outcomes: need evidence on partner involvement in AFC issues, changes in relationships, and research uptake/use • Researcher outcomes: need evidence on researcher capacity-building and changes in relationships • Smallholder outcomes: need evidence on 	<i>Outcome level:</i> No evidence; collecting preliminary evidence could be low-hanging fruit (need to consider the infancy of the project) <i>Impact level:</i>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

(ICRAF) • Peru				<p>smallholder learning and capacity-building from pilots, evidence of changes in smallholder practices</p> <p>Impact estimations: Already have.</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, smallholders (e.g., pilot participants)</i> 	Similar estimates as SUCCESS (possibility of double-counting)
<p>Peru's Agroforestry Concessions Scheme: Collaborative Action to secure Multi-level Readiness for Implementation of an Innovative, Transformative Policy Project (ICRAF)</p> <p>• Peru</p>	<ul style="list-style-type: none"> • 4 external press releases (2020, 2021, 2021, 2021) • 1 ICRAF press release (2021) • 1 internal webpage (2021) <p>*ongoing project (may be too early to collect evidence)</p>	<p>*reliability: high (external sources)</p> <p>*confidence: high</p> <ul style="list-style-type: none"> • Government outcomes (L) • Partner & allies' outcomes (L) 	<p>Y (projection noted in press release)</p> <p>[potential] 120,000 smallholders are eligible for AFCs in Peru (similar to SUCCESS projections – may already be captured)</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence on governmental attitudes/support for AFCs, policy implementation and coordination, and research uptake/use • Partner & allies' outcomes: need evidence on partner support for AFCs (e.g., GGGI, SPDA) and changes in relationships • Researcher outcomes: need evidence on researcher capacity-building and changes in relationships • Smallholder outcomes: need evidence on pilot progress and smallholder registration, evidence of changes in smallholder practices <p><u>Impact estimations:</u> Already have.</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, smallholders (pilot participants)</i> 	<p><i>Outcome level:</i> Possibly, preliminary evidence is promising though key gaps exist (need to consider the infancy of the project)</p> <p><i>Impact level:</i> Similar estimates as SUCCESS (possibility of double-counting)</p>

6. Forestry and Tree Value Chains in Latin America Cluster

Prioritization: low

- Bioversity International representation
- Overlap in Challenges 1, 2, & 3
- Under-represented region
- Representative of FTA and bilateral investment (budget <\$5M USD)
- Feasible (projects are closely interlinked, but some may be too recent)
- Outcome evidence for 1 project is substantial (e.g., Mesoamerica), but key gaps remain or require updated evidence
- Estimations of impact are possible, but require supporting evidence for future outcomes and policy implementation (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? Suggestions for additional data collection (for both outcomes and impact).	Prioritization for additional evidence?
Forestry to enhance livelihoods and	• 1 technical report - Nicaragua	*reliability: medium (external & self-reported sources)	Y (potential impact self-reported, triangulated with	• Government outcomes: need evidence of government use/adoption of data/methods; need update on renewal of community forestry	<i>Outcome level:</i> Preliminary evidence for

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>sustain forests in Mesoamerica: How institutional arrangements and value chains affect benefits and resources (<i>Bioversity International</i>)</p> <ul style="list-style-type: none"> Guatemala Nicaragua 	<p>(2016)</p> <ul style="list-style-type: none"> 1 annual progress report (2016) 1 final report (2017) 1 CGIAR performance report (2019) 2 external press releases (2019, 2019) 1 FTA press release (2021) 1 external webpage (n.d.) 1 peer-reviewed article (2012) 1 OICR (2019) 	<p>*confidence: high</p> <ul style="list-style-type: none"> Government outcomes (L): stated anticipated changes; evidence for Guatemala only Forestry cooperatives outcomes (M) Researcher outcomes (H) NGOs & CSOs outcomes (L) limited evidence Farmers and producers outcomes (L) limited evidence 	<p>external sources)</p> <p>[potential] 9 community forestry concessions in Maya Biosphere Reserve (potential for 25-year contract renewal)</p> <p>[achieved] 1 contract renewed in December 2019 (Cooperative Carmelita covers 53,597 ha)</p> <p>[potential] 11 community-owned areas in RAAN cover 1.5 million ha</p>	<p>concessions</p> <ul style="list-style-type: none"> Forestry cooperative outcomes: need more detail of learning, skill-building, and output use in advocacy Researcher outcomes: more detail needed on student capacity-building and career trajectory; need evidence of output use NGOs & CSOs outcomes: need more detail on learning; update on changes in advocacy for community practice and governance Farmers and producers outcomes: needs evidence of adoption of enhanced management plans for sustainability <p>*predominance of evidence for Guatemala – need evidence of outcomes for Nicaragua component</p> <p>Impact estimations: Already have</p> <ul style="list-style-type: none"> Additional document review (project documents, trip reports, external media) Interviews/surveys with governments, partners, forest cooperatives, grad students/research team Bibliometric analyses 	<p>Guatemala makes it a promising case, but lack of evidence for Nicaragua</p> <p><i>Impact level:</i> Possible from reported achievement and future potential (sensitive to conditions)</p>
<p>Enhancing the competitiveness of Peruvian cocoa via the identification and commercialization of fine and diverse flavour quality</p> <p>(Bioversity International)</p> <ul style="list-style-type: none"> Peru 	<ul style="list-style-type: none"> 1 project results summary 	<p>*reliability: Low</p> <p>*confidence: Low</p> <ul style="list-style-type: none"> Government outcomes (L): limited evidence Farmers and producers (L): limited evidence Researcher outcomes (L): limited evidence 	<p>N</p>	<p>All outcomes require more precise information</p>	<p><i>Outcome level:</i> Possibly there is more information available to support assessment of outcomes</p> <p><i>Impact level:</i> not possible to derive</p>
<p>Integrated Approach to Improving Yield Efficiency and Resilience to Climate Change through Better Use of Cacao Genetic resources</p>	<ul style="list-style-type: none"> 1 Outcome story (2012) 1 Bioversity Annual report (2012) 1 Final review report (2017) 1 Final report 	<p>* reliability: low</p> <p>* confidence: low [all based on limited internal reporting]</p> <ul style="list-style-type: none"> Government outcomes (L): no evidence Forestry cooperatives outcomes (L): no 	<p>Y</p> <p>[Potential to benefit 35,000 farmers with improved cacao clonal material in Colombia as reported</p>	<p>All outcomes need more detail on capacities built, use of project outputs to support outcome assessments, this is not the focus of available reporting. Available reporting focuses on outputs generated from the project.</p> <p>Impact estimations: reported in project document</p>	<p><i>Outcome level:</i> Possible more evidence is available to assess outcome</p> <p><i>Impact level:</i> Potential benefit in Colombia reported</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

(<i>Bioversity International</i>) <ul style="list-style-type: none"> • Brazil • Colombia • Costa Rica • Cote D'Ivoire 	(2019)	evidence <ul style="list-style-type: none"> • Researcher outcomes (H) not externally validated • NGO & CSO outcomes: (L) no evidence • Forestry cooperatives outcomes: no evidence 	in project document]	<ul style="list-style-type: none"> • <i>Additional document review (policy documents, protocols, trip reports, external media)</i> • <i>Interviews/surveys with scientists, members of global strategic cacao collective & farmers in study areas</i> 	in final report
Follow on project: Research on heat and drought tolerant cocoa planting material for: An integrated approach to improving yield efficiency and resilience to climate change through better use of cacao genetic resources (<i>Bioversity</i>) <ul style="list-style-type: none"> • Brazil • Colombia • Costa Rica 	<ul style="list-style-type: none"> • 1 Final report (2020) • 1 technical report (2019) 	Same as above	Same as above	Same as above	Same as above

7. Gender Issues in the Oil Palm Sector in Indonesia Cluster

Prioritization: low

- CIFOR representation
- Overlap in Challenge 3
- Overlap in regional representation
- Not representative of FTA investments (budget < \$1,1M USD)
- Preliminary outcome evidence at local level (strong for 3 pathways), but notable gaps exist
- Impact estimations not possible to derive with current evidence

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
Engendering RSPO Standards (<i>CIFOR</i>) <ul style="list-style-type: none"> • Indonesia 	<ul style="list-style-type: none"> • 1 outcome evaluation (2021) • 1 FTA annual report (2016) 	*reliability: high (external source) *confidence: high <ul style="list-style-type: none"> • Governments 	N	<ul style="list-style-type: none"> • Government outcomes: need evidence of learning, policy change and implementation • NGOs & CSO outcomes: need update on advocacy efforts • RSPO outcomes: need update on implementation 	<i>Outcome level:</i> Possibly not as recent evidence is substantial

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

		<p>outcomes:</p> <ul style="list-style-type: none"> • NGOs & CSO outcomes (H) • RSPO outcomes (H) • Private companies' outcomes (L) no primary evidence from corporations • Women and Indigenous groups outcomes (L) no primary evidence 		<p>of RSPO P&C on gender</p> <ul style="list-style-type: none"> • Private companies' outcomes: need update on adherence to RSPO P&C on gender • Women and Indigenous groups outcomes: need evidence of enhanced participation in oil palm decision-making and governance; need evidence of improved equality and conditions in the oil palm sector <p>Impact estimations: not possible to derive</p> <p>• Interviews/surveys with partners, research team, RSPO, corporations, smallholders</p> <p>• Bibliometric analyses</p>	<p><i>Impact level:</i> not possible to derive</p>
<p>Impacts of large-scale land acquisitions on local women's land and forest tenure rights: Case studies from Indonesia (CIFOR)</p> <ul style="list-style-type: none"> • Indonesia 	<ul style="list-style-type: none"> • 1 midterm report (2016) • 1 final report (2017) 	<p>*reliability: low (self-reported sources)</p> <p>*confidence: low</p> <ul style="list-style-type: none"> • Governments outcomes (L) no evidence • NGOs & CSO outcomes (H) • RSPO outcomes (L) no evidence • Private companies' outcomes (L) no evidence • Women and Indigenous groups outcomes (L) no evidence 	N	<ul style="list-style-type: none"> • Government outcomes: need evidence of government learning; policy change and implementation • NGOs & CSO outcomes: need evidence of influence on RRI's advocacy; need evidence of output use; • RSPO outcomes: need evidence of influence on RSPO members • Private companies' outcomes: need evidence of companies' learning; need evidence of changes in policy and practice; need evidence of project influence • Women and Indigenous groups outcomes: need evidence of enhanced participation in oil palm decision-making and governance; need evidence of improved equality and conditions in the oil palm sector <p>Impact estimations; not possible to derive</p> <p>• Additional document review (project documents, trip reports, external media)</p> <p>• Interviews/surveys with governments, partners, research team, RSPO, corporations, smallholders</p> <p>• Bibliometric analyses</p>	<p><i>Outcome level:</i> Limited evidence</p> <p><i>Impact level:</i> Not possible to derive</p>

8. Furniture Value Chains in Indonesia Cluster

Prioritization: low

- CIFOR representation
- No challenge overlap
- Overlap in regional representation

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

- Not representative of FTA investments (budget <1,1M USD)
- Preliminary outcome evidence at local level (strong for 2 pathways), but notable gaps exist
- Impact estimations may be possible, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
<p>Assessing Furniture Value Chains Research ("Mahogany and teak furniture: action research to improve value chain efficiency and enhance livelihoods") - RTI 93</p> <p>(CIFOR)</p> <ul style="list-style-type: none"> Indonesia 	<ul style="list-style-type: none"> 1 performance story (nd) 1 final report (2013) 1 info brief (2013) 1 CIFOR annual report (2013) 1 adoption study (2019) 	<p>*reliability: high (external evaluation)</p> <p>*confidence: high</p> <ul style="list-style-type: none"> Government outcomes (H): evidence of district level policy enacted, indication of increased funds to support SMEs [needs evidence] Furniture Association outcomes (M): evidence of practice change for 1 association (APKJ) Small-scale producers: (H): evidence of practice change, evidence of capacity to generate increased income 	<p>Y</p> <p>[Potential: Jepara had approximately 6,000 furniture producers reported by the Central Statistical Agency (BPS Jepara 2018) [described in adoption study]</p> <p>[Potential National: 686,000 small-scale wood and handicraft enterprises according to 2011 Indonesian National Statistics Bureau (BPS) data]</p>	<ul style="list-style-type: none"> Government outcomes: need more detail on Sub-national government (Industry and Trade District Office) increase funds to support small-scale furniture producers & on District Regulation 2 of 2014; evidence of scaling investments Furniture Associations outcomes: need update numbers - membership and SVLK certification issued for members, understanding barriers for further association [pathway for issuance of licenses for non-APKJ furniture makers] Small-scale producers: need update number of SVLK certified producers with FTA influence, details/update of increased income generation as a result of SVLK certification; evidence of enhanced access to market opportunities (EU) as result of the certification; <p>Impact estimations: already have</p> <ul style="list-style-type: none"> Additional document review (project documents, trip reports, external media) Interviews/surveys with governments, APKJ members, non-APKJ Small-scale producers, research team Quantification for impact estimation: described in adoption study 	<p>Outcome level:</p> <p>Possibly not as there is recent evidence and additional evidence may take time to materialize (i.e., may not be available)</p> <p>Impact level:</p> <p>Derived from adoption study</p>
<p>FLEGT License to leverage the capacity of small and medium scale furniture enterprises in Indonesia to access global markets - RTI 259</p> <p>(CIFOR)</p>	<ul style="list-style-type: none"> 1 Final report (2021) 	<p>*reliability: Low</p> <p>*confidence: Low</p> <ul style="list-style-type: none"> Government outcomes (L) Small-scale Producers outcomes (L) Furniture Associations outcomes (L) 	<p>N</p>	<ul style="list-style-type: none"> Government outcomes: need more detail on learning, gov't uptake/use of project outputs, changes in policy Furniture Associations outcomes: need evidence of project influence to facilitate access to global markets (as a result of SVLK certification) Small-scale producers: need update number of SVLK certified producers with FTA influence, details/update of increased income generation as a result of SVLK certification; evidence of enhanced access to market opportunities (EU) as result of the certification 	<p>Outcome level:</p> <p>Possibly not as there is recent evidence and additional evidence may take time to materialize (i.e., may not be available)</p> <p>Impact level: not possible to derive</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<ul style="list-style-type: none"> Indonesia 				<p>Impact estimations: not possible</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, Furniture association members (e.g., APKJ and Formekers), non-certified Small-scale producers, research team</i> 	
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9. Diversification of Agroforestry-based Income in Asia Cluster

Prioritization: High

- ICRAF representation
- Overlap with Challenges 2 & 3
- Overlap with regional representation
- Representative of FTA and bilateral investments (budget ~20M USD)
- Preliminary outcome evidence at local level (strong for 7 pathways), but notable gaps exist in specific countries
- Impact estimations may be possible, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
<p>Development of timber and non-timber forest products' production and market strategies for improvement of smallholders' livelihoods in Indonesia</p> <p>KANOPPI (Phase 1) (ICRAF)</p> <ul style="list-style-type: none"> Indonesia 	<ul style="list-style-type: none"> 2 annual reports (2015 & 2016) external evaluation (2017) Donor (ACIAR) blog (2016) 1 project proposal 1 final report (2019) 1 FTA annual report (2017) 1 internal webpage (n.d.) 	<p>*reliability: high</p> <p>*confidence: high</p> <ul style="list-style-type: none"> Government outcomes (H) Extension Agent outcomes (L): limited evidence Researcher outcomes (H) NGOs & CSOs outcomes (M) CBOs outcomes (H) Private companies' outcomes: (H) Smallholders' outcomes: (H) 	<p>Y</p> <p>(impact estimates noted in project proposal)</p> <p>Target: 1200 farmers (30% women) enhance processing and market capacities on timber and NTFPs through</p> <ul style="list-style-type: none"> increase sale prices for farmers by up to 10% <p>Potential: Estimated direct outreach of forestry households at the proposed research sites (Yogyakarta, NTB and NTT): 120,684 [30% of a total of 402 280 households]</p>	<ul style="list-style-type: none"> Government outcomes: need evidence of budget allocation Extension agent outcomes: need evidence of learning, uptake and use Private companies' outcomes: need triangulation of evidence of uptake and use <p>Impact estimations: Already have</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> <i>Bibliometric analyses</i> 	<p>Outcome level: TBD; existing evidence has some promising indications but would require extensive data collection</p> <p>Impact level: Already have</p>
<p>KANOPPI 2: Developing and promoting market-based agroforestry options and</p>	<ul style="list-style-type: none"> 1 ICRAF blogpost (2021) 	<p>*reliability: Low [self-reported source]</p> <p>*confidence: L/M</p> <ul style="list-style-type: none"> Government outcomes 	<p>Same as above</p>	<ul style="list-style-type: none"> Government outcomes: need evidence of learning, evidence of policy change, evidence of uptake and use of project findings, evidence of practice change Extension agent outcomes: need evidence of 	<p>Outcome level: TBD – project in implementation phase</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>integrated landscape management for smallholder forestry in Indonesia (ICRAF)</p> <ul style="list-style-type: none"> Indonesia 		<p>(L): indication of governmental support</p> <ul style="list-style-type: none"> Extension Agents' outcomes (L): no evidence Researcher outcomes (L): no evidence NGOs & CSOs outcomes (L): no evidence CBO outcomes (M): indication of uptake and use Private companies' outcomes (L): no evidence Smallholders' outcomes (M): indication of uptake and use 		<p>learning, evidence of uptake and use of project findings, evidence of practice change</p> <ul style="list-style-type: none"> Researcher outcomes: evidence of uptake and use of project findings NGOs & CSOs' outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change CBO outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change Private companies' outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change Smallholders' outcomes: need evidence of uptake and use <p>Impact estimations: N/A</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> <i>Bibliometric analyses</i> Quantification for impact estimation: not possible 	<p>Impact level:</p> <p>Not feasible. Project in implementation phase.</p>
<p>Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action (AgFor) (ICRAF)</p> <ul style="list-style-type: none"> Indonesia 	<ul style="list-style-type: none"> 1 FTA blog page (n.d.) [reports findings from 2017 summative evaluation (?)] 1 project proposal (2012) 2 internal blogs (2016, 2017) 2 final reports (2017, 2017) 1 outcome story (2016) 2 FTA annual reports (2015, 2017) 1 internal webpage (n.d.) 	<p>*reliability: M/H]</p> <p>*confidence: M [possible double counting]</p> <ul style="list-style-type: none"> Government outcomes (M) Extension Agent outcomes (L): details needed Researcher outcomes (M) NGO/CSO outcomes (M) CBOs outcomes (H) Private companies' outcomes (H) Smallholders' outcomes (H) 	<p>Y</p> <p>[Impact estimates based on total population in target districts]</p> <ul style="list-style-type: none"> [ESTIMATED] 636,972 people (52% women) improved their income as a result of adopting AgFor-promoted tree domestication technologies <p>Potential (?): to benefit 32,948 people (50% women) from improved environmental services' schemes in 11 communities</p>	<ul style="list-style-type: none"> Government outcomes: need evidence of learning, policy change, uptake and use of project findings, practice change Extension agent outcomes: need evidence of uptake and use of outputs & practice change Researcher outcomes: need evidence of uptake and use NGOs & CSOs' outcomes: need evidence of uptake and use Private companies' outcomes: need evidence of practice change Smallholders' outcomes: need detailed evidence to cross-check data and reduce double counting <p>Impact estimations: already have</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, partners,</i> 	<p>Outcome level:</p> <p>TBD - Possibility of double counting in number of project beneficiaries</p> <p>Impact level:</p> <p>Possible to determine with detailed assessment of project information</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

				<p>research team, extensionists, communities</p> <ul style="list-style-type: none"> • Bibliometric analyses • Quantification for impact estimation: comparative analysis of changes in household income & adoption studies 	
<p>Indonesian Rural Economic Development (ICRAF)</p> <ul style="list-style-type: none"> • Indonesia 	<ul style="list-style-type: none"> • Project Plan (2017-2018) • Mid term report – (2017-2018) • Annual report (2017-2018) 	<p>*reliability: L/M [self-reported sources]</p> <p>*confidence: M</p> <ul style="list-style-type: none"> • Government outcomes: no evidence • Extension Agent outcomes (H) • Researcher outcomes (L) • NGOs & CSOs outcomes (M) • CBOs outcomes (L): no evidence • Smallholder outcomes: (M) 	<p>Y</p> <p>Project target: 1,400 farmers have improved economic development in Haharu Sub-District of Sumba Island</p> <p>[achieved: 148 farmers adopted Good agricultural practices (GAP)]</p> <p>[6,565 people in East Nusa Tenggara Province]</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence of learning, evidence of policy change, evidence of uptake and use of project findings, evidence of practice change • Researcher outcomes: evidence of uptake and use of project findings • NGOs & CSO's outcomes: evidence of uptake and use of project findings • CBO's outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change • Smallholders' outcomes: need evidence of economic outcomes <p>Impact estimations: already have</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> • <i>Bibliometric analyses</i> 	<p>Outcome level: TBD; existing evidence has some promising indications but pathway to impact is in early stages</p> <p>Impact level: Pathway to impact in early stages (FDT only)</p>
<p>AFLI-I: Agroforestry for livelihoods of smallholder farmers in Northwest Vietnam (ICRAF)</p> <ul style="list-style-type: none"> • Vietnam 	<ul style="list-style-type: none"> • 1 OICR (2020) • 1 Technical Report - No. 24 (n.d.) • 1 Final report (2019) • 1 AFLi 2 Project proposal (2016) 	<p>*reliability: M/H</p> <p>*confidence: H</p> <ul style="list-style-type: none"> • Government outcomes (H) • Extension Agent outcomes (L) • Researcher outcomes (M) • NGOs/CSOs outcomes (L): no evidence • CBO outcomes (H): evidence of uptake and practice change • Private company outcomes: (H): evidence of support to farmers by 1 private company 	<p>Y</p> <p>Potential adoption scientifically calculated</p> <p>[Potential: adoption of AFS by 123,000-247,000 households could accrue an estimated economic value of USD 160,000,000-320,000,000 over fifteen years [reported by lead scientist]</p>	<ul style="list-style-type: none"> • Extension agent outcomes: need evidence of uptake and practice change • Researches outcomes: need evidence of uptake • NGOs & CSO's outcomes: need evidence of learning, evidence of uptake and use of project findings, evidence of practice change <p>Impact estimations: already have</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> • <i>Bibliometric analyses</i> 	<p>Outcome level: TBD – Promising evidence but key gaps remain</p> <p>Impact level: Economic impact yet to occur at scale (depends on farmers adoption of AF practices – sensitive to assumptions)</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

		<ul style="list-style-type: none"> • Smallholder outcomes: (H) 			
<p>AFLI-II: Developing and promoting market-based agroforestry and forest rehabilitation options in Northwest Vietnam (ICRAF)</p> <ul style="list-style-type: none"> • Vietnam 	<ul style="list-style-type: none"> • Annual report (2019) 	Same as above	Same as above	Same as above	Same as above
<p>Enabling smallholders in Odisha to produce and consume more nutritious food through Agroforestry System (ICRAF)</p> <ul style="list-style-type: none"> • India 	<ul style="list-style-type: none"> • FTA annual report (2018) 	<p>*reliability: Low</p> <p>*confidence: Low</p> <ul style="list-style-type: none"> • Government outcomes: no evidence • Extension Agent outcomes: no evidence • Researcher outcomes (L) • NGO/CSO outcomes: no evidence • CBOs outcomes: no evidence • Private companies' outcomes (L) • Smallholder outcomes: (L) 	<p>Y</p> <p>Estimated 373,214 directly and 1,866,070 indirectly benefit from backyard gardens</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence of learning, evidence of policy change, evidence of uptake and use of project findings, evidence of practice change • Extension agent outcomes: need evidence of uptake and use of project findings, evidence of practice change • Researcher outcomes: need evidence of uptake and use • NGOs & CSO outcomes: need evidence of uptake and use • Private companies' outcomes: need evidence of practice change • Smallholders' outcomes: need evidence of uptake and use <p>Impact estimations: already have</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> • <i>Bibliometric analyses</i> 	<p>Outcome level: TBD – likely require extensive data collection</p> <p>Impact level: Already have</p>
<p>Green Growth Action Plan (ICRAF)</p> <ul style="list-style-type: none"> • Vietnam 	<ul style="list-style-type: none"> • Blog (2021), • Technical report (2019) 	<p>*reliability: low (self-reported sources)</p> <p>confidence: low</p> <ul style="list-style-type: none"> • Government outcomes (M) 	<p>Y</p> <p>[Potential to benefit indirectly 485,131 individuals in the agriculture sector (including agroforestry, forestry, livestock and</p>	<ul style="list-style-type: none"> • Government outcomes: need evidence of practice change <p>Impact estimations: already have</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, partners, research team, extensionists, communities</i> 	<p>Outcome level: TBD - Require extensive data collection</p> <p>Impact level:</p>

			fishery), 66% of the total number of working age individuals in the province by 2030]	• <i>Bibliometric analyses</i>	Too early to determine economic impacts to smallholders
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10. Payment for Environmental Services in Asia Cluster

Prioritization: low-medium

- ICRAF and CIFOR representation
- Overlap with Challenges 2 & 3
- Overlap in regional representation
- Representative of FTA and bilateral investments (budget >10M USD)
- Overlap with challenges 1 and 2
- Preliminary outcome evidence promising for 4 pathways, but notable gaps exist in specific countries
- Impact estimations may be possible, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
Vietnam Forests and Deltas project to support implementation of Payments for Environmental Services (CIFOR) <ul style="list-style-type: none"> • Vietnam 	<ul style="list-style-type: none"> • 1 project brief 	<ul style="list-style-type: none"> * reliability: low * confidence: low • Government outcomes (H) • Int. Dev. Agencies outcomes (L) limited evidence • NGOs & CSOs outcomes (L) no evidence • Smallholders outcomes (L) no evidence • CBOs outcomes (L) limited evidence • Private sector outcomes (L) no evidence 	N	<ul style="list-style-type: none"> • Int. Dev. Agencies outcomes: needs evidence of support to PFES implementation • NGOs & CSOs outcomes: needs evidence of learning and support implementation • Smallholders outcomes: needs evidence of learning, access to financial incentive • CBOs outcomes: needs evidence of increased capacity and resources to access PFES • Private sector outcomes: needs evidence of learning, uptake and use, and co-investments • <i>Additional document review (project documents, trip reports, external media, workshop evaluation reports)</i> • <i>Interviews/surveys with program implementers, project participants, policymakers</i> 	<p><i>Outcome level:</i> Possibly, if overlap with Challenge 1 deep dive case study (Vietnam)</p> <p><i>Impact level:</i> TBD</p>
RUPES 2- Rewards for, use of, and shared investment in pro-poor environmental services phase 2 (ICRAF) <ul style="list-style-type: none"> • China • India • Indonesia • Nepal 	<ul style="list-style-type: none"> • 1 donor report (2011) • 1 final report (2013) • 1 FTA annual report (2012) • 1 OICR (2019) • 3 internal press releases (2018, 2019, 2020) 	<ul style="list-style-type: none"> * reliability: medium - assessments based on focus group discussions with participants and non-participants and interviews with partners * confidence: medium • Government outcomes (H) 	N	<ul style="list-style-type: none"> • Government outcomes: need details of FTA contribution, evidence of implementation and implication for poverty outcomes • Int. Dev. Agencies outcomes: needs evidence of IFAD's integration of RES in other initiatives • NGOs & CSOs outcomes: needs evidence of learning and use of novel PES models • Smallholders outcomes: needs evidence of learning. Triangulation would strengthen • CBOs outcomes: needs evidence of learning, 	<p><i>Outcome level:</i> Possibly, requires triangulation to specify outcomes, status of policy implementation</p> <p><i>Impact level:</i> Might not be feasible,</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<ul style="list-style-type: none"> Philippines Vietnam 	<ul style="list-style-type: none"> 3 external press releases (2017, 2017, 2019) 	<ul style="list-style-type: none"> Int. Dev. Agencies outcomes (H) NGOs & CSOs outcomes (L) limited evidence Smallholders outcomes (L) limited evidence CBOs outcomes (M) Private sector outcomes (M) Practitioners outcomes (L) limited information 		<ul style="list-style-type: none"> uptake and use of PFES models Private sector outcomes: need more detail of company learning and changed practices; need update of co-investments Practitioner outcomes: need evidence of applied knowledge and skills; need evidence of RES monitoring and rehabilitation practices <p>Impact estimations: Requires policy review of key policies reported to be influenced by the project</p> <ul style="list-style-type: none"> <i>Policy review: National RES Protocol of Law 32/2009 – Indonesia, Decision No 99/2010 – Vietnam, RES scheme for grasslands – China, National Environmental Policy – India, Climate Change Act 2008 and Sustainable Forest Management Act 2008 – Philippines, and PES - Nepal</i> <i>Interviews or surveys with researchers, policymakers, program implementers and community members</i> 	requires policy review
<p>INREMP: Integrated Natural Resource and Environmental Management Program (ICRAF)</p> <ul style="list-style-type: none"> Philippines 	<ul style="list-style-type: none"> 1 semi-annual monitoring report (2020) 1 internal webpage (n.d.) 2 internal blogs (2020, 2021) 1 evaluation report (2020) 	<p>* reliability: medium</p> <p>* confidence: high</p> <ul style="list-style-type: none"> Government outcomes: (M) NGOs & CSOs outcomes (L) no evidence Smallholders outcomes (L) limited evidence CBOs outcomes (H) Private sector outcomes (L) no evidence Practitioners outcomes (L) no evidence 	<p>N</p> <p>[achieved: 428 community organizations adopted NRM</p> <p>Smallholders adopt enhanced management practices in 60ha]</p>	<ul style="list-style-type: none"> Government outcomes: needs detail of FTA influence for learning; details of type of incentive provided for the communities NGOs & CSOs outcomes: needs evidence of learning, uptake and use of FTA research Smallholders outcomes: needs detailed information on farmers reached and uptake Private sector outcomes: needs evidence of support to FTA research (if any) Practitioners outcomes: needs evidence of practice change for the DENR <p>Quantification for impact estimation:</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media, workshop evaluation reports)</i> <i>Interviews/surveys with program implementers (of natural resource management subprojects), workshop/training participants in target communities, policymakers</i> 	<p><i>Outcome level:</i> Possibly, there is additional evidence to support assessment</p> <p><i>Impact level:</i> TBD - possible</p>
<p>Opportunities and Challenges to Developing REDD+ Benefit Sharing Mechanisms in</p>	<ul style="list-style-type: none"> 1 evaluation report (2018) 1 outcome story (2016) 	<p>*external evaluation – higher reliability</p> <p>*confidence: high</p> <ul style="list-style-type: none"> Government outcomes 	<p>N</p>	<ul style="list-style-type: none"> Government outcomes: need more detail on results of policy engagement in Indonesia Int. Dev. Agencies outcomes: needs evidence of learning, uptake and use 	<p><i>Outcome level:</i> Pursued for Challenge 1 Deep Dive</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>Developing Countries (accompanying phase 2 of GCS REDD+ program) (<i>CIFOR</i>)</p> <ul style="list-style-type: none"> Indonesia Vietnam <p>(n.b) only activities implemented in Indonesia and Vietnam were included in the assessment for this cluster)</p>		<p>(H)</p> <ul style="list-style-type: none"> Int. Dev. Agencies outcomes (M) NGOs & CSOs outcomes (L) no evidence Smallholders outcomes (L) no evidence CBOs outcomes (L) no evidence Private sector outcomes (L) no evidence Practitioners outcomes (L) no evidence 		<ul style="list-style-type: none"> Practitioners outcomes: needs evidence of uptake and use of FTA research <p>Impact estimations: Could be derived from a policy review policy review (Vietnam PFES)?</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with gov't, partners, research team, private sector</i> <i>Bibliometric analyses</i> <i>Quantification for impact estimation: Policy review</i> 	<p><i>Impact level: Pursued for Challenge 1 Deep Dive</i></p>
<p>Sustainable, Low Carbon Emission Agriculture and Water Resource Co-Investment of Rejoso Watershed (Gerakan Rejoso Kita) (<i>ICRAF</i>)</p> <ul style="list-style-type: none"> Indonesia 	<ul style="list-style-type: none"> 1 internal webpage (n.d.) 1 brief (2018) 	<p>* reliability: low</p> <p>* confidence - low</p> <ul style="list-style-type: none"> Government outcomes (L) no evidence Int. Dev. Agencies (L) no evidence NGOs & CSOs outcomes (L) no evidence Smallholders outcomes (L) no evidence CBOs (L) no evidence Private sector (L) Practitioners (L) no evidence 	N	<ul style="list-style-type: none"> All outcomes require further details on exact project contribution <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with researchers partners (TNC, Social Investment Indonesia, Collaborative Knowledge Network, Danone), project participants in target communities, policymakers</i> 	<p><i>Outcome level: No, substantial gaps to fill</i></p> <p><i>Impact level: not possible</i></p>

11. Climate-resilient Livelihoods in Asia Cluster

Prioritization: low

- ICRAF representation
- Overlap with Challenge 2 & 3
- Overlap in regional representation
- Representative of FTA and bilateral investments (budget ~3M USD)
- Preliminary outcome evidence promising for 2 pathways, but notable gaps exist in specific countries
- Impact estimations may be possible to derive from policy targets, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
Climate-smart, Tree-based, Co-investment	<ul style="list-style-type: none"> 1 external grants results 	*reliability: Medium (donor sheet, self-reported)	N	<ul style="list-style-type: none"> Governments outcomes: need evidence of learning, evidence of policy change (increased 	<p>Outcome level: TBD – key outcome gaps</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>in Adaptation and Mitigation in Asia (STI) (ICRAF)</p> <ul style="list-style-type: none"> Indonesia Philippines Vietnam 	<p>sheet [IFAD] (2018)</p> <ul style="list-style-type: none"> 1 video (2017) 1 final report 	<p>*confidence: High</p> <ul style="list-style-type: none"> Government outcomes (L): limited evidence for Vietnam only Private sector (L): evidence for Vietnam only Smallholders outcomes (M): indication of learning and skills via pilots, indication of uptake in the sphere of influence 		<p>budget, co-investments), triangulation of evidence of uptake and use of project findings, indication of interest to scale up. Needs evidence for Indonesia and the Philippines</p> <ul style="list-style-type: none"> Private sector: need evidence of learning, evidence of change (increased co-investments), indication of interest to scale up. Needs evidence for Indonesia and the Philippines Smallholder outcomes: need evidence of learning, evidence of practice change, needs evidence of increased resilience to climate-change <p>Impact estimations: Could be derived from a policy review (Vietnam only)</p> <ul style="list-style-type: none"> Policy review (district and national level) Additional document review (project documents, trip reports, external media) Interviews/surveys with policymakers, research team, smallholders Quantification of impact estimation needs further information for Indonesia and the Philippines 	<p>Impact level:</p> <p>Could be derived from a policy review (Vietnam only)</p>
<p>Green Rubber: Alleviating poverty and enhancing environmental integrity through re-storing ecosystem services in a tropical plantation crop in the Upper Mekong Region (STI) (ICRAF)</p> <ul style="list-style-type: none"> China Laos Myanmar Thailand 	<ul style="list-style-type: none"> 1 ICRAF blog 	<p>*reliability: Low (self-reported)</p> <p>*confidence: Low (needs triangulation)</p> <ul style="list-style-type: none"> Government outcomes (L): no evidence Private sector (L) no evidence Smallholders outcomes (L): no evidence 	N	<ul style="list-style-type: none"> Governments outcomes: need evidence of learning potential policy change (enabling uptake of green rubber practices by smallholders), triangulation of evidence of uptake and use of project findings, indication of interest to scale up Private sector outcomes: need evidence of learning, evidence of change (increased co-investments), indication of interest to scale up. Smallholder outcomes: need evidence of learning, evidence of practice change, needs evidence of increased resilience to climate-change <p>Impact estimations: not possible</p> <ul style="list-style-type: none"> Additional document review (project documents, trip reports, external media) Interviews/surveys with policymakers, research team, smallholders Bibliometric analyses 	<p>Outcome level: TBD – key outcome gaps</p> <p>Impact level:</p> <p>Not possible</p>

12. Tenure Mechanisms (Global) Cluster

Prioritization: low to medium

- Overlap in Challenge 3
- Supports multi-region representation

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

- Regional overlap to prioritize: Uganda, Peru
- CIFOR representation
- Representative of FTA and bilateral investment (budget < 3M USD)
- More feasible if strategic selection of projects is prioritized
- Outcome evidence for 2 projects is substantial, but key gaps remain or require updated evidence
- Estimations of impact are possible, but require supporting evidence of outcomes and from future policy change (conditions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? <i>Suggestions for additional data collection (for both outcomes and impact).</i>	Prioritization for additional evidence?
<p>Global Comparative Study on Tenure (CIFOR)</p> <p>Tier I countries:</p> <ul style="list-style-type: none"> • Indonesia • Peru, • Uganda <p>Tier II countries:</p> <ul style="list-style-type: none"> • Colombia, • Kenya • Nepal 	<ul style="list-style-type: none"> • 3 case study outcome evaluations (2018, 2019, 2019) • 1 OICR (2018) • 2 CIFOR annual reports (2017, 2019) • 1 FTA annual report (2016) • 1 flagship outcome story (2017) • 1 infobrief (2019) 	<p>*reliability: medium (external and self-reported sources)</p> <p>*confidence: high</p> <ul style="list-style-type: none"> • Government outcomes (H) • Donor & Mult. Orgs outcomes (L): limited evidence • Researcher outcomes (H) • NGO & CSOs outcomes (M) • Forest Community outcomes (H) 	<p>>500 community members are better equipped to defend their rights and seek alternative equitable livelihood options through training</p> <p>1210 households in Madre de Dios and Loreto potentially influenced by the project in Peru</p>	<ul style="list-style-type: none"> • Government outcomes: need more detail of uptake of project outputs; need update of new tenure policy reform or implementation • Donor outcomes: need evidence of donor learning and support for tenure-based management • NGO & CSOs outcomes: need more detail of NGO advocacy and support for tenure-based management, need evidence of advocacy groups' being organized to mobilize tenure rights; need evidence of women's groups being able to claim rights • Forest Community outcomes: need evidence of benefits from implemented tenure reform <p>Impact estimations: Already have.</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> • <i>Bibliometric analyses</i> 	<p><i>Outcome level:</i> Possibly not because of recent evaluation and additional evidence may take time to materialize (i.e., may not be available)</p> <p><i>Impact level:</i> Possible from policy targets, but requires supporting evidence of outcomes (sensitive to assumptions)</p>
<p>Addressing the gender gap in participation and representation in community forestry: Consolidation of research and action on gender, tenure and community forestry in Uganda and Nicaragua (CIFOR)</p>	<ul style="list-style-type: none"> • 1 final report (2017) • 1 CIFOR annual report (2016) 	<p>*reliability: low (self-reported sources)</p> <p>*confidence: medium</p> <ul style="list-style-type: none"> • Government outcomes (M) • Donor & Mult. Orgs outcomes (L): no evidence • Researcher outcomes (M) • NGO outcomes (L): limited evidence • CSO outcomes (L): limited evidence 	N	<ul style="list-style-type: none"> • Government outcomes: need more detail of MoUs; need more detail of policy change; need update of implications of policy change • Donor & Mult. Orgs outcomes: need evidence of learning; need evidence of support for ACM and gender empowerment in forest governance • Researcher outcomes: need more detail of research partnerships and capacity-building • NGO & CSOs outcomes: need more detail of enhanced interactions between communities and NGOs; need more detail on MoU with AUPWAE; need more detail of NGO capacity-building; need more detail of NGO support for gender empowerment in forest governance 	<p><i>Outcome level:</i> Possibly, preliminary evidence is promising though key gaps exist</p> <p><i>Impact level:</i></p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<ul style="list-style-type: none"> Uganda Nicaragua Peru 		<ul style="list-style-type: none"> Forest Community outcomes (H) 		<p>Impact estimations:</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs</i> <i>Bibliometric analyses</i> 	
<p>Assessment of Natural Resource Governance Including Land and Forest Tenure in Coastal Mangrove Forests of Southeast Asia and Africa (CIFOR)</p> <ul style="list-style-type: none"> Indonesia Tanzania 	<ul style="list-style-type: none"> 1 brief (2016) 1 donor report (2016) 1 case study report (2016) 	<p>*reliability: low (self-reported sources) *confidence: low</p> <ul style="list-style-type: none"> Government outcomes (L): no evidence Donor & Mult. Orgs outcomes (L): no evidence Researcher outcomes (L): limited evidence in Indonesia NGO & CSOs outcomes (L): no evidence Forest Community outcomes (L): no evidence 	N	<ul style="list-style-type: none"> Government outcomes: need evidence of learning on and awareness of tenure issues; need evidence of output use; need evidence of prioritization of mangroves at national level; need evidence of policy change (for Indonesia and Tanzania) Donor & Mult. Orgs outcomes: need evidence of learning and support for tenure-based management Researcher outcomes: need more detail of university support for awareness-raising; need more detail of partner capacity-building NGO & CSO outcomes: need evidence of awareness and involvement on tenure-based management issues; need evidence of participation in multi-stakeholder fora Forest Community outcomes: need evidence of learning on tenure and mangrove governance issues; need evidence of community involvement in mangrove management; need evidence of practice change <p>Impact estimations: area of study sites?</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> <i>Bibliometric analyses</i> 	<p><i>Outcome level:</i> Likely not, limited initial evidence base; requires intensive data collection</p> <p><i>Impact level:</i> Possible from reported area of study sites in Indonesia, but requires supporting evidence of outcomes (sensitive to assumptions); unsure of difficulty to collect/resources available for Tanzania</p>

13. Forest-based Livelihoods (Global) Cluster

Prioritization: Low

- CIFOR representation
- No challenge overlap
- Multi-regional representation
- Budget < 1M USD (Missing information for 1 project)
- Outcome assessment requires updated evidence
- Impact estimation: not possible (there is no line of sight between the PEN project and improvements in policies. Hence, logically there is also no evidence as yet of enhanced livelihoods outcomes. The time lags for eventually observing such changes are probably a decade at least)

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? Suggestions for additional data collection (for both outcomes and impact).	Prioritization for additional evidence?
<p>Poverty Environment Network (PEN) (CIFOR)</p> <p>24 countries across Central America, South America, Africa, and Asia</p>	<ul style="list-style-type: none"> • Performance Story (2019) • 1 PEN global dataset webpage • 1 annual report (2017) 	<p>*reliability: medium (internal case-study evaluation)</p> <p>*confidence: high</p> <ul style="list-style-type: none"> • Researcher outcomes (H) • Government outcomes (M) • Donor outcomes (L): no evidence • Multilateral Orgs. outcomes (H) 	N/A [influence via Research pathway]	<ul style="list-style-type: none"> • Researcher outcomes: update bibliometrics • Government outcomes: need more detail on learning, gov't uptake/use of project outputs, changes in policy (Indonesia and Tanzania) • Donor outcomes: need evidence on learning, uptake/use of project outputs, changes in policy • Multilateral orgs outcomes: update dissemination and use would strengthen <p>Impact estimations: N/A</p> <ul style="list-style-type: none"> • Additional document review (project documents, trip reports, external media) • Interviews/surveys with governments, donors, research team • Bibliometric analyses 	<p>Outcome level: TBD. Needs evidence of outcome realization for Governments and Donors</p> <p>Impact level: Not possible to collect or quantify – Influence focus on Research Pathway</p>
DFID Know-for 2: Poverty Environment Network (PEN) (CIFOR)	* same as above	* same as above	* same as above	* same as above	* same as above

14. Bioenergy (Global) Cluster

Prioritization: Medium to High

- INBAR and ICRAF representation
- Overlap with Challenge 2
- Budget > 3.5 M USD (Missing information for 3 projects)
- Preliminary outcome evidence promising for all pathways, but notable gaps exist in specific countries
- Impact estimations may be possible, but require supporting evidence of outcome realization and project contributions (assumptions must be explicit)

Project	Evidence Sources	Level of Outcome Evidence (L, M, H), Reliability Assessment, & Confidence	Impact (Y/N) & Reliability Assessment	What additional evidence is required? Suggestions for additional data collection (for both outcomes and impact).	Prioritization for additional evidence?
<p>Programme for the Development of Alternative Biofuel Crops – (IFAD 1043) (ICRAF)</p> <ul style="list-style-type: none"> • Brazil • India • Kenya 	<ul style="list-style-type: none"> • Final report (n.d.) • ICRAF internal newsletter (Jan 2015) • ICRAF blog news (n.d.) • UNCTAD news page (2015) 	<p>*reliability: L/M</p> <p>*confidence: M</p> <ul style="list-style-type: none"> • Government outcomes (M) • CBOs outcomes (L): limited evidence • SMEs outcomes (M) • Smallholders outcomes 	N	<ul style="list-style-type: none"> • Government outcomes: needs evidence of uptake and use (Brazil); scaling • CBOs outcomes: needs details on beneficiaries (Brazil) • Additional document review (project documents, trip reports, external media) • Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities • Bibliometric analyses • Quantification for impact estimation: 	<p>Outcome level: TBD – likely require extensive data collection</p> <p>Impact level: Possible from policy targets, but requires supporting evidence of outcomes</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

		(M)		<ul style="list-style-type: none"> • <i>Brazil – possible to derive from the National Biodiesel Programme (PNPB) targets (key outcome gaps remain)</i> • <i>India – possible to derive from scale-up activities (Government of Karnataka and Maharashtra)</i> 	(sensitive to assumptions)
<p>Bamboo as Sustainable Biomass Energy (INBAR)</p> <ul style="list-style-type: none"> • Ethiopia • Ghana 	<ul style="list-style-type: none"> • 1 Final report (2014) • 1 INBAR impact brochure – Ghana (n.d.) • 2 INBAR annual report (2012, 2013) 	<p>*reliability: L/M *confidence: M</p> <ul style="list-style-type: none"> • Government outcomes (M) • CBOs outcomes (H) • SMEs outcomes (H) • Smallholders outcomes (H) 	<p>Y</p> <p>Ghana: estimate 15,000 people employed in the bamboo sector (60,000 people)</p>	<p>Impact estimations: already have (Ghana)</p> <ul style="list-style-type: none"> • <i>Additional document review (project documents, trip reports, external media)</i> • <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> • <i>Bibliometric analyses</i> • Quantification for impact estimation: <ul style="list-style-type: none"> ○ Ethiopia: possibly to derive from policy documents (e.g., National Development Strategy and Action Plan for 2019-2030; National Policy on Growth and Transformation) 	<p>Outcome level: TBD</p> <p>Impact level: already have (Ghana)</p>
<p>South-South Knowledge Transfer Strategies Phases I and II (INBAR)</p> <ul style="list-style-type: none"> • Ethiopia • Madagascar • Tanzania • India (as technical partner) 	<ul style="list-style-type: none"> • 1 Final report (2019) • IFAD brochure (2019) • 1 external news (2019) • 1 blog INBAR (2018) • 2 INBAR annual report (2014, 2016) 	<p>*reliability: M/H *confidence: H</p> <ul style="list-style-type: none"> • Government outcomes (H) • CBOs outcomes (H) • SMEs outcomes (H) • Smallholders outcomes (H) 	<p>N</p>	<p>Impact estimations: Possible to derive from policy documents</p> <ul style="list-style-type: none"> • Quantification for impact estimation: <ul style="list-style-type: none"> ○ Ethiopia: policy documents (e.g., National Development Strategy and Action Plan for 2019-2030; National Policy on Growth and Transformation (Ministry of Agriculture). ○ Madagascar: policy document (Bamboo Policy and Strategy) ○ Tanzania: still at pilot stage 	<p>Outcome level: Enough evidence for Phase I (Phase II in progress)</p> <p>Impact level: Possible from policy targets, but requires supporting evidence of outcomes (sensitive to assumptions)</p>
<p>Dutch-Sino East Africa Bamboo Development Programme (INBAR)</p> <ul style="list-style-type: none"> • China • Ethiopia • Kenya • Uganda 	<ul style="list-style-type: none"> • 2 annual reports (2019, 2020) • External evaluation (2020) • 1 external blog (2020) • 1 OICR (2020) • 1 external press release (2019) • 5 INBAR annual report (2015, 2017, 2018, 2019, 2020) 	<p>*reliability: H external evaluation *confidence: H</p> <ul style="list-style-type: none"> • Government outcomes (H) • Donor outcomes (H) • Researcher outcomes (H) • CBO outcomes (H) • SMEs outcomes (H) • Smallholders outcomes (H) 	<p>N</p>	<p>Impact estimations: Possible to derive from policy documents</p> <ul style="list-style-type: none"> • Quantification for impact estimation: <ul style="list-style-type: none"> ○ Ethiopia: policy documents (e.g., National Development Strategy and Action Plan for 2019-2030; National Policy on Growth and Transformation (Ministry of Agriculture). ○ Kenya: ? ○ Uganda: policy document (National Bamboo Strategy and Action Plan) 	<p>Outcome level: enough evidence</p> <p>Impact level: Possible from policy targets, but requires supporting evidence of outcomes (sensitive to assumptions)</p>

FTA's Research Contributions to Address Persistent Rural Poverty and Increasing Levels of Vulnerability (Challenge 4)

<p>Inter-Africa Livelihood Development Programme (INBAR)</p> <ul style="list-style-type: none"> China Cameroon Ghana Ethiopia Madagascar 	<ul style="list-style-type: none"> 1 OICR (2021) 1 annual report (2020) 2 INBAR annual report (2019, 2020) 	<p>*reliability: M (self-reported source) *confidence: H</p> <ul style="list-style-type: none"> Government outcomes (M) CBOs outcomes (H) SMEs outcomes (M) Smallholders outcomes (H) 	<p>Y</p> <p>Project Target: to benefit 30,000 smallholders (including 12,000 women, 3000 youth and 15,000 smallholders)</p>	<ul style="list-style-type: none"> Government outcomes: needs evidence of uptake and use (Cameroon) SMEs outcomes: needs evidence for Cameroon and Ghana <p>Impact estimations: already have</p> <ul style="list-style-type: none"> <i>Additional document review (project documents, trip reports, external media)</i> <i>Interviews/surveys with governments, donors, research team, NGOs, CSOs, communities</i> <i>Bibliometric analyses</i> 	<p>Outcome level: TBD - recent annual report (2020) – likely require extensive field data collection</p> <p>Impact level: Already have</p>
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Brazil nut producers family, the Vela. GCS REDD+, Madre de Dios, Peru.
(Photo by Yoly Gutierrez/[CIFOR](#))

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FTA thanks all the donors who supported this research through their contribution to the CGIAR Trust Fund: cgiar.org/funders/



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foreststreesagroforestry.org

cgiarforestsandtrees@cgiar.org

[@FTA_CGIAR](https://twitter.com/FTA_CGIAR)

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