2.1 Component 1: Smallholder production systems and markets

2.1.1 Introduction

Trees in fields, farming landscapes and forests contribute to human well-being in many ways. Some of their most fundamental contributions are as direct inputs to the livelihoods of resource-poor rural people. This involves interactions between: (1) 1.4 billion hectares of forest;¹ (2) almost a billion hectares of agricultural land with more than 10% tree cover;² (3) 65,000 tree species;³ and (4) some 5 billion people⁴ in the developing tropics alone. Despite the tremendous importance of the tree products and environmental services that underpin livelihoods for the rural poor, these products and services remain little understood, poorly managed, barely recognized, inadequately appreciated and underinvested in. This is surprising given that several studies⁵ have shown that forest-based production contributes about 20% of the total household income of the poorest people in forested areas, through products that are consumed directly or processed and sold. Trees, if appropriately managed,

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help diversify rural livelihoods and contribute to the sustainability of agricultural production through tighter nutrient and water cycling, which increases soil and water productivity.  

Tree products, integrated production systems in which trees are grown or where forest fragments remain on farms, and tree product development typically fall through the cracks of national government and development agency approaches; there is little collection of information about them, limited promotion of their benefits and underinvestment in their development.  

A wide variety of management systems, from wild harvesting through intensive cultivation and husbandry, yield fruits, vegetables, oils, medicines, essences, wood, bamboo and other fibers that are critically important for subsistence uses, for generating employment and income and for meeting emergency needs.  Furthermore, trees may sustain the productivity of agricultural systems through tighter carbon, water and nutrient cycling and the provision of livestock fodder and shade, particularly in seasonally dry environments.

Tree products from natural forests and woodlands contribute revenues valued at US$18.5 billion annually, without including all contributions to poor households. These contributions to livelihoods are in danger as deforestation and forest degradation reduce the availability of important resources. Forest area decline, overextraction and increasing demand have put unsustainable pressure on wild stands, creating both the opportunity and the need for more intensive production and cultivation of tree products. Forest-dependent people may also lose access to resources and be made worse off when new conservation areas are created or ownership rights are claimed by, or assigned to, more powerful actors. More positively, the global trade of the top 20 tropical tree crops exceeds US$80 billion, even without taking into account the hundreds of species that do not have large international markets. There is considerable potential to contribute to poverty alleviation by smallholders creating and capturing more value from tree products.

Component 1 will identify opportunities for improving income generation, household consumption and broader livelihood assets by enhancing management of production systems, improving the function and efficiency of marketing systems and encouraging supportive policies and institutions.

Most tree species that provide useful products locally (fruit, medicine, oils, beverages, sawnwood, fuelwood, charcoal and industrial compounds) remain essentially wild. This means there is a huge opportunity for increasing incomes through their domestication and commercialization in cultivated settings or sustainable harvest where they remain components of natural forest. Many such species have not benefited from characterization, selection and breeding by scientists. What has been done by local farm and forest managers is little understood and often not valued. Information on management requirements of these

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species is lacking and, again, until recently, local knowledge has not been taken seriously.\footnote{Sinclair, F.L. and Joshi, L. (2001) Taking local knowledge about trees seriously. In: Lawrence, A. (ed.) Forestry, forest users and research: new ways of learning, 45–61. ETRFN, Wageningen, Netherlands; Sinclair, F.L. et al. 2010. Systematic approaches to combining local and scientific knowledge about ecosystem services of trees. International Forestry Review 12(5): 474.} This limits these species’ value both to the harvester/grower and to the consumer.

Moreover, local, national and international markets for many of these products are poorly developed and inefficient. The socioeconomic systems and the policy contexts in which these products are produced and managed are neither well understood nor adequately supported. The lack of knowledge about quality tree germplasm, inappropriate farm management practices, insecure forest and tree tenure\footnote{Larson, A. et al. 2008. Tenure rights and beyond: community access to forest resources in Latin America. CIFOR Occasional Paper No. 50. CIFOR, Bogor, Indonesia.} and limited market integration are constraints that can be addressed, thereby improving livelihoods and the environment. The research in this component will identify and help to exploit these opportunities to enhance poor people’s livelihoods by improving the quality, quantity and type of trees, their management, their marketing and their governance.

The factors constraining tree production are complex and interrelated, and, in many cases, require integrated solutions. The policy and institutional environment strongly influences people’s rights and incentives to manage forest and tree resources, with national and regional policy frequently subverting existing management systems and local institutions. Poorly functioning markets, lack of credit and limited information severely undermine the potential contributions even from high-value products. Poor rural people face many constraints that limit entrepreneurship. Even where these constraints can be overcome, technical constraints in commercially oriented management systems, planting materials and practices prevent the poor from taking advantage of opportunities to earn more income, create employment and improve livelihoods at household and community levels.

The research under this component aims to understand and improve the systems in which forest, tree and agroforestry products are produced, locally used (for food, fuel and construction), processed and sold, as a way to enhance livelihoods. Alleviating poverty through better management of tree cover requires protecting poverty mitigation functions, enhancing income and employment options, and taking advantage of opportunities to build and strengthen local institutions through policies and project-level interventions.\footnote{Belcher, B.M. 2005. Forest product markets, forests and poverty reduction. International Forestry Review 7(2): 82–89.}

### 2.1.2 Thematic focus

Component 1 includes the following three interrelated themes encompassing the management of tree production systems (including interactions with other system components when cultivated on farms and the sustainable harvest of products from wild resources in natural forests); enterprise development and the processing and marketing of tree products; and greater social recognition and more equitable rights associated with forest and tree production.
Research Theme 1: Enhancing productivity and sustainability of smallholder forestry and agroforestry practices, including food security and nutritional benefits, through better management of production systems.

Research Theme 2: Increasing income generation and market integration for smallholders through utilization of forestry and agroforestry options.

Research Theme 3: Improving policies and institutions to enhance social assets and to secure rights to forests, trees and land.

Together, these three themes address the nested sets of opportunities and constraints in small- and medium-scale tree and forest production and marketing. Medium-scale enterprises are not the primary focus, although they do have some relevance, in two ways. First, small-scale enterprises often face similar constraints to medium-scale enterprises and hence are amenable to similar solutions. Second, small-scale enterprises are often integrated into the value chain where medium-scale local enterprises purchase raw or semi-processed products from smallholders. The objective of the research is to provide analyses and knowledge that will support new policy, institutional and technical approaches to protect, create and capture livelihood values, in order to help people out of poverty and to distribute the benefits of forest and tree resources more equitably.

Research on eco-certification forms part of both Theme 2 of this component and Component 5. The eco-certification aspect in Component 1 will deal primarily with issues pertaining to agroforestry products such as shaded cocoa and coffee, whereas in Component 5, the emphasis is on forestry products, principally timber. Close links will emerge between the two in relation to products that are found in both forests and agroforestry systems, such as smallholder timber and charcoal. The policy and governance issues covered in Component 1 relate specifically to smallholder productivity in terms of people’s access to forest and tree resources, how trees condition land rights and differential usufruct to tree products. These issues all have immediate impacts on smallholder decision making about forest and tree management and hence the role forests and trees play in rural livelihoods.

2.1.3 Objectives and expected outcomes (10 years)

The overall objectives of Component 1 are to enhance the productivity of forest and tree production systems, to increase smallholder participation in tree product markets and to understand and strengthen institutional arrangements (including tenure security and local collective action) underpinning the management and use of forests and trees. The research will analyze and address constraints and opportunities in smallholder agroforestry and forestry production and marketing enterprises, with the following expected outcomes.

**Predominantly Theme 1**

- Technical innovations increase the productivity, sustainability and profitability of smallholder forest and agroforestry production.
- Smallholder natural-resource-based enterprise development is encouraged and facilitated.
Predominantly Theme 2

- Accessibility, effectiveness and efficiency of markets for forest and tree products is increased.
- Innovative extension approaches increase the speed, appropriateness and targeting of the spread of superior tree germplasm and tree management options.

Integrated across Themes 1 and 2

- Smallholder production and marketing systems attract efficient private-sector input suppliers (e.g., quality planting material, production and harvesting inputs, and postharvest processing equipment).

Predominantly Theme 3

- Policy and institutional changes provide tenure security and incentives for small- and medium-scale forest and tree product producers, processors and traders.
- Local-level institutions that regulate use and management of forest and tree resources are supported and strengthened (including their aggregation into higher-level structures) to improve their effectiveness, to enhance market access and to increase opportunities for influencing policy and practice.
- Rules, norms and strategies for conflict resolution and equitable benefits capture among multiple resource users are identified and strengthened.

Integrated across all three themes

- Recognition of actual and potential contributions of forest and tree products to livelihoods is increased among national-level government agencies and national and international programs and projects.
- National Agricultural Research Systems (NARS) increase problem-oriented research on social, economic, policy and technical issues including local knowledge and practice relevant to smallholder forest and tree production systems.
- Women and other disadvantaged actors have greater incentives, rights and capacity with which to benefit from forest, tree and agroforestry products.

These outcomes will contribute to the following CRP6 impacts: increased social and economic benefits from forest and agroforestry goods and services; reduced risks to rural livelihoods; and enhanced access of women and other disadvantaged groups to benefits at all levels.

2.1.4 Geographic priorities

CRP6.1 covers a wide geographic range, including West, Central, East and Southern Africa, South and Southeast Asia and Meso-America, the Andes and the Amazon, with opportunities for poverty reduction and conservation across ecological zones and systems. To provide focus, and to take advantage of synergies between this component and other components within CRP6, significant co-location of work is intended in sentinel landscapes. For example, we anticipate co-located research along forest transition gradients in Mali in the Sahel with CRP1.1 and on shaded cocoa systems in West Africa and shaded coffee in East Africa with CRP1.2. During the inception workshop with partners, we will use the land use transition
framework to select study sites to address priority issues at key points along the forest transition curve, from natural forest through to degraded or secondary forest, cropland–agroforestry systems and plantations. Common elements and issues at each stage in the transition will bring focus to the work. The development of generic approaches and tools that can be customized for local implementation lies at the heart of the Component 1 research strategy. While a large proportion of the work will co-locate at sentinel landscapes (if possible), some innovations, such as improved, high-value tree germplasm or tree management options conferring eco-certification benefits for commodities such as coffee and cocoa, have generic potential for rapid scaling across single points in the transition. Scaling-up research is a key component of Theme 2 and will incorporate the different needs of forest and cultivated tree options.

In core forest and logged-over forest areas, for example in the Amazon and Central Africa, we will explore opportunities for increased commercialization and improved/intensified production of timber products and non-timber forest products (NTFPs). Research and support are needed to help market and enterprise development. Research is also needed on policies affecting trade, credit, infrastructure and agricultural incentives in zones with more intensive agriculture. Major opportunities exist to integrate trees into food crop systems to enhance crop productivity and provide environmental services and greater income, an endeavor referred to as “Evergreen Agriculture”. Research in this area will be focused on identified breadbasket areas in Africa, specifically:

- southern Mali,
- northern Ghana,
- the Beira Corridor in Mozambique,
- the southern highlands of Tanzania, and
- Ethiopia.

Strategic issues include the need for improved planting material (selection, domestication), improved management/technology and improved market access, marketing and enterprise development.

At the right-hand end of the transition are plantations, an under-researched area that includes small- and medium-scale plantations for poles, wood, fuel, fiber and non-timber products; at the other end are poorly understood and heretofore ignored local practices of tree management and “domestication of landscapes”. New opportunities are emerging with changing land and tree tenure, reduced supplies from natural forests, increased demand and new institutional arrangements (e.g., contract farming for wood or fiber). At each stage, there are opportunities to better understand and improve the contributions of forest and tree resources to local livelihoods. The specific requirements vary according to the context, but there are sets of researchable issues on production and productivity, on markets and enterprise development and on the policies and institutions that govern these systems. Systems, locations and environments in the forest/agricultural domains of humid, subhumid, semi-arid and drylands, with significant numbers and/or density of poor people, will be targeted. For example, in Africa, we propose to undertake fieldwork, surveys, analyses,

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policy reform, data set assembly, species targeting and market interventions in forest and farm environments associated within the following five of the 14 main agricultural landscape domains identified by Dixon et al.:\(^{15}\)

- tree crop (No. 2),
- forest based (No. 3),
- highland perennial (No. 5),
- cereal root crop mixed (No. 8) and
- maize mixed (No. 9).

This will involve working in dry forest/crop areas in Sahel and sub-Saharan savannas, humid West Africa coastal forests, Congo Basin forests, Afro-montane forests in East and West Africa, high-potential highlands of East Africa, Miombo woodlands and adjacent maize croplands. Areas in Latin America and Asia will be similarly prioritized during component implementation.

### 2.1.5 Research Theme 1: Enhancing productivity and sustainability of smallholder forestry and agroforestry practices, including food security and nutritional benefits, through better management of production systems

**Rationale**

As smallholder forest and tree management has received comparatively little research attention, it offers unrealized potential for new insights into novel principles of management, as well as increases in production, productivity and profitability through improved management and improved planting material.\(^{16}\) This applies to wood and fiber production and to many NTFPs and agroforestry tree products (AFTPs).\(^ {17}\) Other constraints, such as lack of or limited access to credit, land/tree tenure, marketing support and climatic vulnerability, are partly addressed in Themes 2 and 3.

Forest and tree management on farms is more complex than annual crop management because of the life cycle, trait differences, size, perenniality and multiple tree forms, even within the same species. There has been little research on small-scale systems, in which management conditions change with evolving market requirements, trees interact with other system components, and production environments are dynamic because of intensifying pressure on land and climate change. Against this background, research and technical support are urgently needed to meet the needs of small-scale producers. The specific sets of constraints and opportunities are unique to each situation, and will require careful assessment as part of the research in each site. Nevertheless, there are similar types of production and management problems. Basic silvicultural recommendations on spacing, thinning, pruning

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and fertilization exist for a limited number of tree species. Such species are typically grown in large plantations in block arrangements where close spacing forces individual trees toward more marketable forms (e.g., straight trunks). Trees in agricultural landscapes are mainly planted: (1) as single scattered trees in cropland; (2) in linear arrangements on borders or contours; or (3) in small blocks (not necessarily with regular spacing).

Some of the forests managed by smallholders are highly diverse and complex, whereas others are fragmented or degraded. As a result, the selection of products and markets and other management decisions made by forest smallholders differ greatly from those of industrial-scale managers. In managed forest environments, smallholders and communities often manage integrated systems for a variety of products and services. Multiple-use forest management has gained attention as a means of increasing sustainability and income for forest managers. However, these diverse multiple-use systems, with highly variable biophysical, social and economic characteristics, remain poorly understood, resulting in missed opportunities. This research will support scale-appropriate, systems-oriented interventions based on more complete understanding of such systems and their management to improve management and livelihoods.

Small-scale forest managers and farmers in tropical agroforestry systems tend to have low awareness of “quality” planting material and poor access to “good quality” planting material. Such systems fall short of their potential in providing useful tree products (and services). Achieving a diversity of species and effective tree management requires a range of approaches for gradual or radical transformation of the supply and use of selected tree germplasm; this is both more productive and appropriate for local ecological, social and economic conditions on farms. This theme aims to provide practical and direct approaches to increase the value of forest products and trees in small-scale systems.

The scientifically uncharacterized status of most forest and tree products (fruit, vegetables, honey, medicines, oils, beverages, bushmeat, building materials, sawnwood and industrial compounds) implies unrealized potential for both the harvester/grower and the consumer. Low or inconsistent quality of products, and unpredictable or erratic timing of harvests, can drastically reduce market potential and profitability. As the value of some of these products tends to accrue disproportionately to women and marginalized families, improvements in the quality, quantity and type of trees available can directly improve livelihoods of these groups.

Species choices and varieties available for small-scale planted systems are typically limited. Farm and market surveys reveal the need for trees that grow fast, fruit early, are pest and drought resistant, and provide multiple products. Nursery surveys, however, reveal poor matching of these needs to available planting stock. Of equal concern are the high level of inbreeding and low diversity of founder populations introduced to farmlands, leading to chronic underproduction in future generations of cultivated trees.

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The opportunity for private sector engagement with recurrent germplasm sales has strengthened investment in annual crops, which tend to involve only a few species and substantive public sector investment over many decades. In contrast, the plethora of possible species, low recurrent annual demand (not absolute demand) and the technical complexity of handling large, long-lived taxa have led to a deficit in both public and private sector investments in tree species. Moreover, there is a lack of knowledge of the fundamental aspects of the biology, ecology and growth of many tree species compared with their annual crop counterparts. Often, local knowledge about trees and their management, accrued over many years, may complement scientific understanding.

Production of NTFPs, management of trees on farms and tree management and domestication are all heavily influenced by social processes of control over use and overuse of wild populations and the land on which trees regenerate or can be planted. In later stages of domestication, explicit steps of genetic selection for specified “ideotypes” dominate, but early steps implicitly affect the genetic pool available for such selection. Many annual food crops have been so extensively bred that further advances in productivity require highly sophisticated genetic approaches. In contrast, many tree species used in agroforestry are virtually wild, meaning simple improvement strategies, cognizant of system compatibility, have the potential to generate huge genetic gains rapidly.

This research theme focuses on developing design principles, technology options and decision support tools that facilitate adoption and adaptation of improved forestry and agroforestry practices by farmers directly and via national governmental and NGO extension processes. There is tremendous scope for improving knowledge about the management of forests and trees on nurseries and farms and for targeting agroforestry interventions tailored to local ecological, economic and social circumstances and gender differentials. Efforts must include reconciling local and external knowledge to support the generation of locally relevant options and development of the enabling environment, in terms of policies and institutions, required for adoption and optimal management of forests and trees on farms. This theme addresses the need to understand the principles of managing integrated farming systems with trees and the synergies and trade-offs between economic returns, market production and the long-term sustainability of intensified and diversified production systems.

**Methods and research approach**

The research in this theme will identify and address key technical constraints and opportunities for enhanced quality and productivity of forest and tree products in selected small-scale management systems. The work will develop new approaches for diagnosing problems and designing interventions, improving understanding of small-scale forest and tree management and improving the tools and techniques available for characterizing and improving tree germplasm.

Research will take a multidisciplinary approach combining social and biophysical scientists to address the diverse issues faced by smallholder foresters and agroforesters. It will rely on participatory action research methods to identify, test and validate management practices appropriate for the conditions faced by smallholders. Specific methods will include forest inventory as well as rapid appraisal methods, producer surveys and ethnography. In addition, remote sensing will assist with assessing how local management practices fit into and shape land use mosaics.
Systematic approaches to acquisition of local agroecological knowledge,\textsuperscript{21} will be combined with participatory modeling techniques to explore the relevance of local and scientific understanding in order to improve productivity of smallholder agroforestry and forestry practices; this will include identifying knowledge gaps and developing decision support tools.\textsuperscript{22} Well-established tree domestication methods will be combined with molecular techniques to understand variability within tree populations and, where appropriate, to assist selection.\textsuperscript{23} Tree improvement strategies will take into account system compatibility issues arising from interactions between trees and other system components\textsuperscript{24} as well as the realities of farmer practice\textsuperscript{25} and will combine participatory on-farm and on-station trials with simulation modeling to derive appropriate understanding of management options. Tree diversity will be incorporated into the design and improvement of forest and agroforestry options using mapping of vegetation types combined with consideration of climate change scenarios.\textsuperscript{26}

Previous experience with \textit{Allanblackia} spp.\textsuperscript{27} will be used to exemplify an integrated approach to tree domestication for high-value species, when rapid scaling-up of germplasm supply of a species is required. The timelines, human resources and investment required for effective domestication, including germplasm scaling-up, will be documented and key decision points and bottlenecks explained. Lessons learned from this real-life case study (where domestication is well under way but by no means completed) will be systematized to support more effective domestication of other priority high-value species.

\textsuperscript{22} Vanclay, J. et al. 2006 Realizing community futures: a practical guide to harnessing natural resources. Earthscan, London.
\textsuperscript{27} http://www.allanblackia.info
### Research questions

<table>
<thead>
<tr>
<th>Broad research questions (Component 1, Theme 1)</th>
<th>Gender-specific aspects of the question</th>
<th>Examples of science outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to increase investment in species-specific tree improvement using generic domestication techniques for priority NTFP and tree species to ensure quality planting material is available?</td>
<td>What interventions (e.g., policies) can improve women’s access to important NTFP and tree species for germplasm collection and use?</td>
<td>New/improved tree and crop germplasm</td>
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<td></td>
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<td>NTFP and tree domestication strategies</td>
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<td>What approaches, tools and methods can be used to adapt tree and forest management techniques to the scales, resource types, objectives and opportunities of smallholders and community forest managers?</td>
<td>How to ensure promotion and domestication of high-value NTFP and tree species are based on men’s and women’s differentiated preferences (products and species)?</td>
<td>Best practice guidelines</td>
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<td></td>
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<td>Forest and tree management tools</td>
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<td>How and why do different tree species x management options confer affordable sustainability benefits for farmers in terms of higher soil and water productivity in the medium to long term?</td>
<td>How do gender-differentiated roles and control of resources affect species and management preferences and ultimate choices?</td>
<td>Development of associational tree ideotypes and hence system-compatible tree germplasm</td>
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<td></td>
<td>What changes in women’s control of tree and land resources are necessary for their preferences to prevail in decisions about tree planting, retention and management?</td>
<td>Tools for matching trees and tree mixtures to sites and circumstances</td>
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<tr>
<td>How can innovative management techniques be used to improve NTFP and tree use to diversify farming systems and enhance rural livelihoods?</td>
<td>How does the introduction of innovation or intensification affect gender roles or differential access to resources and benefits?</td>
<td>Tools for promoting tree diversity on farms and in farming landscapes</td>
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<td>How can innovative management techniques (locally derived and science based) be identified, tested and evaluated more efficiently?</td>
<td>How do knowledge and preferences of women and men differ in relation to choices of tree species and management options?</td>
<td>Databases of scientific and local assessments of tree attributes that confer productivity gains and system compatibility</td>
</tr>
<tr>
<td>Which farmer forest and tree management skills can be enhanced with respect to establishment, protection, spacing, thinning, selection, pruning, coppicing, harvesting, irrigation and fertilization?</td>
<td>How to consider gender roles and targeted training in different forest/tree management activities to promote complementarity of skills, especially in labor-scarce households?</td>
<td>Forest and tree management manuals, Databases, Demonstration sites</td>
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</table>

### Research partners

A comprehensive plan for regional, country and site partners will be developed in the early phase of implementing the research program and kept under ongoing review. Some indicative organizations are shown here to illustrate the form of partnerships envisaged.
<table>
<thead>
<tr>
<th>Type of research partner</th>
<th>Organization</th>
<th>Research partner contributions</th>
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</thead>
<tbody>
<tr>
<td>Participating CGIAR center</td>
<td>World Agroforestry Centre</td>
<td>Provides research expertise in the development of design principles for agroforestry and tree management options in fields and farming landscapes across Africa, South and Southeast Asia and the Amazon. Provides a key link to the methods and data in AfSIS (African Soil Information Service) used for targeting interventions</td>
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<tr>
<td></td>
<td>CIFOR</td>
<td>Provides research expertise on management and productivity of forest products and services and smallholder forestry</td>
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<td></td>
<td>CIAT</td>
<td>Conducts research on characterization of fruit germplasm suitable for agroforestry systems. Contributes to design of sustainable production systems including tropical fruits. Conducts life cycle analysis of tropical fruits under agroforestry systems. Provides support in developing market linkages for NTFPs</td>
</tr>
<tr>
<td>International level</td>
<td>CIRAD</td>
<td>Contributes expertise through staff seconded to participating CGIAR centers, on shade coffee systems and tree–crop interactions, particularly in relation to carbon and water cycling</td>
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<tr>
<td></td>
<td>SLU, Bangor, Wageningen and Gottingen Universities</td>
<td>Contribute expertise and advanced laboratory facilities for understanding carbon, nutrient and water cycling</td>
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<td></td>
<td>INBAR</td>
<td>Collaborates on action research on smallholder production systems and markets for bamboo, rattan, and NTFPs in general (through the GFAR Global Partnership Programme on NTFPs, which INBAR coordinates)</td>
</tr>
<tr>
<td>Regional level</td>
<td>CATIE</td>
<td>Provides expertise in genetic resources and breeding of tree crops. Coordinates research in Central America. Disseminates results via outreach activities and curricula. Public–private partnership platform in Ghana, Cameroon, Liberia, Nigeria and Tanzania focusing on extracting oil from the local <em>Allanblackia</em> species on a commercial scale. The partnership is unique in that it involves local communities and small-scale businesses, in cooperation with non-profit development partners, local governments and Unilever.</td>
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<td></td>
<td>Novella Africa Initiative</td>
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<tr>
<td>Country or site level</td>
<td>National tree crop, agriculture and forestry research institutes (e.g. Coffee Research Foundation, Kenya; CRIG and FORIG (Cocoa and Forest Research Institutes of Ghana, respectively))</td>
<td>Collaborate in research in specific countries and at specific sites</td>
</tr>
</tbody>
</table>
2.1.6 Research Theme 2. Increasing income generation and market integration for smallholders through utilization of forestry and agroforestry options

Rationale

Small-scale farmers, forest-dependent producers and entrepreneurs often lack business skills, have limited access to timber and tree product markets, or both. There are notable exceptions.\(^{28}\) Poor access to transportation (due to lack of infrastructure or inability to pay), information barriers and social barriers all stand in the way of profitability.\(^{29}\) Such producers typically have difficulty producing consistent-quality products in sufficient quantities to gain market power. Without good organization and stable markets, they tend to be price takers with high marketing risks and costs and low returns. At the same time, forestry and agricultural extension systems in the developing world are declining or collapsing. Agricultural extension agents typically lack knowledge about trees appropriate to smallholders, and often are ignorant or dismissive of local markets and marketing systems. Forestry extension agents are often trained to serve industrial timber enterprises and have little awareness of the products, scales and constraints relevant to smallholders, community forest management and forest product markets that serve the poor. In some cases, commercial suppliers and companies, with their own interests, are stepping into this role. Products such as fuelwood and charcoal are often extremely important economically but are ignored by researchers, extension staff and policymakers alike.

Government agencies and NGOs seeking to facilitate smallholder marketing also face obstacles. Staff often lack the appropriate training and tools to assess market opportunities or help farmers exploit available opportunities such as adding value to farm products. These facilitating organizations are also hampered by a lack of knowledge, understanding and appreciation of markets, local and international demand for products, or ways to intervene to support small producers and entrepreneurs. Methods are needed to assess demand and develop business investment models for tree product investors. Insufficient credit and other types of financing further constrain investment by small-scale rural producers. There has also been little development in postharvest handling and processing, resulting in spoilage and poor-quality products.\(^{30}\)

The lack of enabling conditions and incentives to commercialize products compound the problems. Inadequate institutional support (e.g., credit, market information) and skewed policies, barriers and disincentives make it difficult for smallholders to market their produce. There is an absence of quality assurance schemes for NTFPs and AFTPs and a lack of


services for production and marketing.\footnote{Simons, A.J. and Leakey, R.R.B. 2004. Tree domestication in tropical agroforestry. In: Nair, P.K.R. et al. (eds) Advances in agroforestry, 167–182. Kluwer Academic Publishers, New York.} Trade for some products is overregulated (e.g., on-farm timber), whereas in other cases it is underregulated (e.g., herbal medicines).\footnote{Rukunga, G. and Simons, A.J. 2006 The potential of plants as a source of anti-malarial agents. Plantaphile Publications, Berlin, Germany.} Many policymakers still view private traders as an overly opportunistic class rather than as a resource that can generate wealth in rural areas. They also often fail to perceive the potential of NTFPs and tree products for generating significant incomes for smallholder farmers. Furthermore, they often fail to understand and seize the new opportunities that are offered by changing demographic conditions, including the “deagrarianization”\footnote{Wilson, G.A and Rigg, J. 2003. Post-productivist agricultural regimes and the South: discordant concepts? Progress in Human Geography 27: 681–707} of rural communities, rapid rates of urbanization and increased circular migration and the economic potential of remittances.

Research under Theme 2 will investigate constraints that limit the functioning of small- and medium-scale resource-based enterprises (SMEs), and will develop ways to support and improve such enterprises. Research is also needed to guide technical support and policy reform that will benefit these small enterprises, by targeting increased income and employment opportunities and creating incentives for better resource management. Key science opportunities in this theme include: (1) assessing innovative extension approaches, such as volunteer farmer trainers and rural resource centers for building capacity of smallholder producer organizations; (2) assessing and addressing key constraints and opportunities for commercial forest and tree products (e.g., charcoal, fuelwood, cheap timber and other forest products for burgeoning urban settlements, indigenous fruits, natural products and fodder) that are not achieving their potential due to market failure and poor market development; (3) understanding how to implement community-based marketing systems for tree planting material and other inputs (i.e., seed and seedlings; processing equipment); and (4) assessing the efficiency and equity impacts of sustainability standards (also termed “eco-certification”) and comparing them with payments for environmental services (PES).

**Methods and research approach**

The research in this theme will focus on small-scale agroforestry and forest product enterprises and market development and function. It will develop tools and approaches to analyze market opportunities and constraints, identify typical constraints and opportunities in selected systems and develop and test interventions to support enterprise and market development. It will also focus on extension approaches. Given the decline of state-funded extension services, volunteer farmer trainer programs have emerged as an innovative and potentially more sustainable approach. Gender-differentiated methods are required in assessing market opportunities and designing extension approaches. Women are often confined to low-return value chains (e.g., low-value indigenous fruits); when such products become profitable, these value chains are taken over by men.\footnote{Kiptot, E. and Franzel S. In press. Gender and agroforestry in Africa: are women participating? ICRAF Occasional Paper, Nairobi.}
The methods used in the assessments will include:

1. **Qualitative methods.** These will include both individual and group interviews and will focus on eliciting people’s perceptions of their needs, approaches/interventions, problems encountered and their views of impacts. Methods will include participatory research tools, such as semi-structured interviews, matrix ranking and scoring and time lines. These methods are important for developing sound hypotheses and questionnaires for collecting quantitative data as well as for triangulating results obtained from quantitative analyses.

2. **Random, controlled experiments and natural experiments in the rollout of marketing or extension interventions.** These could be either *ex ante* or *ex post*, and involve establishing a control counterfactual as well as various treatments involving single or multiple extension approaches in order to compare their effects with each other and with the controls.

3. **Econometric analysis.** Econometric modeling will be used to assess factors influencing the flow of information among farmers, the flow of information from farmer trainers to others, and the effectiveness of the dissemination process in bringing about adoption. To evaluate volunteer farmer trainer programs, econometric modeling will be used to assess the factors influencing the number of farmers trained by volunteer farmer trainers. Independent variables will include meso variables (population density of area), socioeconomic characteristics of the trainers (age, gender, etc.) and characteristics of the technologies being disseminated (e.g., complexity).

4. **Cost–benefit analysis** will be used to assess the benefits and costs of interventions from the perspectives of various stakeholders.

5. **Gender analyses.** Data collected will be disaggregated by gender. For example, data on farmers’ perceptions of interventions, farmers’ access to and use of information and inputs, farmers’ ability to implement practices, and benefits of practices will be analyzed by gender. Wherever possible, gender-specific subgroups will also be analyzed. For example, we hypothesize that women in male-headed households have different perceptions and activities, and accrue different benefits, from those leading female-headed households.

6. **Value chain analysis.** Value chain analysis methods are well established, but few involve scientific rigor and few are appropriate for the analysis of most tree and non-timber forest products. We will adapt present methods to solving market-related problems and assessing the performance of markets.

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## Research questions

<table>
<thead>
<tr>
<th>Broad research questions (Component 1, Theme 2)</th>
<th>Gender-specific aspects of the question</th>
<th>Examples of science outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>What improved methods and rapid appraisal tools can be used to analyze the actual and potential value of forest and tree products for poor and women farmers and for subsector and value chains (including inputs, nurseries)?</td>
<td>How to increase women's participation in value chains and reduce inequity in household benefits? Appraisal tools should be gender sensitive and inclusive.</td>
<td>Rapid appraisal tools of market chains Viability and profitability studies Value chain reports Fair pricing guidelines</td>
</tr>
<tr>
<td>What scaling-up and novel extension approaches are effective in promoting the spread of knowledge and materials (e.g., seed), particularly among women and the poor, are sustainable and help build capacities of communities to access information and innovate? How does the impact of innovative extension approaches vary by commodity, by land use system, by social setting and by region?</td>
<td>How to ensure scaling-up and extension approaches and interventions are specifically targeted to cultural and gender differences, according to men's and women's different participation in commodities, land use systems and social settings?</td>
<td>Novel extension approaches Scaling-up protocols Rural resource centers</td>
</tr>
<tr>
<td>What are key marketing interventions for helping farmers improve returns from NTFP and agroforestry enterprises and improve smallholder competitiveness? How should the interventions be sequenced?</td>
<td>Collective marketing enables smallholders to &quot;break into&quot; the market, but gender relations can break down the collective if not attended to.</td>
<td>Marketing strategies Franchising options Outgrower schemes</td>
</tr>
<tr>
<td>What are the multiplication and deployment systems for improved tree germplasm that ensure genetic integrity, provide disease-free planting material, and are adapted to various local conditions?</td>
<td>Are the methods of multiplication accessible for both men and women?</td>
<td>Cultivar multiplication and deployment systems for tree crops identified and evaluated Locally adaptable tree seed and seedling systems and means of selecting appropriate models for different settings, developed and tested for both high-value and high-volume species.</td>
</tr>
<tr>
<td>What innovative and sustainable ways can be devised and implemented to improve the supply of market information, technical assistance and appropriate finance to differentiated, local end-users of forest- and tree-based production systems?</td>
<td>Community-based market information platforms are innovative and can be effective in supplying timely market information and getting feedback, but conflicts of interest and power relations between men and women in mixed platforms need investments in repairs and maintenance.</td>
<td>Market information systems Information hubs Microcredit schemes Decentralized extension approaches Demonstrations</td>
</tr>
<tr>
<td>How can certification of good agricultural practices and sustainable timber practices incentivize farmers to modify their tree-planting decisions?</td>
<td>How to improve women's participation in value chains and reduce inequity in household benefits? Appraisal tools should be gender sensitive and inclusive.</td>
<td>Certification checklists Generic criteria Publications</td>
</tr>
</tbody>
</table>
Research partners

A comprehensive plan for regional, country and site partners will be developed in the early phase of implementing the research program and kept under ongoing review. Some indicative organizations are shown below to illustrate the form of partnerships envisaged.

<table>
<thead>
<tr>
<th>Type of research partner</th>
<th>Organization</th>
<th>Research partner contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participating CGIAR Center</strong></td>
<td>World Agroforestry Centre</td>
<td>Provides research expertise on agroforestry product marketing, extension and eco-certification</td>
</tr>
<tr>
<td></td>
<td>CIFOR</td>
<td>Provides research expertise on marketing of forest products and services</td>
</tr>
<tr>
<td></td>
<td>Bioversity</td>
<td>Provides expertise in genetic resources and germplasm, manages tree crop genetic resources networks (CacaoNet and COGENT)</td>
</tr>
<tr>
<td></td>
<td>CIAT</td>
<td>Provides expertise on life cycle analysis of tropical fruits under agroforestry systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provides methodological support in developing market linkages for NTFPs</td>
</tr>
<tr>
<td><strong>International level</strong></td>
<td>Cultural Practice (US-based NGO)</td>
<td>Contributes expertise on gender-differentiated value chain analysis and assessment of extension approaches</td>
</tr>
<tr>
<td></td>
<td>INBAR</td>
<td>Research partner on processing and marketing of NTFPs, in particular bamboo and rattan</td>
</tr>
<tr>
<td></td>
<td>UNCTAD Committee on Sustainability Assessment (COSA)</td>
<td>Provides links with certification bodies, global-and national-level policymakers and private sector companies interested in certification and the impact of certification on livelihoods</td>
</tr>
<tr>
<td><strong>Regional level</strong></td>
<td>African Forum for Agricultural Advisory Services</td>
<td>Leads extension network participating in research on extension approaches and disseminating policy results</td>
</tr>
<tr>
<td></td>
<td>African Network for Agriculture, Agroforestry, and Natural Resources Education (ANAFE)</td>
<td>Provides research fellows to participate in market research and reforms curricula to include latest research results</td>
</tr>
<tr>
<td><strong>Country or site level</strong></td>
<td>District Women's Associations in(Zambia)</td>
<td>Collaborates in marketing agroforestry products</td>
</tr>
<tr>
<td></td>
<td>Kenya Forestry Research Institute (KEFRI)</td>
<td>Collaborates in research on agroforestry extension approaches</td>
</tr>
<tr>
<td></td>
<td>Tanzanian Association of Women Leaders in Agriculture and Environment (TAWLAE)</td>
<td>Collaborates in research on marketing of indigenous fruits</td>
</tr>
</tbody>
</table>
2.1.7 Research Theme 3. Improving policies and institutions to enhance social assets and to secure rights to forests, trees and land

Rationale

Policy and institutional frameworks shape access and control over forests, trees and land, which in turn affect the central issues discussed in the previous two themes—productivity and sustainability, income generation and market integration. Access, rights and opportunities for millions of forest-dependent and smallholder households and communities throughout the tropics and subtropics are affected by a complex mix of stakeholders, demographic pressure, economic forces and government policies. Smallholders and traditional communities that have practiced low-intensity, diversified resource use are encountering a variety of pressures affecting their access to forests and land use choices. In addition to growing rural populations, ranchers, loggers and large-scale agricultural enterprises, as well as actors with interests in petroleum, mining and carbon, compete for land rights; conservation interests seek to limit resource use to protect forests; and subsistence needs and commercial opportunities may encourage overexploitation or forest conversion.

Improved policies and institutions can help address these problems. For example, many land users will hesitate to invest in tree planting or sustainable forest management without secure tenure over the lands and resources they use. Securing rights may be a difficult and ongoing process, however, as actors with competing interests—including, at times, state entities—will continue to seek access and control over valuable land and resources. Policies need to ensure that people can invest in their lands and forests without the risk of losing their investments to more powerful forces outside communities (e.g., urban elite or industry over rural communities, government over customary claims). Of particular importance are policies to protect the rights of women and indigenous communities against more powerful forces.

Even if rights are secure, markets and regulatory systems may encourage forest degradation and conversion to other uses. Regulations regarding the use and trade of forest products often discourage or even prohibit smallholders and communities from harvesting or trading tree and forest resources, particularly those of higher value, such as timber. In many countries, the production of charcoal is illegal, even though it is one of highest-value commodities traded. Even where smallholders are permitted to sell valuable resources, the regulatory framework and state bureaucrats often place high financial, logistic and legal obstacles in the

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40 Dove, M. 1994. Marketing the rainforest: “green” panacea or red herring? East-West Center (EWC), Honolulu, USA.
way. In addition, without substantial support for smallholders and communities, markets tend to work in favor of larger and wealthier actors, so that little value accrues to those who own or extract the resource. Market constraints limit smallholder options and profitability. At the same time, opening up market opportunities can fundamentally change resource management and utilization priorities.

At the forest, territory or community scale, greater understanding of customary institutions typically governing resource use is needed, as is more information on the traditional indigenous knowledge that underlies these institutions and the processes through which they change. For example, the use of fire for land clearing and maintaining open grazing systems continues to discourage tree planting and management in many areas. At the same time, improved institutional frameworks are needed to promote sustainable adaptive management, and to address inter- and intragroup conflict over resource access and the distribution of resources. Local elites or people in positions of authority may dominate or interfere with the rights of other stakeholders; men may have greater access to resources and benefits than women. Moreover, while local institutions for the management of forests and trees are increasingly recognized, the gender differentiation and internal equity implications of such institutional arrangements are less well elaborated. At all scales, innovative policies and institutions are needed to ensure that forest communities and smallholders participate both in the decisions that affect their forests and livelihoods and in resource-related benefits.

Activities under this theme will support policies and institutions for improved and more secure resource access and use, for greater participation in decisions regarding forest and tree resources at all scales, and for improved livelihood benefits from those resources. The improvement of national policies regarding tenure rights and forest law and regulations, combined with the strengthening of local governance involving indigenous communities and smallholders and the scaling-up and -out of sustainable production systems (Theme 1) and value-added products (Theme 2), will facilitate the establishment of more resilient social and biophysical landscapes. Because goods and services from forests and trees are often used and valued at varying temporal and spatial scales, spanning multiple users, uses and values, the coordinating and enforcement role of state actors is necessary for sustainable use and equitable distribution of these goods and services.

Conflicting policies between agriculture and environment are not uncommon (e.g., how to manage riverbanks). Furthermore, the failure of government enforcement of forestry (and related sectors) strategies, policies and laws in many settings raises a central question of how to improve their performance. This theme is also concerned with factors underlying the asymmetry between relevant policy intentions and their actual implementation. In particular, it will address the factors that influence whether and how state officials implement policy goals, legal mandates and organizational strategies, how their implementation further influences local agents’ incentives for sustainable use/management of trees and forests and the distribution of benefits and, lastly, how state institutional incentives can be changed to stimulate more sustainable use of resources.

This theme will address the following issues:

- ill-defined, contested or absent tenure rights over forests and trees, which lead to conflict and failure to support rural producers;
- incongruence between customary and formal forest tenure and the effect of contradictory and overlapping policies on resource ownership and use;
- the need for forest and resource use policies that balance command-and-control approaches to environmental law enforcement with the need for increased local autonomy and systems based on social control, self-regulation and local rule formulation at the community level;
- improved mechanisms that encourage adaptive management of smallholder forests and that promote tree planting and harvesting on farms;
- weak institutional capacity and mechanisms for inter-institutional linkages that inhibit active coordination and collaboration in planning and management of local forest and agricultural landscapes;
- the need for greater understanding of how technical norms and regulations can be tailored to reflect the contexts, constraints and opportunities faced by smallholders and community-level producers;
- the need for innovative methods for mediation and dialogue for decision making and benefit distribution at the local scale and for conflict management in multi-stakeholder resource systems; and
- the need for mechanisms that promote equitable distribution of the benefits of forest and tree products and services (including across genders), under various social, economic and political pressures.

**Methods and research approach**

As a first step, a synthesis of existing research in this theme will be undertaken to guide the identification of high-priority research topics and locations for the future. Research into the policies and institutional arrangements that frame the use and management of fragmented and secondary forests, small-scale plantations and individual trees on farms and communities will draw on a variety of methods and approaches to generate a broad understanding of the drivers or constraints influencing decisions made by smallholders as well as the positive and negative consequences of those decisions. This body of work will rely on multidisciplinary teams capable of addressing the diverse biophysical and socioeconomic facets of policy and institutional analysis related to resource governance, and will focus on several scales from the global to the local. Through the use of global comparative studies using standardized instruments, tools and methods, research in this theme will generate quantitative and qualitative data to analyze differential success or failure of policy and institutional innovations to enhance assets and provide more secure rights, and to identify conditions under which national or local policies do lead to desired changes.43 Data collection will rely on surveys, key informant interviews and focus groups with stakeholders such as the

policymakers and technicians who design and implement policy frameworks and the producers, representatives of community enterprises and related actors that must operate within the imposed frameworks.

At local and regional scales, illustrative case studies will serve to analyze the effectiveness, efficiency and equity of policy frameworks and novel innovations for influencing resource use behavior and decision making, to improve livelihoods and to provide greater security in property rights (e.g., processes for local participation in by-law reforms). These studies will examine institutions used by local stakeholders to navigate official processes, to assist with negotiations with other stakeholders and to fill gaps not addressed by formal rules or agencies. In addition to the methods listed above, we will also apply ethnographic and participatory methods; these will facilitate the identification, documentation and evaluation of existing institutions as well as the identification of lessons learned or innovations developed by local stakeholders to enhance assets or secure their rights.

Gender analysis will generate insights on the gender-differentiated implications of policy implementation, while historical institutional analysis will generate insights into the political and social circumstances that influence policy and institutional reform. Gender analysis will increase understanding of the distinct views and perceptions that men and women have of policy, as well as the different opportunities and obstacles that policy frameworks might provide. Evaluation methods will be used to study the effects of national and local policy and institutional innovations designed to strengthen women’s usufruct and ownership rights over agroforestry and forest resources. The research will seek to be action oriented in partnership with government or development organizations, and will follow careful designs and baselines. Research will also evaluate options to strengthen science–policy linkages in gender issues. Research will be coordinated with the sentinel landscapes program to monitor effects of policy and institutional change. Coordination on research design and methodology is further envisaged with Component 2, Theme 4, and Component 5, Theme 2, both of which place emphasis on securing community rights and access, strengthening collective action and enhancing benefits from forests and trees.

## Research questions

<table>
<thead>
<tr>
<th>Broad research questions (Component 1, Theme 3)</th>
<th>Gender-specific aspects of the question</th>
<th>Science outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>How can multilevel governance institutions best work to enhance local rights and livelihoods?</td>
<td>How can women participate effectively in multilevel governance institutions and what is needed to overcome barriers to participation?</td>
<td>Tools for facilitating collaboration necessary for multilevel governance Approaches for analyzing multilevel and polycentric governance systems Tools for overcoming barriers to women’s participation</td>
</tr>
<tr>
<td>What mechanisms can improve smallholder and community access and control over forest and tree resources?</td>
<td>How to build bargaining power and confidence among women in seeking equitable access and control over forest and tree resources in mixed environments? How to link local women’s organizations to national and international movements to increase their voice and strengthen their rights and access to forest resources and to market opportunities in forest and tree products? How can property rights security for women best be enhanced, particularly with regard to common or communal property?</td>
<td>Generic tools for analyzing access in the context of legal pluralism; synthesis of local experience and emerging patterns; analysis of factors that foster or constrain multilevel collective action for securing local rights and access Operational guidelines for assessing tenure constraints and opportunities</td>
</tr>
<tr>
<td>How to better integrate scientific and local knowledge to improve management institutions that govern forest and tree resources?</td>
<td>How to recognize and address different states/levels/types of knowledge between genders regarding forest and tree resources? What approaches ensure that women’s knowledge and preferences are heard when attempting to modify resource governance systems?</td>
<td>Approaches for analyzing, comparing, contrasting and, where appropriate, integrating multiple knowledge systems User-friendly entry points to synthetic science-based models to complement local knowledge</td>
</tr>
<tr>
<td>What policies can protect livelihoods and enhance well-being given greater pressures (e.g., market integration, REDD+, biofuel expansion)?</td>
<td>How to ensure the inclusion of pro-women policies to adjust negative results caused by gender power relationships?</td>
<td>Analytical tools Synthesis of site-level experience</td>
</tr>
<tr>
<td>How can forest policies better respond to needs for tree management in agricultural lands and what institutional reforms can lower barriers between forestry and agriculture to serve the different tree germplasm and information needs for forestry and agroforestry development?</td>
<td>How do reforms of forest policies in response to needs in agroforestry affect female farmers or tree managers?</td>
<td>Smarter policy formulations that do not have perverse outcomes on tree resources on agricultural land</td>
</tr>
<tr>
<td>How can technical norms and regulations be tailored to reflect the contexts, constraints and opportunities faced by smallholders and community-level producers?</td>
<td>How to ensure gender differences in knowledge and learning styles are understood in the cultural context?</td>
<td>Analysis and synthesis of ways to link knowledge with action</td>
</tr>
<tr>
<td>In what ways can local-level institutions for collective use and management of forest resources</td>
<td>What elements of gender-differentiated rules, norms and practices for collective use and</td>
<td>Methods and approaches for incorporating and/or recognizing local-level</td>
</tr>
<tr>
<td>Broad research questions (Component 1, Theme 3)</td>
<td>Gender-specific aspects of the question</td>
<td>Science outputs</td>
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<tr>
<td>(including rights and access) be recognized and taken into account by higher-level, rules, strategies and procedures without compromising their functions and effectiveness?</td>
<td>management can be reasonably formalized without undermining men’s and women’s capacities for collective organization? What are the sustainability and benefit distribution effects of different group structural and functional attributes?</td>
<td>institutions (including rights and access) that are sensitive to gender-differentiated needs and priorities</td>
</tr>
<tr>
<td>What innovations in incentives, including rewards, sanctions, responsibilities and discretion, can improve the implementation of policies and laws by officials (especially frontline bureaucrats)?</td>
<td>In what ways are forestry officials’ implementation practices (e.g., enforcement) gender differentiated? How do they affect men’s and women’s compliance and incentives for sustainable forest management?</td>
<td>Organizational strategies and interventions for improving officials’ incentives</td>
</tr>
</tbody>
</table>

### Research partners

A selection of indicative organizations are shown below to illustrate the form of partnerships envisaged for Theme 3.

<table>
<thead>
<tr>
<th>Type of research partner</th>
<th>Organization</th>
<th>Research partner contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participating CGIAR Center</td>
<td>World Agroforestry Centre</td>
<td>Provides research expertise on agroforestry policy development including the recent Agroforestry Policy Initiative</td>
</tr>
<tr>
<td></td>
<td>CIFOR</td>
<td>Provides research staff and expertise on forest policy, governance institutions and forest property rights</td>
</tr>
<tr>
<td>International level</td>
<td>IUCN, WEDO, International Forest Resources and Institutions (IFRI) research program; Ecoagriculture Partners; advanced research institutes (e.g., IIED, CIRAD, International Center for Research on Women (ICRW), RRI, universities</td>
<td>Explore opportunities for collective approaches to policy reform in the forestry sector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide access to IFRI’s multisite, extended period global data sets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contribute to expanding the scope and depth of research and provide training in research methods</td>
</tr>
<tr>
<td>Regional level</td>
<td>CATIE, RECOFTC</td>
<td>Develop research priorities</td>
</tr>
<tr>
<td></td>
<td>CORAF, FORNESSA, ASARECA, NEPAD–CAADP Pillar 4 on research, African Centre for Technology Studies</td>
<td>Collaborate in regional research and on policies for forestry and agroforestry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collaborate in research in specific regional contexts</td>
</tr>
<tr>
<td>Country or site level</td>
<td>Government agricultural, forest and environment ministries, NGOs active in advocacy, university departments/faculties of forestry and environment, gender/women’s studies</td>
<td>Collaborate in research in Kenya</td>
</tr>
<tr>
<td></td>
<td>Examples from Kenya: KARI, KEFRI, University of Nairobi (IDS), Kenya Forests Working Group, IUCN Kenya, ICRW regional office, Nairobi</td>
<td></td>
</tr>
</tbody>
</table>
2.1.8  Sentinel landscapes

Many research questions in Component 1 would be efficiently addressed through coordinated research in a network of sentinel landscapes (Annex 4) with strategically chosen satellite sites that broaden the variability in key parameters over which germplasm, management options, extension approaches and policies are evaluated. Key criteria for selecting sentinel sites for this theme would include:

- sites, in contrasting major biomes, where the forest transition (from fairly natural forest through agriculture) can be sampled; this is essentially a tree cover gradient but is also likely to be confounded with population density, market access and agricultural intensification;45
- sites, in contrasting national policy contexts, that ensure a spread of policy environments, particularly in terms of the level of decentralization in governance of natural resources (principally forests, trees, water and land);
- efficiency of co-location with other CRPs (principally CRP1.1 and CRP1.2) and/or partners where system diagnostic research is being conducted and opportunities exist for evaluating tree options and their knock-on effects on rural livelihoods, and CRP5 where targeting of vulnerable agroecosystem niches for enhancing tree cover is already being conducted.

The effect of the uses of sentinel landscapes on geographic priorities, as determined in consultation with partners during program implementation, is set out in Section 2.1.4.

2.1.9  Impact pathways

The work in this component recognizes the important contributions of forest and tree products to rural livelihoods and environments and aims to increase the quality and quantity of those contributions through technical, institutional and policy improvements. The research takes a systems approach. It recognizes that small-scale forest managers and producers are socially and economically differentiated and operate in complex and highly constrained environments. The three themes will address the three main types of constraints in a range of systems. The research will generate impacts through several main, interrelated pathways, at two scales.

At the scale of individual production, processing and marketing systems, the research will analyze opportunities and constraints facing small-scale operators and develop appropriate interventions. Theme 1 research will seek technical solutions to improve production, productivity and profitability. It is anticipated that gains can be realized through improved scale-appropriate management techniques and the development and delivery of improved tree varieties for use in planted systems. Box 2.1 provides an illustrative example of the potential to increase smallholder production.

Theme 2 research will focus on enterprise (single farm to small company) development and management and market links. It will investigate market potential and identify where potential is unrealized. Depending on the system, it is expected that basic weaknesses in skills

and capacity, poor information availability and a variety of market failures will be found. Some of these weaknesses could be addressed by training and information support for business management, market development and marketing.

**Box 2.1 Example of potential impact: The Novella Africa Initiative to upscale smallholder production and incomes from Allanblackia**

Unilever discovered that *Allanblackia* oil had huge potential for use in a wide range of food and cosmetic products because of its high quality and consistency at room temperature; it estimated potential demand as at least 200,000 tons per year. However, there were challenges. First, there were too few trees in the wild to generate anywhere near the quantity needed, which meant the species had to be domesticated for more intensive management. Unilever decided that domestication should take the form of smallholder production. Thus, the next challenge arose: seed germination is poor and, even when successful, there is a long time from growing from seed until full production.

In 2004, the World Agroforestry Centre was formally invited to join the Novella partnership consisting of Unilever, international partners SNV and IUCN, and country research and development partners Novel Development Ghana Ltd, Novel Development Tanzania Ltd, the Forestry Institute of Ghana, Amani Nature Reserve and the Tanzania Forestry Research Institute. The World Agroforestry Centre, together with project research partners, was challenged to significantly increase the propagation, survival and growth rates of *Allanblackia*. The effectiveness of the new vegetative propagation methods was evident in just two years. Although wild trees do not bear fruit for up to 12–15 years, the new vegetative propagation methods dramatically sped up growth and fruiting so that full production could be expected by seven years. Soon after this breakthrough, the partners began work to multiply the vegetative material from the most productive trees.

Outcomes since 2006 include the establishment of four gene banks carrying about 500 superior accessions, or distinct varieties, the use of protocols for vegetative propagation by national partners for multiplying planting material and the establishment of 10 large-scale commercial nurseries selling *Allanblackia* seedlings while also providing training for on-farm planting. By 2008, this enabled smallholders in those countries to plant 100,000 *Allanblackia* improved seedlings (e.g., grafted or marcotted).

Source: World Agroforestry Centre

However, it is likely that the policy and institutional environment may also be constraining the development of small enterprises and market development. Theme 3 research will analyze these aspects and recommend improvements for governance, collective action, property rights institutions and policy. It will support policy and institutional outcomes through awareness raising, training, meetings, support for government champions and, importantly, through sustained support for national policy research, civil society advocacy organizations and implementing agencies. Impact at this scale will depend in large part on local partners, as well as on international partners that are working locally, that will contribute to the problem identification, definition and analysis, and that will follow up research recommendations with direct interventions.

Important as these types of case-level impacts are, the real power of this research will come through the lessons developed by comparing and contrasting situations across a range of cases. By identifying common patterns in the kinds of problems encountered by small-scale forest-product producers and forest-based enterprises, and by learning from responses to targeted interventions (implemented by partners), Component 1 researchers will be able to develop generic tools and recommendations for wide application. For example, efforts to select and/or improve particular tree varieties will be used to develop streamlined, efficient protocols that can be adopted and adapted by national research organizations to select and enhance other varieties and species for local conditions. The analysis of problems in rural forest- and tree-based enterprises in a range of cases is expected to yield improved methods.
for market analysis and policy analysis, as well as appropriate and effective interventions that have been tested in the case study sites.

These analytical tools and proven approaches for intervention will be valuable to government agencies, national and international development agencies and conservations agencies that are working in rural development. The work will have a wide impact if the priority issues identified by the research reflect and influence the priorities of the larger conservation and development community, and if those organizations adopt and implement the analytical approaches, tools, methods and recommendations generated by this component and CRP6 generally. Component 1 aims to:

1. influence the research agendas of national programs and international agencies by demonstrating the importance of the issues and by developing efficient tools and methods for researching social, policy and technical constraints and opportunities in these systems;

2. encourage policy reforms that will facilitate small-scale forest enterprises;

3. facilitate effective engagement in the sector by national and international development and conservation agencies by developing and testing project-scale interventions that support forest enterprise development and management; and

4. stimulate public and private investment in small-scale forest- and tree-based enterprise sectors by producing scale-appropriate technical innovations that will increase productivity, sustainability and profitability.

These outcomes, and the intended improvements in rural livelihoods and natural resource conservation, go beyond what can be achieved by research alone. They require partnerships and broad uptake and use of research results and recommendations. A schematic of the “impact pathways” is given in Figure 2.2 (gender-specific impacts are discussed and illustrated in Section 3.1). It shows a series of research outputs that will inform the actions of other organizations. Ideally, some of these organizations will be involved in the research as “research partners”, “policy and practitioner partners” and “knowledge-sharing partners”, as described in Section 3.2 (Partnerships). The research outputs will also be shared through a variety of other means, including peer-reviewed publications, policy briefs and a range of popular communications, as described in Section 4.1 (Communications and Knowledge-sharing).
Figure 2.2 Impact pathways for Component 1
2.1.10 Milestones

During the initial planning as part of the implementation phase, we will determine, through dialogue with partners, the priority geographic contexts in which outputs and milestones will be achieved. Hence, different milestone sequences will apply to different contexts. Revised milestones for the first three years will also aggregate outputs from ongoing projects that are subsumed into CRP6.1. Below are indicative key milestones for the outputs shown in Figure 2.2.

**Theme 1**

**Output 1:** Nucleus amounts of quality and locally appropriate tree germplasm selected, bred and distributed, together with propagation options

Years 1–2: Farmers/forest managers consulted, partners identified, species for multiplication selected and prioritized for region

Years 3–4: Context for tree improvement defined for each species, including system compatibility and propagation options, baseline status of germplasm established and improvement strategy identified

Years 5–10: Improved germplasm evaluated through laboratory and field assessments (then ongoing) and appropriate germplasm for various contexts selected

**Output 2:** Tree management options developed for forests and farms

Years 1–2: Farmer/forest manager partners identified, management constraints and opportunities identified, existing knowledge compiled and gaps identified

Years 3–4: Initial best practice options developed through understanding of local knowledge, trials/knowledge acquisition initiated to address gaps and refine options

Years 5–10: Initial options refined through integration of local knowledge, trial results and field testing

**Output 3:** Tools for matching tree species and management options to sites and circumstances developed and tested for use on smallholder farms and forests

Years 3–4: Partnerships established, once germplasm and management options have been set for Outputs 1 and 2 above

Years 5–6: Targeting methods from CRP5 used in conjunction with AfSIS in Africa to target the most vulnerable sites for the region

Years 7–8: Tools developed and undergoing tested on farms and in forests
Theme 2

Output 1. Rapid market appraisal tools to evaluate tree products developed

Years 1–2: Existing appraisal tools assembled and assessed

Years 3–5: Rapid appraisal tools applied and evaluated in different situations, e.g., for different types of products and for different types of analyses, such as gender analysis

Years 6–8: Rapid appraisal tools refined and incorporated into decision support tools according to the appropriate methods under different situations

Output 2. Decision support frameworks developed

Years 1–10: Decision support tools for novel extension approaches assessed, including their ability to involve and empower women and the poor. This will be accomplished for at least three novel extension approaches (timing and geographic location to be determined at component implementation workshop):

1. rural resource centers (timing to be planned)
2. volunteer farmer trainer programs (timing to be planned)
3. civil society mobilization approaches such as SCALE (Sustainable Collective Action for Livelihoods and the Environment) (timing to be planned)

Output 3. Marketing strategies assessed

Years 1–2: Approaches tested for enhancing the role of women in collective action for marketing agroforestry and forestry products

Years 3–5: Impact of market information systems for agroforestry products assessed

Years 6–8: Demand for e-advisory services using mobile phones assessed and strategies for providing services designed and tested

Output 4: Guidelines for improving quality assurance systems developed

Years 1–2: Lessons assessed for improving smallholder access to established quality assurance systems for sustainability standards

Years 3–5: Lessons assessed on how the poor and women can accrue greater benefits from certified markets

Years 6–8: Impact of certification evaluated
Theme 3

Output 1: Review of policies, laws and regulations affecting smallholder and community access and use of forest and tree resources

Output 2: Framework developed for combining multiple knowledge systems

Output 3: Syntheses of case study on constraints, barriers and access rights

Year 1: Detailed outcome mapping and strategy developed, including partnerships, communications and capacity strengthening; conceptual framework for research developed; research and implementation partnerships established and guided by policymaker needs; research design and data-gathering instruments developed for analysis of relevant legal frameworks, policy and institutional innovations and their impacts on producer behavior; protocol developed to ensure data collection includes impacts on women and marginalized groups; roles and responsibilities of partners defined in work plan and agreed upon; national and subnational sites selected; inception workshop held

Years 2–4: Research activities undertaken in sentinel sites and other priority research sites for CRP6.1; data analyzed at multiple levels (case study, national, regional, global); results validated through stakeholder feedback (workshops) and peer-reviewed publication; synthesis report and policy briefs completed

Years 4–5: Recommendations and best practice guidelines produced; policymakers engaged to evaluate implications for existing legal frameworks and develop policy reform pilots and proposals; reforms adopted and monitoring program established in a wider set of sites for testing the reforms

Years 5–9: Annual monitoring report generated at multiple scales (national, global), workshops organized (at national and global levels) to evaluate trends; public awareness raising conducted, including via workshops, conferences at multiple levels and website and media presentations; guidelines, strategies and policy briefs disseminated

Year 9: Multi-stakeholder workshops held to evaluate original recommendations in light of monitoring data; application and continued relevance or recommendations validated

Year 10: Observe improvement in smallholders’ access to and control over trees and forestlands; improved productivity and incomes from the products of forests, agroforestry and trees; improved distribution of benefits to women and other disadvantaged actors; observed rehabilitation of degraded forests, and stabilization or expansion of forest fragments; observed improvement in resource quality and quantity of smallholder forests and trees due to improved access and rights
### 2.1.11 Role of partners

**Table 2.1 Illustrative list of policy and knowledge-sharing partners for Component 1**

<table>
<thead>
<tr>
<th>Levels/Types</th>
<th>Policy and practitioner partners*</th>
<th>Roles/contributions</th>
<th>Knowledge-sharing partners</th>
<th>Roles/contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International level</strong></td>
<td>FAO</td>
<td>Raises policy awareness of livelihood opportunities from trees and forests</td>
<td>Panos</td>
<td>Uses content in training journalists</td>
</tr>
<tr>
<td></td>
<td>FSC</td>
<td>Translates research results into standards and guidelines for producers</td>
<td>The Global Forum for Rural Advisory Services (GFRAS)</td>
<td>Disseminate information on appropriate extension approaches</td>
</tr>
<tr>
<td></td>
<td>UNCTAD Committee on Sustainability Assessment (COSA)</td>
<td>Assesses impact of certification systems on smallholders</td>
<td></td>
<td></td>
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<tr>
<td><strong>Regional level</strong></td>
<td>COMIFAC</td>
<td>Translates research results into policy guidance for Congo Basin governments</td>
<td>CATIE</td>
<td>Uses content in graduate curriculum</td>
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<tr>
<td></td>
<td>OTCA (The Amazon Cooperation Treaty Organization)</td>
<td>Coordinates policy dialogue, dissemination</td>
<td>RECOFTC</td>
<td>Assists with dissemination</td>
</tr>
<tr>
<td></td>
<td>Regional Economic Commissions (e.g. COMESA)</td>
<td>Provide financing and technical support to national policy reforms and dissemination</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>NEPAD – CAADP program</td>
<td></td>
<td>African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE)</td>
<td>Curriculum reform for 132 universities and technical institutes in 35 African countries</td>
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<tr>
<td></td>
<td>African Forest Forum</td>
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<tr>
<td></td>
<td>AGRA (Alliance for a Green Revolution in Africa)</td>
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</tr>
<tr>
<td><strong>Country or site level</strong></td>
<td>Ministries of forestry in research and target dissemination countries</td>
<td>Identify improved policies and collaborate on action research in pilot policy and institutional change</td>
<td>Local media organizations</td>
<td>Raise awareness of livelihood opportunities in forest and tree products and their policy constraints</td>
</tr>
<tr>
<td></td>
<td>Ministries of agriculture in research and target dissemination countries</td>
<td>Identify improved policies and collaborate on action research in pilot policy and institutional change</td>
<td>VDS (Association des Volontaires pour le Développement au Sahel), Burkina Faso</td>
<td>Dissemination</td>
</tr>
<tr>
<td></td>
<td>ANAFOR (National Forestry Development Agency, Cameroon)</td>
<td>Define research priorities</td>
<td>Producer organizations and other civil society organizations</td>
<td>Engage in policy advocacy on behalf of smallholders and forest communities; dissemination and training in entrepreneurship and marketing practices</td>
</tr>
<tr>
<td></td>
<td>NGOs involved in policy advocacy (e.g. Greenbelt movement in Kenya)</td>
<td>Define research priorities</td>
<td>NGOs</td>
<td>Engage in dissemination, policy advocacy and testing of institutional innovations</td>
</tr>
</tbody>
</table>
2.1.12 Prioritization

It is important to integrate the three themes within Component 1 to ensure the research contributes to overall outcomes of improvements in livelihood and sustainability. Research under Theme 1 will generate germplasm and management options. Research under Theme 2 will examine market integration and extension to ensure that options are scaled out and higher value is obtained from products. Research under Theme 3 will examine the enabling policy and institutional environment that conditions what options are viable for smallholders. Experience has shown that development programs that neglect one or more of these three elements are unlikely to yield successful outcomes.

The emphasis of the research across these themes will vary according to local circumstances. Key bottlenecks exist in relation to management options, their extension and market integration or policy and institutional reform. At a global scale, innovation in all three areas is required simultaneously to address rural poverty and underpin sustainable food production for urban dwellers. Considerable investment will be required for Theme 1 because the generation of improved tree germplasm and management options will be subject to the finest-scale spatial variation and will need to operate across a wide range of tree species, agroecological contexts and social, economic and policy environments. It will be necessary to make considerable progress over the next decade in determining which options are likely to work where and for whom, in ways that can underpin locally customized promotion. However, generating the necessary data to achieve this progress will be expensive and time consuming.

The ecological and socioeconomic environment for which germplasm and management options are being developed and selected is dynamic, due not only to anticipated climate change but also to major demographic shifts and changing patterns of pest and pathogen prevalence. Although it is tempting to see a progression from Themes 1 through 3—and this holds for individual innovations—there remains an overall need for research in all three themes to address changing circumstances. As Themes 2 and 3 inherently operate across wider spatial and temporal scales, each dollar of investment leverages a greater proportion of the development space than does investment in Theme 1. However, Themes 2 and 3 rely on the germplasm and management options generated as part of Theme 1 research, in order to make available options that rural people can adopt and adapt in response to extension, market development and policy reform. Priorities vary geographically, as set out in Section 2.1.4. Prominence of each of the research themes will vary according to location, and prioritization across locations will be a key element of the early part of the component implementation.