Mega Program 6 Forests and Trees: Livelihoods, landscapes and governance

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Abstract

Mega Program 6 (MP6) will be the leading global comparative research initiative focused on forestry, agroforestry and tree biodiversity in developing countries. It will deliver international public goods that contribute to achieving the CGIAR's vision by:

- **enhancing human security** through mitigation of forest and tree-based sources of emissions and carbon stock enhancement, and increasing local and societal resilience through forest and tree-based adaptation measures;

- **improving livelihoods** from forest and tree-based sources of income; and

- **maintaining or enhancing forest and tree-based sources of environmental services**, including biodiversity.

MP6 will spearhead innovation in forestry and agroforestry through undertaking research with a long time horizon and a high degree of integration across landscapes, scales, institutions, sectors and disciplines, while pioneering new communication strategies. MP6 will bring together the collective expertise and complementarities of nine CG centers. It will further convene numerous additional research partners and together we will strategically address some of the world's most pressing issues by developing key research agendas linked to programs and projects that deliver impact. We will collaborate on global comparative research to optimize the use of forest, agroforestry and biodiversity resources for income and environmental sustainability, benefiting the world's poorest people.

Our research will span humid to dry forest types across the developing world where the poorest people live. We will focus on landscapes where local people depend on forest and agroforestry resources for their livelihoods and where forests are under severe pressure from other land uses, and/or where forests are projected to be severely affected by climate change. Priority geographical areas will include centers of forest tree biodiversity in subtropical, semi-arid, montane and tropical regions.

The initial annual budget is estimated conservatively at US$56 million, and is expected, in real terms, to increase by at least 5% annually over the next three years. MP6 will leverage additional project funds above and beyond these initial estimates. Further, increasing global concern regarding the issues confronted by MP6 will likely both offer and demand more rapid growth to meet expanding needs.

1. INTRODUCTION

Forests fall, temperatures rise, biodiversity is lost and indigenous cultures disappear. With the rise in temperatures, fires increase, droughts lengthen, floods spread, soils erode, irrigation systems silt, and pests and diseases affecting livestock and plants adapt and multiply. What many are calling a "perfect storm" gathers strength and the impact rolls across the developing world from the forests to the farms to the atmosphere. The first hit are the poorest people who eke out a living farming dry cereals on degraded and rain-fed lands where the margins for error are slim to none. Next hit are the irrigated areas where floods and drought combine to silt or empty reservoirs; farmers who plant highly targeted crop varieties struggle to adapt, while those dependent on coastal lands and fisheries suffer. Incomes and livelihoods of billions of the world's poorest people begin to spiral downward.

Humans have been poor stewards of our forests, trees and wild genetic resources. Despite decades of effort to reverse deforestation and forest degradation, the trend continues at an alarming rate. During the time it takes to read this case for investment, as much as 400 ha of natural forests and tree cover and the biodiversity they embrace will disappear, a net loss of almost 5.2 million ha annually. According to the Intergovernmental Panel on Climate Change, a conservatively estimated 194,000 tons of carbon will be released in the next 40 minutes from deforestation and land use change. Together, deforestation and land use change contribute 15–20% of the world's total annual emissions.

Natural forests form a dwindling part of a finite land area where conversion to agriculture poses the greatest threat – especially in the developing tropics. Adjacent or newly cultivated cropland may retain remnant trees or accommodate natural tree regenerations. However, these are generally insufficient to provide the goods and services from trees formerly provisioned by intact forests. With a lack of well-planned, well-resourced and long-term efforts to derive more value from trees deliberately cultivated in agricultural and forest-adjacent lands, small-scale farmers will become more impoverished.

There has been a failure to implement the policies, solutions and innovations generated by decades of forestry, agroforestry and genetic research. While forest conservation, management, rehabilitation and tree planting have long been part of national and international agencies' strategies for sustainable development, the track record of success is poor. The initiatives have failed on the back of constraints ranging from the technical (planting the wrong trees in the wrong places) and social (inequitable land tenure arrangements) to the institutional (inadequate law enforcement) and political (vested interests in the status quo). Failure to maintain optimal forest and tree cover across the tropics and subtropics is resulting in further deficits in rural livelihoods and loss of environmental services.

The value of forests, agroforestry and trees

The worst-case scenario is not inevitable; the threat of disasters triggers response. The world's policymakers – international, national and local – now realize what is at stake. Despite rapid deforestation and failure to implement integrated farming systems on degraded lands and farms in humid and semi-arid zones, forests and trees still cover more than 30% of the global land area, containing 80% of terrestrial biodiversity. This combined habitat includes more than 60,000 tree species, many still undescribed, thousands of which are of critical importance to the diets, medicines and incomes of poor people around the world.

Furthermore, nearly half of the world's agricultural lands have at least 10% tree cover. In dry areas, trees play a particularly important role in producing fodder and fruit and facilitate water infiltration, soil erosion and nutrient cycling. Fuelwood from trees accounts for 10% of total primary energy equivalent to 1.6 billion m^3 of wood. In Africa, more than 90% of wood removals from forest are for fuel. Even at a modest value of $50 per m^3, this equates to an annual value of more than $80 billion.

Estimates of the value of international trade in timber are as high as $150 billion annually. Income derived from the sale of non-timber, forest and farm products such as fuelwood, nuts, fruits, honey and bushmeat, more often than not harvested, processed and/or marketed by women, adds as much as $50 billion more. These industries may provide income for one billion people; however, these income streams are now threatened by supply constraints due to overexploitation and/or underutilization. The value of environmental services – water and hydrology, pollination and carbon storage – if properly accounted for could add tens of billions of dollars more. The importance of natural forest resources as a source and sanctuary for cultural and aesthetic values is beyond measure.

The context: Tree cover transitions

To grasp the unique opportunity offered by Mega Program 6 (MP6), it is essential to understand trends in forest and tree cover. Historically, forested countries have experienced phases of decreasing and then increasing forest area, shifting both the type and amount of tree cover in landscapes, as illustrated in Figure 1. The progress of a country or region along the so-called "forest transition curve" has tended to track demographic change and economic development. Depending on stakeholder perspectives, changes can imply environmental degradation or improvement. However, various trajectories along the curve can lead to the suboptimal outcomes now experienced from the perspectives of rural communities and societal resilience, where tree cover loss lead to deficits in forest-based livelihoods and environmental services. As illustrated in Figure 2, the underlying cause of these outcomes is, overwhelmingly, a deficit in governance.
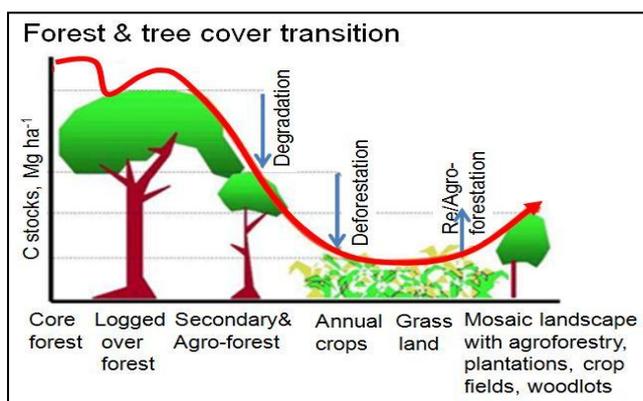

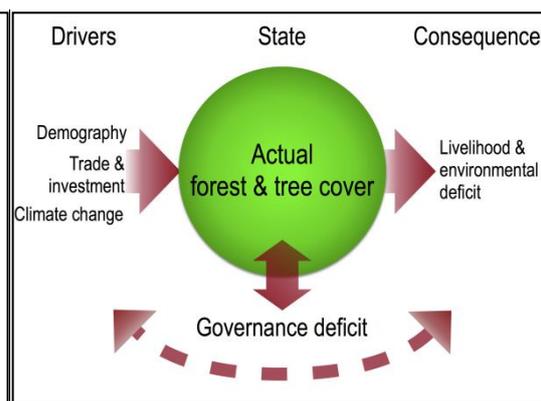**Figure 1. Forest, agroforestry and tree components in landscape mosaics**

Figure 2. Forest and tree cover drivers and deficits

The opportunity

Given a 10-year horizon, there are mutually reinforcing global trends and factors that underline the opportunity and urgency for undertaking MP6. First, global awareness of tropical and semi-arid forests, agroforestry and biodiversity has risen to the forefront of political discourse with the appreciation of linkages between forests, climate change and the

growing demand for energy and food security. This awareness is generating new finance and political will to address the long-standing challenges described above. The opportunity now is greater than ever before for current and new research to inform the policies and practices that determine how well forests and trees will meet the needs of stakeholders from the poorest to the richest countries – and never before has there been a greater demand for practical information, solutions, tools and policies in these areas.

MP6 will be the first global research initiative of its kind to focus on the potential roles of forest, agroforestry and tree genetic resources in mitigating and adapting to climate change and improving livelihoods across the landscape from forests to farms. The international research centers engaged in MP6 represent the spectrum of CG centers and bring decades of global comparative research and experience in "what works" (and doesn't work) to address the challenges ahead. They have built a reputation for unbiased science and have partner networks, built over years of collaboration, which span the globe. If they do not already have the answers to the most pressing problems at hand, they are optimally placed, individually and collectively, to design and undertake the research necessary for impact – today and in the future.

Current research opportunities include the following.

- Research to inform strategies to conserve and use natural production forests, and the genetic diversity of socioeconomically important tree species, while reducing climate emissions.
- Research to inform policy and approaches to help rural communities adapt, while maintaining environmental services, in the context of climate change impacts on forests, trees and agroforests.
- Options to increase the productivity of smallholder agroforestry and tree-crop production through intensification, while enhancing soil fertility and carbon density of agricultural landscapes.
- Knowledge to support the domestication, propagation and improvement of wild tree species, thus enhancing their value to rural communities.
- Approaches to assist communities and smallholders – especially women – to secure access to forest, agroforestry and tree products such as timber, bushmeat, fruits, resins, honey and firewood, and to provide incentives for long-term investment to enhance rural incomes.
- Support to improve decision-making in the allocation of forestland to produce food, fuel, fiber and environmental services.
- Research to develop approaches to conserve biodiversity of forests and trees at the landscape scale for societal benefit while understanding and addressing trade-offs with rural income opportunities.
- Studies to identify the leverage points (and thus influence policy) that can shape the effects of global trade and investment on forests, agroforests and trees, and on the people who can and do use these resources.

In addition to these opportunities, and others highlighted in this proposal, we anticipate addressing emerging research needs as they unfold over the life of MP6. With appropriate partnerships, CGIAR centers participating in MP6 could contribute to the development of currently embryonic science linking forest-cover change to continental scale shifts in rainfall patterns. In addition, increasing afforestation globally, be it through habitat rehabilitation or plantations, remains insufficiently understood in terms of impacts on society and

environmental services, and could become a more focused target of MP6 research. Finally, the progress of climate change itself, and the rapidly evolving regimes governing the integration of forests and trees into climate protection strategies at global and national levels, will undoubtedly generate unexpected research needs that we will be well positioned to tackle.

2. OBJECTIVES

MP6 aspires to be the leading global comparative research initiative focused on forestry, agroforestry and tree biodiversity in developing countries. We will convene the world's leading expertise through new and existing partnerships with advanced and national research institutes, and will work closely with other national and local-level partners to assess and build capacity to undertake research for impact.

MP6 is designed to deliver three types of impacts for achieving the goals of the CGIAR:

- Enhanced human security through mitigation of forest and tree-based sources of emissions and carbon stock enhancement, and increased local and societal resilience through forest, agroforestry and tree-based adaptation measures (measured by reduction in tons of carbon emitted and increase in tons sequestered; and hectares of land covered by well-adapted tree and forest management practices).

- Improved livelihoods from forest, agroforestry and tree-based sources of income (measured by numbers of people, and proportion of women, affected; and by how much).

- Maintained or enhanced forest and tree-based sources of environmental services, including biodiversity (measured by hectares of land spared from unwise conversion or degradation, hectares of land rehabilitated and the level and value of services provided).

Quantification of these prospective impacts, and more detailed elaboration of the pathways by which they will be achieved, will be included in the full proposal. MP6 will consist of three components, each with a clear objective. Because forest, agroforestry and tree resources can and indeed must be managed for multiple benefits, research under each component will serve all three objectives, allowing impact pathways (see Figure 3) to be interwoven. The three components are:

(1) Enhancing the contribution of forests, agroforests and trees to climate change mitigation and adaptation

(2) Improving livelihoods from forests, agroforestry, trees and their genetic resources

(3) Maintaining goods and services from forests, agroforestry and trees in multifunctional and dynamic landscapes

Research under each component will span humid to dry forest types across the developing world. Priority geographical areas will include centers of forest tree biodiversity in subtropical, semi-arid, montane and tropical regions, areas where local people depend on forest and agroforestry resources for their livelihoods, and forest areas under severe pressure from other land uses and/or projected to be severely affected by climate change.
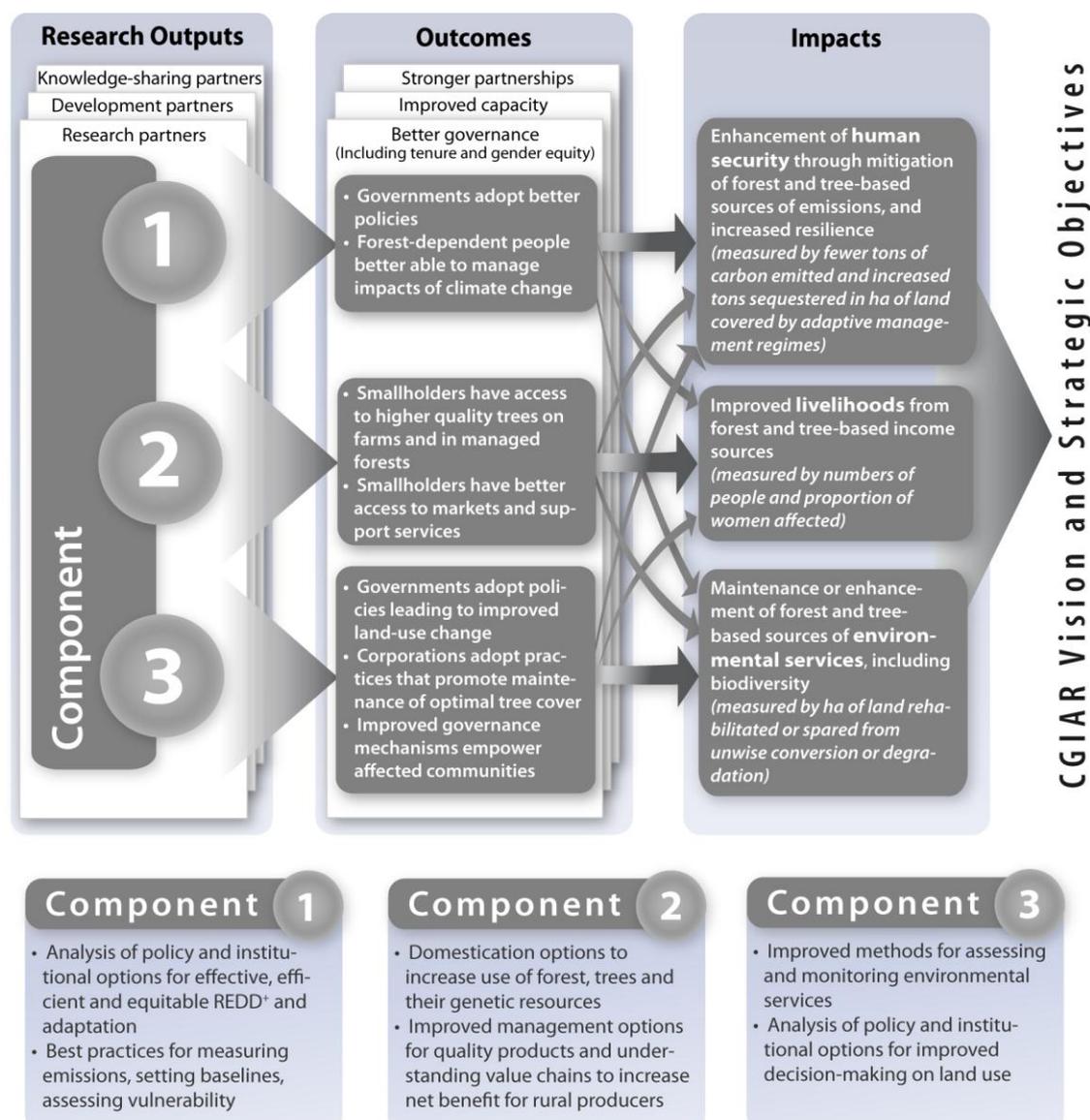
Research Outputs

Knowledge-sharing partners
Development partners
Research partners

Component 1 2 3

Outcomes

Stronger partnerships
Improved capacity
Better governance
(Including tenure and gender equity)

- Governments adopt better policies
- Forest-dependent people better able to manage impacts of climate change

- Smallholders have access to higher quality trees on farms and in managed forests
- Smallholders have better access to markets and support services

- Governments adopt policies leading to improved land-use change
- Corporations adopt practices that promote maintenance of optimal tree cover
- Improved governance mechanisms empower affected communities

Impacts

Enhancement of **human security** through mitigation of forest and tree-based sources of emissions, and increased resilience *(measured by fewer tons of carbon emitted and increased tons sequestered in ha of land covered by adaptive management regimes)*

Improved **livelihoods** from forest and tree-based income sources *(measured by numbers of people and proportion of women affected)*

Maintenance or enhancement of forest and tree-based sources of **environmental services**, including biodiversity *(measured by ha of land rehabilitated or spared from unwise conversion or degradation)*

CGIAR Vision and Strategic Objectives

Component 1
- Analysis of policy and institutional options for effective, efficient and equitable REDD+ and adaptation
- Best practices for measuring emissions, setting baselines, assessing vulnerability

Component 2
- Domestication options to increase use of forest, trees and their genetic resources
- Improved management options for quality products and understanding value chains to increase net benefit for rural producers

Component 3
- Improved methods for assessing and monitoring environmental services
- Analysis of policy and institutional options for improved decision-making on land use

Figure 3. MP6 impact pathways

3. INNOVATION

MP6 represents an innovation in research design by undertaking research with a long time horizon, across landscapes, scales, institutions, sectors and disciplines, while pioneering new communication strategies to lead from research to outcomes and impacts.

Long-term research: As documented in the 2009 Social Science Stripe Review and other recent reports, increasing reliance on restricted funding has driven CGIAR research toward ever-shorter time horizons. With the assurance of longer-term funding, MP6 will put into place mechanisms for collecting longitudinal data sets and generating knowledge from global comparative research, including the establishment of "sentinel sites" such as those recommended in the Review. We envisage utilizing a combination of benchmark sites/watersheds, transects, permanent sample plots and stratified baselines.

Integrated research across landscapes and scales: By spanning the transition gradient from relatively undisturbed natural forests to trees in agricultural mosaics, MP6 will offer an

integrated vision of forests, agroforestry and trees at the landscape scale, and the options they provide to better address livelihoods of the poor and protect the environment. The potential geographic scope is huge, and covers the majority of the developing world, 3.7 billion ha of forest (30% of the total land area), 260 million ha of tree plantations and one billion ha of agricultural land with >10% tree cover. By assessing drivers and impacts of tree cover change from local to global scales, MP6 will illuminate the trade-offs and complementarities between local uses and global demands for forest and agroforestry resources. Recognizing that the sustainability of such landscapes requires finding a balance between forest conservation and competing land and resource uses, MP6 will help achieve more equitable outcomes by providing a basis for negotiation among groups and across scales.

Integrated research across institutions, sectors and disciplines: Previous research has demonstrated that most drivers of forest loss originate outside the forestry sector narrowly defined, and that solutions must involve institutions and disciplines beyond ministries of forestry and foresters. MP6 will mobilize interdisciplinary research teams and partnerships across sectors to match the complexity of the challenge to be overcome. Moreover, it will assume co-responsibility to ensure that research outcomes are achieved with new constituent partners. Engagement with development enablers and promoters will provide better pathways from research outcomes to overall impact.

Communications: MP6 will apply innovative communication strategies to ensure that the knowledge generated informs policy, practice and public discourse on a daily basis. We will continue to use traditional peer-reviewed and other scientific publications as a means to validate and communicate research results, but will also make use of "new media" opportunities and respond to needs identified from the field. MP6 will aim to fill a global media and policy gap for scientifically authoritative, unbiased, high quality and engaging information on forests, agroforestry and trees. MP6 will leverage the centers' existing high levels of global exposure from events such as Forest Days (hosted annually at UNFCCC COPs) and World Agroforestry Congresses (Delhi 2013), and will take advantage of other opportunities – such as the UN International Year of Forests in 2011 – to disseminate knowledge generated.

4. PROGRAM COMPONENTS

MP6-Component 1: Enhancing the contribution of forests, agroforestry and trees to climate change mitigation and adaptation

Better management of forest and tree resources is the least expensive and potentially fastest response to many of the challenges of climate change. Their contribution to carbon sequestration and mitigation of emissions is recognized in the international negotiations on reducing emissions from deforestation and degradation (REDD+), related national strategy initiatives and landscape-scale pilot projects already underway. Forests and trees also provide environmental services that facilitate adaptation to climate change in wider sectors of the economy and society, and as such are a key component of environmental-based approaches to adaptation. However, forests and trees, as well as the people who depend on them, will themselves suffer the effects of climate change, and sector-specific adaptation measures are needed. The identification and maintenance of adequate levels of diversity, within and between forest tree species, will play a crucial role in preserving adaptation options.

Policymakers and practitioners at national and sub-national levels face many challenges in the development and implementation of mitigation and adaptation (M&A) policies and strategies, including REDD+, the Clean Development Mechanism, Nationally Appropriate Mitigation Actions and National Adaptation Programs of Action. This MP6 component will focus on providing the knowledge and tools that they need to enhance the role of forests and agroforestry in mitigating and adapting to climate change. Research will address technical, livelihood and governance challenges, including the measurement and monitoring of emissions, the equitable implementation of REDD+, analysis of agricultural intensification as a strategy for achieving REDD+, and the inclusion of forests and agroforestry in strategies to reduce vulnerability.

It is our aspiration that research conducted under this component will constitute a unique and important contribution to ensuring that new forest-and-climate regimes currently being constructed at global and national levels are effective, efficient and equitable. Within five years, research results will have shaped key features of the global regulatory systems as well as financing priorities for forest-related M&A measures. Within 10 years, research will have resulted in demonstrable improvements in policies and practices, as "second generation" initiatives incorporate lessons from those now getting underway, and in associated impacts measurable in terms of tons of carbon emissions avoided and land area covered by adaptive management practices.

Research Theme 1: Informing international- and national-level policies and processes related to climate change, forests, agroforestry and trees

The aim of this research theme is to identify likely determinants of success or failure of the national policy processes and international agreements related to M&A, forests, agroforestry and trees. Illustrative research questions include:

- What are the key forest-related design elements of international agreements, finance and capacity-building efforts necessary for efficient, effective and equitable REDD+ and adaptation policies?

- How can transparent and inclusive REDD+, adaptation policy processes and implementation strategies overcome existing barriers to reform?

- What governance mechanisms are most effective in fostering the cross-sectoral coordination necessary for REDD+ and cross-scale linkages needed for harnessing the potential of forests to reduce societal vulnerability?

Research outputs will include tools and guidelines for improved international mechanisms and national planning processes based on analysis of the results of early experiences in several leading countries. Over time, as experience accumulates, research will be able to answer questions about the conditions under which needed reforms – such as clarification of forest tenure – can be accelerated, as well as the comparative efficacy of alternative institutional arrangements for channeling REDD+ and adaptation funds, and for facilitating the necessary inter-sectoral and cross-scale collaboration.

Impact pathway: Comparative analysis of different international and national M&A options – disseminated directly to relevant policy arenas and indirectly through knowledge-sharing partners – will lead to better understanding among UNFCCC negotiators, relevant national policymakers, opinion leaders representing key stakeholder groups, and the media. Better understanding of the implications of alternative options among relevant stakeholders in turn

will lead to the adoption and implementation of improved policies and institutional arrangements.

Research Theme 2: Improving sub-national and local initiatives for climate change mitigation and adaptation

The aim of this research theme is to influence the design of sub-national and local M&A initiatives in forested or tree-dominated landscapes. Illustrative research questions include:

- How can specific design features contribute to equitable benefit sharing (including across gender), tenure clarification and leakage prevention in landscape-level REDD+ activities?

- How can local communities be involved in vulnerability assessments and planning for adaptation in ways that improve their adaptive capacities?

- What are the trade-offs and synergies between forest, agroforestry and tree-related M&A measures in sub-national and local initiatives?

Research outputs will enable the proponents of initiatives to incorporate existing knowledge to ensure effective, efficient and equitable outcomes. While experience in the implementation of M&A demonstration activities is limited, there is ample experience from related activities to inform the design of new initiatives. There is also considerable potential to design assessment and monitoring systems to maximize learning from the "first generation" of REDD+ and adaptation initiatives to develop best practice for the "second generation," and similarly for follow on approaches.

Impact pathway: The results of a comparative analysis of how M&A initiatives interact with local livelihoods and governance contexts will be disseminated through a purpose-built "learning community" utilizing appropriate partnerships and new media. Findings regarding the policy and capacity constraints on more effective, efficient and equitable outcomes will be disseminated to policymakers and donors in a position to finance capacity-building efforts. Affected communities will have access to new knowledge and tools necessary to take advantage of REDD+ opportunities and develop strategies for adaptation.

Research Theme 3: Best-practice methods for improved mitigation and adaptation initiatives

The aim of this research theme is to develop best-practice technical methods for improved M&A initiatives related to forests and trees at different levels. Illustrative research questions include:

- What are the best practices and decision support tools for measuring, estimating and managing carbon stocks in landscapes?

- What are the most cost-effective methods and tools for assessing the impacts of climate change on forests, agroforests and biodiversity (including genetic resources) and for determining adaptation options?

- How can communities take part in the participatory monitoring of carbon stocks and climate change impacts?

Action research at the community level linked to the work of advanced research institutes will identify cost-effective methods for measuring, estimating and managing forest carbon stocks and flows at the national and local scales. We will build methods and tools for analyzing the future impacts of climate change on forests, for measuring threats and

determining adaptation options for reducing negative impacts, and for addressing impacts on forests, agroforestry and trees (e.g., designing networks of protected areas and managing *ex-situ* collections for important forest tree species). In addition, we will develop specific methods for evaluating the role of environmental services in societal adaptation, such as the role of hydrological services in decreasing vulnerability to water scarcity, and for assessing the potential and costs/benefits of environmental-based approaches to adaptation.

Impact pathway: Multi-scale research will generate methods and tools for monitoring forest- and tree-related carbon and climate impacts. Partnerships with development organizations will lead to the use of research findings by M&A practitioners to design programs that are effective, efficient and equitable, and include the meaningful participation of local communities. We will extend research results relevant to the design of rules for REDD+ and adaptation finance through reporting directly to relevant policy arenas.

MP6-Component 2: Improving livelihoods from forests, agroforestry, trees, and their genetic resources

This component deals with lost opportunities to enhance poor people's livelihoods stemming from the suboptimal quality, quantity and type of trees as well as from limited access to forest resources, which restricts rural and forest-dependent peoples' income and self-reliance. The lack of quality tree germ plasm, inappropriate farm management practices, insecure forest and tree tenure, and limited market integration mean that much potential for improving livelihoods and the environment remains untapped. Global trade of the existing top 20 tropical tree crops exceeds $80 billion, yet little of this value is accrued by smallholders. In particular, valuable opportunities to improve the livelihoods of communities are being lost due to:

- Underinvestment in the improvement, prioritization, domestication and wider cultivation of higher-value tree species (both existing and new tree crops).

- Underperformance of trees retained or planted due to gaps in the knowledge smallholders need for good silvicultural/horticultural management of tree intercrops.

- Poor understanding of reproductive inviability of unrepresentative, inbred or small founder populations of trees used for subsequent generations of tree planting.

- Threats to natural and planted populations of tree stands, including lack of attention to tree biodiversity conservation, with inadequate or inappropriate integration of trees into sustainable farming practices.

- Prohibitions and restrictions against on-farm commercial forestry, tree ownership and utilization.

- Inadequate understanding of market opportunities, underperforming (and gender-biased) policy and institutional support for smallholder production and processing.

- Neglect and lack of recognition in forest and agricultural policy of the informal timber sector, which tends to be closely associated with agricultural systems.

Better use of trees and forest resources to benefit livelihoods thus requires a combination of: (1) improved tree management and propagation; (2) enhanced resource access (land, retained and planted trees) linked to resource conservation, improved productivity of tree-based agricultural and local forest management systems; and (3) better market access for smallholder- or community-managed forest and tree products. Research will develop tools

and identify policies to (1) enhance tree domestication (in its institutional and biological dimensions); (2) support small-scale forest-based enterprise; and (3) enhance smallholder revenue from agroforestry and community forest products.

Research Theme 1: Domestication, utilization and conservation of superior tree stocks

Illustrative research questions include:

- How can the lack of prior investment in species-specific tree improvement be circumvented using generic techniques for priority tree species (often near-wild in nature)?

- How can key genetic traits in wild populations be identified and harnessed such that high-quality germ plasm of socioeconomically important tree species can be made available for planting or grafting, acknowledging climate variability and change?

- What pathways for genetic improvement and better silvicultural management of tree species can best balance short- and medium-term productivity gains with the need to maintain genetic and species diversity in farming landscapes to achieve long-term sustainability and resilience to climate variability and change?

- What are the most effective approaches for promoting the domestication of high-value tree species with different types of partners (e.g., small-scale farmers/agroforesters, research institutions, private companies)?

- What are the best approaches and delivery systems to enhance the quality and range of tree germ plasm cultivated in smallholders' farming systems?

- How can the production and distribution of forest reproductive material be improved?

- How to enhance incomes of poor farmers, particularly women, through diversification and intensification of tree use, including multipurpose species (medicinal and aromatic plants)?

Examples of targeted outputs include farmer-led (multi-locational), researcher-assisted and researcher-led domestication. Efforts will support increased productivity but maintain a level of diversity in species and provenances identified for different functional uses of tree species. Efforts will also increase productivity for different agricultural landscapes and for different product markets, and develop scalable models of on-farm supply of diversified tree-planting materials.

Impact pathway: Assessment and dissemination of tree domestication options for increasing use of forest and tree genetic resources will improve the quality and quantity of trees on farms and across landscapes. Successful domestication will diversify local and global economies and improve forest and tree genetic resource management. Assessment of approaches to support supply chains for tree planting material will lead to improved policies for on-farm production of trees, tenure resolution and investment in innovation.

Research Theme 2: On-farm management of trees

Illustrative research questions include:

- What forms of management of trees, intercrops, pests and diseases and weeds are best suited for a range of agro-ecological conditions, land/labor ratios and economic risks of specialization on single tree crops? What changes in tree management practices and value

chain development are required to increase productivity of the upper canopy component of smallholder perennial systems?

- What facilitative roles of trees can support increases in total farm productivity through sustainable soil, water and nutrient management in intercropping systems with perennials?

- What agroforestry strategies are appropriate for conserving tree genetic resources for future use, in the context of current and emerging challenges (e.g., continued deforestation, agricultural mechanization) to conservation?

- How can we improve the productivity and sustainability of agroforestry systems?

Example targeted outputs include system approaches to support farmer decision making on the use of trees for a wide range of biophysical and socioeconomic contexts. Approaches will identify contextualized "best bets".

Impact pathway: Tools for improving management and quality of planted and retained trees will lead to better interactions between stakeholders. This will result in better-informed decision-making and better-informed policies for investment in innovation, in turn leading to reduced economic vulnerability and increased income for farmers and rural communities.

Research Theme 3: Linking smallholder tree products to markets

Illustrative questions include:

- What framework conditions (policies, incentives) are needed for successful product and value chain development?

- How can certification of good agricultural practices and sustainable timber practices incentivize farmers to modify their tree planting decisions?

- How to establish and effectively develop innovative, equitable and successful ways to facilitate market value chains for forest and tree products?

- What innovative 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?

Example targeted outputs include analytical tools for product and value chain development for forest, agroforestry and tree products linked to good practice guidelines for effective supply of market information, technical assistance and appropriate finance to smallholder tree-based production systems.

Impact pathway: Assessment of product value chains and income opportunities will lead to improved policies, better dialogue between stakeholders, and better-informed farmer and forest manager decision making. Farmers will thus be enabled to provide improved products for the market and thus enhance their income.

MP6-Component 3: Maintaining forest and agroforestry goods and services in multifunctional and dynamic landscapes

Demographic shifts, development pressures and globalized trade and investment (T&I) associated with growing competition for food, feed, timber, fiber and energy constitute major drivers of transitions in tree cover and forests (Fig. 2). These drivers present differentiated

threats and opportunities across forested landscapes and are changing the quantity, type and quality of forests and tree cover at small and large scales (Fig. 1). This MP6 component will help the international community, governments, local authorities, local communities and civil society understand and manage the trade-offs between conservation and development outcomes in multifunctional landscapes in ways that avoid deficits in livelihoods and environmental services.

Our research in this component will adopt an integrated multidisciplinary approach to problem solving. It will assess broad patterns of impacts and trends across space and time, explain landscape and institutional change, and develop knowledge through global comparative studies. The component is organized around three interlinked themes to address: (1) drivers of tree cover transition, including extensive agriculture, and global trade and investment; (2) securing environmental services and conservation outcomes; and (3) improved forest management at the landscape scale.

It is our aspiration that research conducted under this component will precipitate a paradigm shift in how production and conservation forests, and associated forest margins, are managed, and by whom. At a global level, the investment decisions, standards and guidelines of key public and private investors, and conservation and forestry agencies, will increasingly reflect this paradigm shift.

Within 10 years, research will have contributed to significant increases in forest area protected from unwise conversion to other uses, spurred by payments for environmental services (PES) and other innovative reward schemes and managed for goods and services beyond timber.

Research Theme 1: Managing drivers of forest transition

Although multiple drivers influence landscape transformation and forest transitions, globalized T&I is playing an increasingly significant role. A variety of trends are shaping global T&I and their impacts on forested landscapes in developing countries: (1) growing demand from emerging economies, especially China and India, for forest and tree (crop) products such as timber and cocoa, with large companies sometimes buying directly from poor producers; (2) the increasing role of transnational corporations in the production and trade of agricultural commodities such as oil palm and soybeans that replace forests; and (3) expansion of large-scale land acquisitions for food crops and biofuel plantations, often at the expense of forests and agroforests. The globalized nature of current drivers demands more effective governance instruments and architectures at multiple levels than currently exist.

Illustrative research questions include:

- How do patterns of forest transition vary with scale in space and time?

- What are the impacts of global T&I on landscapes and livelihoods of the poor, and how do they interact with local conditions?

- What T&I patterns are driven by demand from specific countries or regions, and how does change in supply and demand in one region indirectly affect another?

- What changes in T&I policies and standards at various levels of governance show the most promise for channeling T&I flow in ways that optimize forest-related environmental services and create rural income opportunities?

Research outputs will include policy options and guidelines to manage T&I impacts, and analysis of impacts of change in policy or practices across landscapes and commodities. Research on global voluntary guidelines and standards for responsible investment, such as "eco certification" of forest products and crops that replace forests, and their impact on global investment and trade in tropical and subtropical countries, will link to work in Component 1 of MP6 as well as MP2.

Impact pathway: Assessments of current and future impacts of trade and investment on forest environmental services and forest-based livelihoods – channeled to key policymakers directly and through knowledge-sharing partners – will raise awareness of the problem and create demand for solutions. Adoption of analytical tools for assessment of drivers of forest transitions and policy options will lead to voluntary action by corporations as well as regulatory changes to better manage forest margin trade-offs and improve land-use planning. More equitable distribution of benefits, secure rights and negotiated responsibilities of forest margin communities will take place. Pressure on forests will be reduced and drivers of forest transitions will shift toward sub-optimally used non-forest lands.

Research Theme 2: Securing environmental services and conservation outcomes

Past and current conservation efforts have tended to focus on protected areas -- sometimes resulting in social conflict and exclusion of local communities from access to forest resources. However, the majority of the world's biodiversity occurs outside protected areas in fragmented landscape mosaics characterized by varying stages of transition from forest to agriculture. Such landscapes provide environmental services, and protect biodiversity values linked to human well-being, as documented in the Millennium Ecosystem Assessment. In the presence of strong tenure and property rights, environmental services can attract direct payments (so-called "payments for environmental services", or PES) and other reward mechanisms, and contribute to both biodiversity conservation and local livelihoods.

Illustrative research questions include:

- What are the most effective methods for assessing environmental services and changes that result as a function of landscape level change?

- How do the outcomes of negotiations over conservation and development trade-offs systematically vary in relation to such factors as negotiation capacity of various stakeholders, scientific input and inclusiveness of participation?

- Under what conditions and at what scales can PES schemes produce outcomes for conservation and human well-being that are effective, efficient and equitable?

Research outputs will include analyses that clarify and quantify which environmental services are at stake in various stages of tree cover transition, and assessments of the effectiveness of alternative governance mechanisms for managing the trade-offs between conservation and development at multiple scales. Research will be coordinated with Mega Program 5 specifically on issues pertaining to wetlands, sustainable land management in the agricultural component of the mosaics and downstream beneficiaries in watersheds.

Impact pathway: Research under this theme will provide methods and tools to assess and design PES schemes and other mechanisms for reconciling conservation and development objectives. We will disseminate policy implications to local authorities, national- and international-level fora and financing agencies. We will mobilize development and

knowledge-sharing partners to influence the practices of local authorities and local and international conservation NGOs. Changes in policy and practice will lead to more optimal land-use planning processes and outcomes, reduced conflict over access to, and conservation of resources, and livelihood enhancement.

Research Theme 3: Sustainable forest management at the landscape scale

A significant portion of the world's forests continue to be managed as "production forest", thus supporting national economies while providing employment and maintaining higher levels of environmental services (such as biodiversity conservation) than other land uses. In theory, such management can be sustainable, but conversion to non-forest land use has often followed logging due to such factors as unsustainable extraction regimes, fire, colonization and infrastructure development. Various public and private standards for sustainable forest management to address both social and environmental aspects have been established, but their content and the role they play in modifying actual forest management practices continue to be contested. In addition, the difficulties faced by small-scale producers in obtaining certification of compliance with such standards have so far limited their application to community forest enterprises.

Over the past decade, major donor agencies have promoted so-called Forest Law Enforcement, Governance and Trade (FLEGT) initiatives to combat illegal logging and trade. Bilateral "Voluntary Partnership Agreements" are being negotiated between the European Union and a number of timber-exporting countries to govern timber exports, requiring the development of standards for legality. The prospective efficacy of these mechanisms, and their impacts on "informal" timber exploitation by rural producers for domestic markets, are currently under debate. Research has demonstrated that efforts to address forest crime tend to target "the little guys" and fail to address underlying causes such as conflicts over forest ownership and corruption.

Empirical research that addresses the perspectives and concerns of a wide range of stakeholders is needed to secure progress in the negotiation of sustainable forest management and timber legality standards, and to ensure that the application of such standards serves to create opportunities rather than hardships for rural communities. Revisiting the scientific bases for improving forest management will help remove major constraints to the implementation of appropriate forest management practices, allowing more equitable and sustainable production of goods and services.

Illustrative research questions include:

- What forest management policies and practices can provide sustainable incomes and incentives for maintaining environmental services, while protecting the natural resource base, and under what conditions?

- What institutions and capacity-building interventions are necessary to level the playing field for smallholder and community forest producers to gain access to formal sector markets?

- How can national and international forest law enforcement efforts be designed for more effective, efficient and equitable outcomes?

Impact pathway: Research will inform multilateral fora, agreements and institutions that *de facto* or *de jure* determine the standards that apply to timber production and trade. These include the UN Forum on Forests, the Convention on Biological Diversity, the International

Tropical Timber Organization and the Forest Stewardship Council; as well as bilateral donors and multilateral development banks, regional organizations and producer organizations. We will also inform and influence such processes as FLEGT and associated Voluntary Partnership Agreements to reduce illegal logging and trade. At the national and local levels, research will empower development and knowledge-sharing partners to provide tools and instruments to governments, companies and communities for the development and adoption of policies, standards and management arrangements that ensure sustainable and responsible forest use and curtail forest crime.

5. CROSS-CUTTING THEMES

Gender

Women play critically important yet underappreciated roles in managing forest, agroforestry and tree resources. They are traditionally the main collectors of fuelwood and medicinal and aromatic plants, and other non-timber forest products from open access landscapes. Changes in tree cover and loss of community access to forests can thus have a disproportionately adverse impact on women, with indirect impacts on households and, consequently, on livelihoods of five to ten times as many people.

Accordingly, gender analysis is integral to each of the MP6 research components outlined above. Research will generate an understanding of key institutional, cultural and attitudinal contexts that entrench inequity. It will also identify policies and practices that will enhance gender equity in access to forests and trees and the distribution of associated benefits. Interdisciplinary methodologies (such as household surveys, action research and focus groups) will be developed and applied to capture gendered relations at varying spatial scales and governance levels.

In line with the MP6 components, research will focus on establishing and understanding the impacts of gender differentials on:

- Vulnerability to climate change and adaptation options, and opportunities and risks associated with forest and tree-related mitigation initiatives such as REDD+.

- Access to, and the distribution of, incomes and benefits from forests, agroforests, trees and related products.

- Participation in formal and informal decision-making forums related to forest resource management and land-use change, from the community to higher governance levels.

Research outputs will include analysis of gender in relation to property rights and access to forests, trees and markets; processing of forest products, product value chains, and inputs such as germ plasm and credit; access to knowledge of improved technologies and their adoption; and gendered participation in the various forms of decision-making at local and community levels, and in federated structures. Research conducted under MP6 will result in the increased availability of gender-disaggregated data related to forests and trees.

Gender-related outcomes of MP6 will include the incorporation of gender equity considerations into forest-related policies and practices, and the increased inclusion of women in institutions for forest-related decision-making. These outcomes, in turn, will result in improved gender equity in control, access and benefits from forest, agroforestry and tree resources across spatial scales.

Capacity building

The capacity-building needs of institutions in developing countries relevant to forest research and implementation are substantial. There is a lack of foresters and agroforestry specialists and a dearth of multidisciplinary expertise spanning the biophysical, social, economic and political sciences needed to address the challenges and opportunities described above.

We see capacity building as a crucial ingredient of impact orientation, and we have gained extensive experience in building capacity through much of our project work. In the context of MP6 and its research partnerships, research capacity will be built wherever appropriate, usually through "learning-by-doing" rather than through more formal capacity-building activities such as extended training or diploma courses, which are not a comparative advantage of the CGIAR. We will include in impact pathways long-term partnerships with organizations that specialize in capacity building, including universities, NGOs, training networks (e.g., African Network for Agriculture, Agroforestry and Natural Resources (ANAFE), African Forest Forum (AFF)), and training centers such as Regional Community Forestry Training Centre (RECOFTC) and Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). Target audiences will include National Agricultural Research System (NARS) scientists, but where appropriate may target extension agents, farmers and rural women involved in the processing and marketing of value-added products.

Examples of capacity-building activities in MP6 include the following.

- Building capacity for research by providing in-service training, fellowships for visiting scientists, short courses and mentoring of study toward academic degrees at other institutions, where it is critical to achieve impacts and is cost effective.

- Supporting the work of knowledge-sharing partners by developing manuals, study guides and other types of training materials in multiple languages for use by target audiences.

- Implementing internal capacity-building programs for research and support staff as well as mentoring postgraduate and other students.

- Documenting gaps in implementation capacity, particularly where they may hamper prospects for attaining impacts, and "handing the baton" to partners with the expertise and resources to address those gaps.

Knowledge sharing

Agricultural research communication is undergoing a transformation driven by the spread of the high-speed Internet, the advent of digital media, the development of new tools, platforms and methodologies, and changes in the ways the world accesses and uses information. The opportunity to implement a rapid, highly targeted and efficient transfer of research results – captured also in peer-reviewed journals and publications – into practice and policy is here today.

Our approach will be iterative, evolving in response to evaluations and feedback from key stakeholders, and taking advantage of emerging or unforeseen opportunities. We will work through partners, building on existing networks, to expand others' capacity for learning and applying "what works". We will leverage our extensive networks of media contacts and partner networks, make use of our communication experience and capabilities, and deploy

our partners' knowledge assets and communication reach. We will measure the success of our knowledge sharing in several ways, including changes in the perceptions of selected groups of policymakers and practitioners.

Developing a learning community: We will support the development of a forest, biodiversity, agroforestry and trees learning community, targeting researchers and practitioners from local to global levels. Support will be provided by face-to-face learning at events, as well as Internet-based knowledge building and sharing, such as the development of a global portal for forest genetic resources. The community will be strengthened by providing multilingual tools and support for community interactions.

Sharing knowledge through major international events and initiatives: We will share knowledge through conferences, workshops and seminars, leveraging our ongoing participation in and leadership in international events (within and beyond the forest community), such as IUFRO's World Congresses, FAO's COFOs, Forest Days in association with UNFCCC COPs, and the UN's International Year of Forests in 2011.

Reaching out to policymakers: We will identify and execute specific outreach programs to inform and foster change among policymakers ranging from climate change negotiators to parliamentarians to officials in ministries of forestry and other relevant ministries.

Supporting the policymaking cycle through media relations: Media are key interlocutors in the policymaking cycle. We will execute a highly targeted and evolving media outreach strategy to engage and excite leading environmental, poverty, financial and mainstream journalists at the local, regional, national and international levels.

6.   COMPARATIVE ADVANTAGES

Forests and agroforestry have never before experienced their current high profile. The CGIAR system is uniquely positioned to lead the research incorporated in MP6. No other network focused on generating international public goods combines multidisciplinary expertise on optimizing forestry and agroforestry resource use for rural income and environmental sustainability with a global comparative perspective. We integrate an understanding of forests, biodiversity, forest-agriculture mosaics and trees on farms across landscape mosaics throughout the developing world. The CG centers involved bring a rich diversity of strengths in socioeconomics, biophysical sciences, policy research and knowledge sharing combined with an unparalleled reputation for delivering credible, high-quality analysis that embraces input from multiple stakeholders, ranging from the poorest members of society to the highest levels of government.

Since their inception, the CG centers have focused on leveraging additional research capacity and influence through networks of partner organizations. These include advanced research institutes that can be engaged with to address specific questions (e.g., climate change modeling), as well as NARS and capacity-building organizations and regional networks (see Table 1). Collaborating with FAO on projects such as the *State of the World's Forest Genetic Resources* report builds networking capacity. Expanding private sector partnerships (e.g., Unilever, Google, Mars Inc., Syngenta ITC, CFC) for forestry and agroforestry also positions the CGIAR system to attract new development partners.

Partnerships and linkages

Partnership is key to the success of MP6. Many organizations and individuals are already collaborating with the various CGIAR centers involved in this proposal, and we anticipate many of them will make substantive contributions to the design of the full proposal for submission in September 2010. Further, we anticipate engaging a much broader suite of partners as MP6 goes into full implementation. Table 1 illustrates the types of partners we will invite to participate. The mix of partners will vary across the components and research themes, depending on the associated impact pathway.

Table 1. Illustrative list of potential partners for MP6

Levels / Types	Research Partners	Policy and Practitioner Partners	Knowledge-sharing Partners
International Level	CIRAD, IRD, CSIRO, Forest Landscape Denmark, IUFRO, Norwegian University of Life Sciences, and other advanced research institutes, ASB Partnership for the Tropical Forest Margins	Collaborative Partnership on Forests (CPF), FAO, UNEP, World Bank FCPF, UN-REDD, IPCC, FSC, IUCN Forest Landscape Restoration (FLR), private sector (e.g., Mars Inc.)	BBC World Service Trust, Panos, UN-REDD, CPF, IUCN
Regional Level	CATIE, Amazon Initiative, ANAFE, FARA, SEANAFE; ASARECA, CORAF, SAARD, STCP, SAFORGEN, APFORGEN, LAFORGEN	AFF, COMIFAC, Asia Forest Partnership, ECOWAS	RECOFTC, STCP, CATIE
Country or Site level	NARS, local/national research organizations, Forestry Research and Development Agency (FORDA) and Bogor Agricultural University (Indonesia), NGOs, IWOKRAMA (Guyana), KEFRI/KARI (Kenya)	NARS, ministries (environment, forestry, agriculture), FORDA, forest- and landscape-dependent community-based organizations, development and environmental NGOs, private sector companies	Local NGOs (e.g., PILI in Indonesia), forest and environmental ministries, Greenbelt Movement (Kenya), Amazon Livelihoods and Environment Network

Links to other mega programs

The active engagement and contribution of the participating centers in other mega programs will build links and synergies to ensure the success of MP6, while efforts undertaken in MP6 may make significant contributions to the work and goals of others. While potential links are many, the following are readily apparent:

MP1: Agriculture Systems for the Poor and Vulnerable. Key areas for collaboration will be on tree-crop and related issues on the components dealing with *Integrated agriculture for dryland systems* and *Integrated agricultural systems for the humid tropics*. Mangroves are an interface with the coastal zone program.

MP2: Agricultural policies, markets and institutions have their counterparts in MP6.

MP3: Under the Genetic Resources crosscutting component of MP3, ICRAF will be working with Bioversity on the complementarity of *in situ, circa situ* and *ex situ* tree conservation strategies. Work on tree crops (cacao, coffee, coconut) will also be carried out under the Genetic Resources crosscutting component.

MP5: There is a clear upstream-downstream link with the role of forests to ensure provision of environmental services, buffer water flow and reduce erosion and other degradation processes.

MP7: Agriculture and Climate Change. Particular opportunities for collaboration include joint work on vulnerability assessment and methods for scaling global/large-scale climate change models down to local levels, and exchange of knowledge on mitigation in forest and agricultural systems.

7. PROGRAM MANAGEMENT

Our proposed management structure for MP6 (not yet finalized) comprises: (1) a Stakeholder Advisory Group; (2) a Research Steering Committee; and (3) an MP Management Unit. The composition and operation of each of these entities will be defined in the full proposal. Our goal is to ensure transparent and inclusive management as a means of incorporating and benefiting from the knowledge of partners and stakeholders. This requires a management structure that provides mechanisms for CGIAR center partners and other stakeholders to inform and guide the research agenda and decision-making processes, while providing oversight. A detailed management structure for the full proposal will be developed in consultation with stakeholders with a specific focus on promoting scientific excellence, and adaptive project management grounded in rigorous evaluation, transparency, fairness and inclusiveness.

CIFOR, ICRAF and Bioversity are the CGIAR centers primarily responsible for the implementation of MP6 and will closely monitor and evaluate research activities. The Management Unit will put in place mechanisms to assure the quality, relevance and impact of the research and will develop procedures for monitoring and evaluation of the activities, projects and processes. This will be undertaken at multiple levels and scales using established methods. As part of performance evaluation, MP6 will adopt peer review mechanisms through meetings and workshops, where all partners and stakeholders can jointly review major results, achievements and process outcomes, and identify new opportunities. External reviews will also be periodically arranged at the behest of the Management Unit. All partners will develop yearly work plans, which will include participatory monitoring and evaluation.

8. RISK ANALYSIS

Risk	Assumption
Insufficient funding to match needs and expectations	Funding commitments by donors secured by CGIAR in advance of start of the MP
Partner non-performance in managing program activities, generating sound data, analysis, outreach or financial management	Management Unit assisted by focal point staff in each partner organization provides adequate monitoring and support to national-level partners
Lack of clarity of research boundaries	Carefully articulated research proposal that is agreed by all partners
Suboptimal coordination of research activities	Research Steering Committee provides clear lead on research strategy and oversight of research activities
Difficulty of measuring impact	Achievable targets and impact pathways identified and agreed, and sound methodologies employed at outset of activities to capture data

9. COLLABORATION AND PROCESS IN DEVELOPING THE MP6 PROPOSAL

This proposal has been developed in collaboration with a broad group of scientists spanning nine CGIAR centers. It incorporates suggestions from IRD and CIRAD, and has benefited from input from participants in the MP6 parallel session at the GCARD in Montpellier in March. CIFOR Deputy Director General Andrew Taber has coordinated input from a dozen staff and led the process of pulling together the whole MP6 design across the centers. Tony Simons, Deputy Director General of ICRAF, has worked closely with Andrew; Meine van Noordwijk has coordinated the bulk of the technical input from ICRAF. During the past weeks, CIFOR and ICRAF staff have been meeting on an almost daily basis. Judy Loo and Laura Snook have provided important content and ideas from Bioversity. Among others, Jim Gockowski and John Casey from IITA, Farid Waliyar from ICRISAT, Mounir Louhaichi from ICARDA, Glenn Hyman from CIAT, and Steve Staal from ILRI have all contributed extensive comments, edits on drafts and suggestions. In total, we have circulated proposal drafts four times, and had two conference calls among centers on the proposal. Finally, Consortium Board Member Ganesan Balachander met with CIFOR and ICRAF staff during a visit to Bogor, Indonesia, to discuss the design and content of the proposal; his contributions came at a pivotal moment in the proposal's development.

10. STANDARDIZED BUDGET

MP6 Project	Forests and Trees									
	Budget Composition in US$ m									
	CIFOR	ICRAF	IITA	Bioversity	IFPRI	ICARDA	CIAT	ICRISAT	ILRI	TOTAL
Base Year	26.30	22.34	3.13	3.09	0.52	0.36	0.22			55.96
Base Year +1	27.62	23.46	3.05	3.40	0.54	0.42	0.23	-	-	58.71
Base Year +2	29.00	24.63	3.08	3.48	0.57	0.48	0.24	-	-	61.49
TOTAL/Center	82.92	70.43	9.27	9.97	1.62	1.26	0.70	-	-	176.16
% base year	47%	40%	6%	6%	1%	1%	0%			100%

The participating centers have assumed a modest 5% annual growth rate in bilateral funding for the purposes of this proposal, although we anticipate funding growth being more aggressive given donor interest. Financial data for ICRISAT and ILRI had not been provided at the time of proposal submission.