

Tackling Global Challenges through **Agroforestry**

ESSAY

*Agroforestry
science at
the heart of
the three
environmental
conventions*

Annual
Report
2006



World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

About the World Agroforestry Centre

The World Agroforestry Centre is part of The Alliance of the CGIAR Centres — a global network of 15 centres, funded by the Consultative Group on International Agricultural Research (CGIAR).

We are an autonomous, not-for-profit research and development institution supported by over 50 different governments, private foundations, regional development banks, and the World Bank. The Centre was founded in 1978, initially as the International Council for Research in Agroforestry (ICRAF), to promote the exchange of information on agroforestry research in the tropics. The Council was created in response to a visionary study led by Canada's International Development Research Centre (IDRC), which coined the term 'agroforestry'.

In 1992, ICRAF joined the CGIAR and, in the years since then, has transformed itself into a world-class international agricultural research centre. In order to more fully reflect our global reach, as well as our more balanced research and development agenda, we adopted a new brand name in 2002 — 'World Agroforestry Centre.'

Our vision is an Agroforestry transformation in the developing world — a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, health, fodder, shelter and energy, income and a regenerated environment.

Our mission: We use science to generate knowledge about the complex role of trees in agricultural systems and their effects on livelihood and the environment, and foster use of the knowledge to influence decisions and practices that impact the poor.

Our values guide our priorities and directions and underpin the way we go about our work. These values include:

- A fundamental respect for all persons with whom we work;
- The highest standards of professionalism in our activities;
- A culture of learning and evaluation permeating our strategy and activities;
- Creativity and teamwork;
- Commitment to equitable and interdependent partnership, mutually beneficial to all;
- Advancing diversity and gender balance in our organization;
- Maintaining an informal and transparent working environment; and
- Balancing work with family and community.

We believe that success in living and fostering these values is fundamental to being a vibrant organization that will contribute to knowledge and impact in the coming years and materially ensure a Tree Revolution in the developing world.

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World Agroforestry Centre
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From the Chair of the Board of Trustees



Since 1999, I have had the honour and pleasure of serving as a trustee of the World Agroforestry Centre, including as Board Chair for four years. During my tenure, I have witnessed significant programmatic and management changes the Centre has undertaken to better serve its beneficiaries and fulfil its mandate. One key milestone was the 3rd External Program and Management Review (EPMR) held in 2005–2006.

The review elicited strong support for our vision to achieve an agroforestry transformation in the developing world and advance the science and practice of agroforestry. The panel endorsed WorldAgroforestry's four strategic goals, and reaffirmed that they are aligned well with the Millennium Development Goals and the CGIAR's new research priorities. The report noted that this places the Centre in a highly favourable position to play a major role in achieving the CGIAR's mission.

The EPMR panel recommended that, as part of the Centre's ongoing evolution, we should consolidate our strategic research priorities into a long-term strategic plan that will direct more effort towards a limited number of relevant research topics. Furthermore, the panel recommended analysis of the likely impacts of the Centre's involvement in large development projects on the overall balance between research and development, staff commitments and administrative costs.

In response to the panel's recommendations, the Centre's Board and Management have implemented organizational and programmatic changes to streamline the Centre's management processes and structure.

We have developed a new strategic plan and identified a set of research priorities selected on the basis of their salience, credibility, legitimacy and fundability. We have also developed new global projects that re-focus our research agenda.

The Board supports management's plans to maximize ownership and implementation of the new strategy by the Centre's staff to ensure that everyone's talents and energies are dedicated to achieving an agroforestry transformation in the developing world.

The Board is mindful of the need to raise the necessary resources that will enable the Centre to implement the new strategy successfully. I am pleased to note that the Centre is in sound financial health, and that it has achieved a reasonable level of reserves to bolster financial stability.

Over the last few years, it has been meeting the CGIAR's financial targets, and has surpassed the upper threshold recommended for short-term solvency. The Board has continuously reviewed and approved appropriate centre financial investment policies and guidelines. The financial investment strategy, implemented in 2006, has surpassed the targeted returns. It is expected that these investments will continue to make a modest contribution to the earned income of the centre.

I am satisfied with the considerable progress the World Agroforestry Centre has made in response to the changing circumstances and realities in the donor and partner communities. The Centre is in a strong position to meet its challenges as a global centre of excellence. Its leadership and staff are committed to and focused on the delivery of its many useful technology options, which will enhance policy and institutional innovations for the benefit of poor people.

The Centre's Board is committed to providing the highest level of governance oversight and fiduciary controls. I hand over the chairmanship of the Board to Ms Lynn Haight, who has impeccable credentials and experience for this important task. I leave the Board with the quiet confidence that the World Agroforestry Centre is poised to deliver outstanding results towards achieving its mission of leveraging science to unleash agroforestry innovations that will benefit tens of millions of rural people and stabilise the fragile environments from which they sustain their livelihoods.

Eugene R. Terry,
Chair, Board of Trustees

From the Director General

The past year was a watershed for agroforestry science. Never before have so many multilateral and international organizations shown interest in working with us to deploy our science, tools and approaches in tackling global challenges. This surge of interest was driven, among other things, by the advances in land quality assessment methods developed by our scientists over the past several years. The robustness of these methods, combined with their radically low costs, have attracted considerable interest from both national and global partners. Indeed, new partnerships developed to deploy the novel methods promise to make efforts to understand and avert land degradation more effective than ever before. Likewise, our work on institutional innovations that mobilize local and national efforts for Landcare achieved global significance in 2006. Landcare programmes have now sprouted in more than 15 countries.

Global warming continues to be one of the most pressing public concerns around the world. The Stern Review on the economics of climate change, published by the UK Government in 2006, has put forests and land use back on the global agenda. UNEP and WorldAgroforestry co-hosted the Climate Change Convention of the Parties in Nairobi in November. These and other events have highlighted the urgency of addressing how rural people will adapt to the effects of climate change, and the importance of linking carbon credits much more aggressively with smallholder agroforestry throughout the tropics.

Governments and development agencies are now paying serious attention to the huge potential for smallholders to participate in carbon markets and improve their livelihoods by incorporating useful trees in their farms. However, to enable smallholder communities to participate in carbon markets, more effective and cheaper methods for smallholder agroforestry carbon projects are urgently required. The methods toolbox for carbon projects — being developed by WorldAgroforestry scientists — is generating a lot of interest among national governments and international agencies as an enabler for major carbon investment flows to smallholders.

Biodiversity conservation in landscape mosaics is a challenge for both livelihoods and environmental services. In partnership with the Center for International Forestry Research (CIFOR), we launched a Joint Biodiversity Platform — building on our respective comparative strengths to tackle the challenges of protecting biodiversity in both natural and agricultural landscapes more effectively.

These and other developments have brought agroforestry centre-stage in addressing the objectives of each of the three major environmental conventions — on Desertification, Climate Change and Biodiversity. Agroforestry encompasses land use systems that increase human welfare while



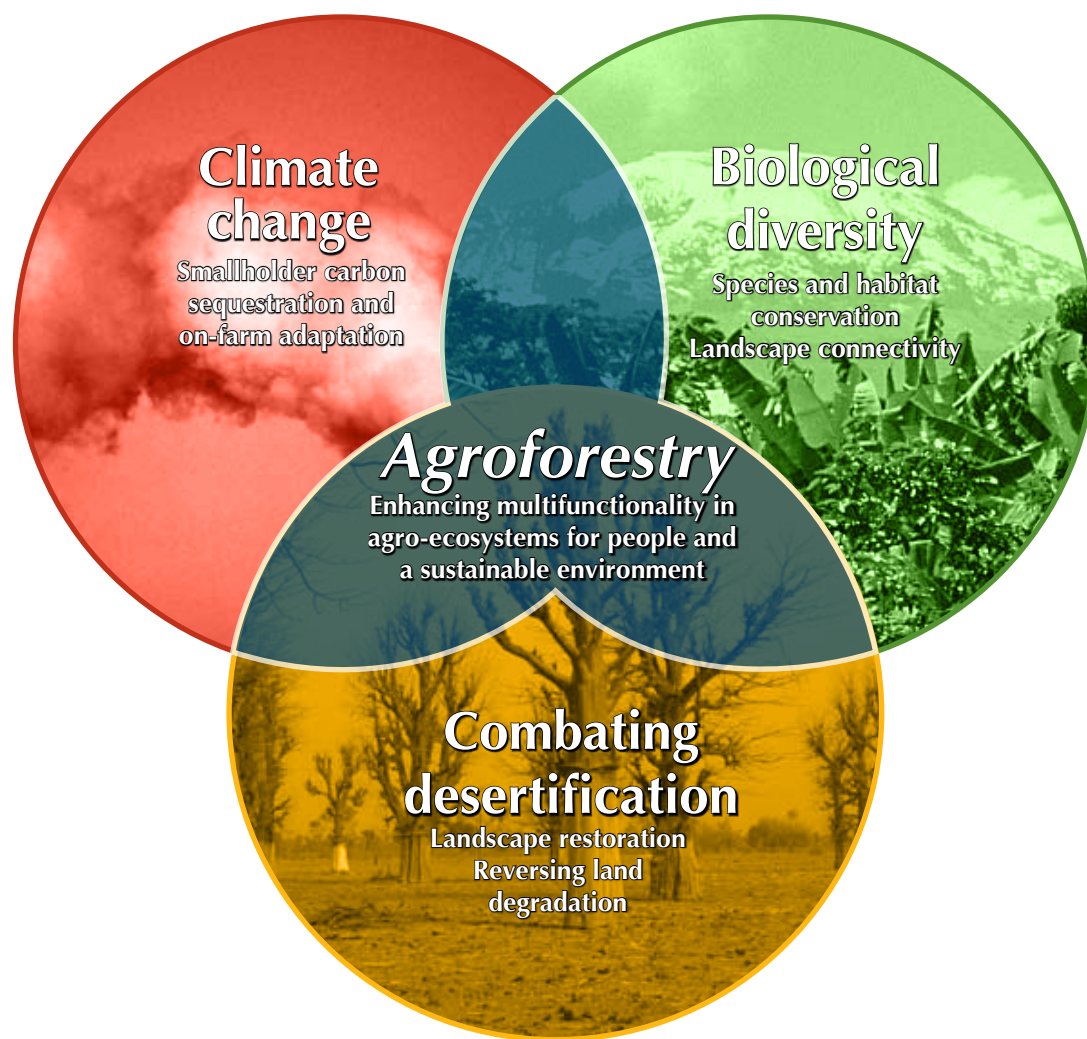
protecting the environment. Thus, smallholder agroforestry is uniquely suited to tackling both global environmental problems and poverty. As a former director of the Global Environment Facility noted to me, “Agroforestry is really at the heart of the three conventions.” Hence this report’s theme, which is explored in detail in the Feature Essay.

The 3rd External Programme and Management Review — completed during the year — encouraged us to re-think the Centre’s role in light of evolving global challenges. It has spurred us to better focus our research agenda to address questions at regional and global levels.

Taking the review panel’s recommendations to heart, we launched a major exercise to complete a new strategic plan that will guide us in the coming years. We reformulated our mission statement to emphasize our role as a Centre committed to producing science-based solutions to tackle poverty and environmental challenges.

We invite you to join us in the exciting journey that lies ahead for agroforestry science, and to explore its unique contributions in addressing both development and environmental challenges.

Dennis Garrity
Director General



Agroforestry science at the heart of the three environmental conventions

Fostering synergies to address biodiversity loss, land degradation and climate change through the science and practice of agroforestry

Since the 1992 Earth Summit in Rio, the global community has focused its efforts on three major environmental conventions — desertification, biodiversity and climate¹ — to mobilize the science, economics and social and political will to bring about sustainability in the use and management of the Earth's natural resources.

Following the establishment of the Global Environment Facility (GEF) in 1991, the world's governments affirmed their commitment to streamline major investments to make sure the conventions deliver practical solutions to overcome pressing environmental problems. As governments continue to make progress in balancing environment and development needs, there is growing recognition that truly innovative approaches are needed that foster synergies in the face of global change.

Agroforestry — the ancient practice of integrating trees on farms and in rural landscapes — is one such approach, due to its ability to reduce poverty, improve productivity and achieve environmental sustainability. Through major research efforts conducted over the past 30 years, agroforestry has evolved as a mainstream approach to improve natural resource management in agricultural landscapes. Agroforestry is a *dynamic, ecologically-based natural resources management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits*.²

Governments have expressed their desire to see greater synergies³ among conventions in achieving their objectives in a more holistic fashion. And expectations are growing that investments by the GEF emphasize the inter-linkages between loss of biodiversity, climate

change, land degradation and human activities.⁴ In this context, the multifunctional role of agroforestry is gaining in importance.

For example, the Millennium Ecosystem Assessment highlighted agroforestry as a system of alternative land uses that has great potential for generating win-win opportunities for sustaining ecosystem services.⁵ Agroforestry is indeed an integrative science that offers a unique perspective to understand and utilize the complexities in livelihood and natural resource management, including tradeoffs and synergies. These integrated dimensions include building on local knowledge to optimize the use and management of natural resources for improved livelihoods, all the while accommodating species and habitat conservation needs and ecological processes across multiple scales.

Why agroforestry is at the heart of the three conventions

Knowledge of the complex role of trees in agricultural landscapes has increased substantially over the past three decades. As a result, the potential for agroforestry to transform lives and landscapes is grasped now more than ever before. Yet the potential contributions of agroforestry in the implementation of environment and development policies has not been fully harnessed.

The three conventions continue to evolve in response to drivers of change, political pressures, impacts on ecosystem services and the state of human well-being. While each of the conventions has a specific mandate and scope of action, there are clear opportunities for synergies that have emerged. As the multi-year work programmes are negotiated and developed by governments, the links and interactions between climate change, biodiversity loss, land and water degradation — and their effect on ecosystem services and human well-being — are increasingly apparent. Over the years, agroforestry research has generated a wealth of knowledge has been generated to enhance evidence-based decision making and policy implementation addressing these issues. Hence, the potential for

1 These include UNCBD — United Nations Convention on Biological Diversity; UNCCD — United Nations Convention to Combat Desertification; UNFCCC — United Nations Framework Convention on Climate Change.

2 Leakey RRB. 1996. Definition of agroforestry revisited. *Agroforestry Today* 8(1):5–7.

3 The identification of synergy in implementing the Rio conventions and action thereon is considered as increasingly important by Parties. In the context of the Rio conventions, the benefits of synergies have been identified, among others, as the opportunity (i) to utilize and share relevant services and information provided through the 'sister' processes, (ii) to coordinate relevant actions to maximize their impacts, and (iii) to optimize the impacts of both human and financial resources used in the implementation of the instruments. Source: Opportunities for synergy in implementing the three Rio conventions Note by the Executive Secretary 2004 UNEP/CBD/WS-Syn.Afr/1/2.

4 GEF. 2004. A conceptual design tool for exploiting interlinkages between the focal areas of GEF. Scientific and Technical Advisory Panel. Global Environment Facility, Washington DC.

5 Millennium Ecosystem Assessment, 2005.



Multi-strata agroforestry systems can assist farmer adaptation, improving land use and providing more diverse streams of income.

agroforestry as a benign land use to mitigate and adapt to climate change, address land degradation and enhance biodiversity conservation is clear.

If the conventions can be implemented collaboratively and in a coordinated manner, synergies will result that lead to greater progress on all fronts. The following options for harnessing inter-linkages have been proposed:⁶

1. Addressing climate change can impact rates of desertification and biodiversity loss, for which climate is a key factor.
2. Introducing renewable energy technologies for reducing greenhouse gas emissions also reduces pressure on land and forest biodiversity by providing an alternative to unsustainable biomass fuels.
3. Combating deforestation reduces net carbon dioxide emissions, land degradation and the loss of biodiversity.

The conventions share the objective of contributing to the sustainable development goals of Agenda 21, including the targets of the Johannesburg Plan of Implementation of the World Summit on Sustainable Development, and the Millennium Development Goals.

Agroforestry innovations for synergies and inter-linkages

The World Agroforestry Centre recognizes that mainstreaming existing knowledge in policy discourse is a crucial step toward major investments in widespread application of agroforestry practices. Here we briefly outline some of the important innovations relevant to nurturing synergies and inter-linkages in relation to the three conventions.

Trees, connectivity and landscapes — multifunctionality for livelihoods and environment

Agroforestry is an important land use in many of the areas that harbour the world's biologically richest and most threatened ecoregions, including most of the global biodiversity hotspots. While the protection of natural habitats remains the core of conservation strategies, agroforestry practices designed to improve land quality and productivity also offer great opportunities to create habitats for wild species in agricultural landscapes.⁷ In fact, the multifunctional nature of agroforestry offers a range of opportunities for sustaining ecosystem service functions at landscape scale. This includes the use of live fences (to protect home gardens), woodlots (for fuel wood) and nitrogen fixing trees (to improve soil fertility). Research in different parts of the world has demonstrated that the benefits of integrating trees in agricultural landscapes are manifested both above ground (e.g. diversified and 'connected' habitats used by wildlife, increased carbon sequestration) and below ground (e.g. increased soil biota).

By enhancing agroforestry innovations for improved natural resource management in multifunctional landscapes, the goals of agricultural development (i.e. increased crop and livestock productivity) can be more effectively aligned with biodiversity conservation. In addition, such landscapes will become increasingly resilient to climate change impacts. Such inter-linkages would benefit immensely from greater understanding of agroforestry potential relative to livelihood priorities and landscape conservation needs.

⁷ Naidoo R. 2002. Final report: Avian species richness and community composition in a tropical forest-agricultural landscape. A study (to partially fulfil PhD requirements) conducted in Mabira Forest, Uganda, as part of a collaboration between ICRAF-FORRI (Uganda) and the University of Alberta, Canada.

⁶ <http://www.biodiv.org/cooperation/interlinkages.shtml>

Complex agroforests — a win-win for agriculture and biodiversity

Complex agroforests represent a traditional land use practice in the tropical humid forest regions. Here farmers integrate tree crops with a diverse range of high value (and often) indigenous timber or fruit species. The *damar* and *durian* gardens in Indonesia and the multi-strata shade cacao and coffee systems of Africa and Latin America, are complex ‘agroforests’ designed by smallholder farmers to optimize social, economic and livelihood gains. Research conducted in these systems has consistently demonstrated significant benefits with respect to biodiversity.⁸ The levels of plant biodiversity and carbon in agroforests are often comparable to primary forests.⁹

In Indonesia, the regeneration of woody species in rubber agroforests is recognized as a practical opportunity to support biodiversity in a landscape where the natural forests are disappearing. In the Americas, traditional coffee-based agroforestry systems play an important role in protecting the migration corridors for birds. As a result of such synergies, complex agroforests represent a win-win opportunity for leveraging biodiversity conservation and carbon sequestration through innovative agricultural practices.

Participatory Tree Domestication—Science for sustainable use

The traditional practice of integrating trees on farm has paved the way for evaluating a range of species that have high value for income generation by smallholder farmers. The science of participatory tree domestication has played an important role in sustainable utilization of promising indigenous trees in Africa (e.g. *Uapaca kirkiana* and *Dacryodes edulis* for high value fruits, *Prunus africana* and *Warburgia ugandensis* for high value medicinal products). This science involves the development of reliable propagation methods and the selection and multiplication of elite germplasm. Domestication of trees shows great promise for diversifying smallholder farms in marginal areas and reducing pressure on wild harvesting. Tree domestication also conserves and enhances the within-species diversity of valuable trees.

In the Sudan, agroforestry research has contributed to sustainable gum yields from *Acacia seyal*, an



Land degradation has transformed Lake Victoria, the world's second largest freshwater lake, to a eutrophic state in only a few decades.

important multipurpose tree of the agro-silvopastoral system in semi-arid South Kordofan through studies on tapping intensity and optimal harvest times for gum yields. In dry areas, when the yields of the understorey crops are low, gum production could compensate farmers for their loss. More than 80% of the total worldwide gum arabic harvest worldwide is collected in the semi-arid gum belt of Sudan, with an annual trade of about USD(\$ 45 million.¹⁰

Tree domestication science and practice offers immense opportunity for achieving synergies through biodiversity conservation, carbon sequestration and ecosystem resilience.

Harnessing agroforestry as a global land use option

The forces of globalization are becoming a major factor in land use change throughout the world. For example, as new income generation opportunities emerge for smallholder farmers, the potential for commercial agricultural land use will likely increase. The need to diversify smallholder farms and foster efficient use of natural resources will also become more apparent. In this regard, the market chain approach for tree cultivation holds potential for alleviating rural poverty, stimulating enterprise and promoting diversification.

For example, there is now growing interest in the private sector and among commodity organizations in harnessing the potential of agroforestry. The World Agroforestry Centre is well placed to leverage these opportunities, particularly in the following areas: climate change, land degradation, water resource use and payments for environmental services.

⁸ “Mature cocoa agroforests maintain approximately 60% of the carbon stock of primary forest, are important genetic reserves for indigenous fruit trees and preserve important habitats for avian populations of threatened species, such as African grey parrots and hornbills.” Gockowski J, Nkamleu GB, Wendt J. 2001. Implications of resource-use intensification for the environment and sustainable technology systems in the central African rainforest. In: Lee DR, Barrett CB, eds. *Tradeoffs or synergies? Agricultural intensification, economic development and the environment*. Oxon, UK: CABI Publishing. p.19–219.

⁹ See for example, Cheryl A. Palm, Stephen A. Vosti, Pedro A. Sanchez and Polly J. Ericksen, eds. 2005. *Slash and burn agriculture: the search for alternatives*. New York: Columbia University Press and www.asb.cgiar.org (the website for the ASB Partnerships for the Tropical Forests Margins).

¹⁰ Kamal EM Fadl and Jens Gebauer. 2006. Effect of time and intensity of tapping on the gum yields of *Acacia seyal* var. *seyal* in South Kordofan, Sudan. *Forest, Trees and Livelihoods* 16:219–225.



Opportunities to enhance carbon sequestration through agroforestry have been widely recognized.

Agroforestry and climate change

As the scientific evidence mounts, there is greater public acceptance of the importance of the multiple threats of climate change. The Stern Report at the end of 2006 concluded that delaying action to solve the climate change problem was no longer rational and that the costs of delay were unacceptably greater than the costs of early action. The Fourth Assessment Report from Working Group I of the Intergovernmental Panel on Climate Change (IPCC) further reinforced a sense of urgency. It concluded that the earth's climate is changing more quickly and with more intensity than previously suspected.¹¹ The global community is now keen to act on both mitigation and adaptation, and agroforestry has great potential to leverage these synergistically.¹²

11 The Fourth Assessment Report from Working Group I of the Intergovernmental Panel on Climate Change (IPCC) in January 2007.

12 For example, results from Kakamega District in western Kenya show a doubling of total system carbon (C) following 20 years of nutrient recapitalization in an agroforestry system. Total C sequestration may therefore be quite considerable with agroforestry systems that involve soil fertility replenishment and intensification, and

The need for adaptation is becoming increasingly urgent in Asia and Africa where agricultural production must respond to rising ambient temperatures, greater variation in rainfall and shorter growing seasons. On a local or regional scale, the impacts of global climate change are often exacerbated by the impacts of land use practices, thereby increasing the vulnerability of poor communities.

Multi-strata agroforestry systems can assist farmer adaptation by providing shade, improving soil functional capacity, reducing soil erosion, reducing rainfall runoff and providing more diverse streams of income. Research on improved fallows suggests that more variable rainfall patterns may increase the risk of tree establishment; however, once tree fallows are established, they provide farmers with good maize yields even in low rainfall years. More research on the adaptation potential of a wider variety of agroforestry systems is needed. Agroforestry will itself need to adapt to climate change with more emphasis placed on drought and flood tolerance.

With respect to mitigation, the opportunities to enhance carbon sequestration through agroforestry have been widely recognized. Agroforestry is cited as one of the options to reduce emissions and enhance sinks of greenhouse gases by the IPCC.¹³ The IPCC Land Use, Land-Use Change and Forestry Report of 2001 concluded that transformation of degraded agricultural lands to agroforestry has far greater potential to sequester carbon than any other managed land use change.

Research on the tropical forest margins has demonstrated that depleted deforested lands can be transformed into diverse, medium-carbon homestead agroforest gardens that are highly productive.¹⁴ In addition to a rich harvest of fruits, firewood, medicine, animal forage and resins, such agroforests offer great potential for adaptation to climate change by smallholder farm households. The diversity of plants used in agroforestry systems provides multiple harvests at different times of the year, which in turn reduces risk. Increases in soil carbon, when combined with the greater drought resilience of adapted agroforestry tree species, make such systems more resilient in the face of climate change and helps farm families to more readily

diversification of farming systems through the use of high valued trees. Sanchez PA, Bashir J, Niang AI, Palm CA. 2001. Soil fertility, small farm intensification and the environment in Africa. In: Lee DR, Barrett CB, eds. *Tradeoffs or Synergies? Agricultural intensification, economic development and the environment* Oxon, UK: CABI Publishing p. 325–344.

13 See for example, the "Summary for Policymakers: Scientific-Technical Analyses of Impacts, Adaptations and Mitigation of Climate Change" IPCC Working Group II.

14 Tomich TP, van Noordwijk M, Budidarsono S, Gillison A, Kusumanto T, Murdiyarso D, Stolle F, Fagi AM. 2001. Agricultural intensification, deforestation and the environment: assessing tradeoffs in Sumatra, Indonesia. In: Lee DR, Barrett CB, eds. *Tradeoffs or synergies? Agricultural intensification, economic development and the environment*. Oxon, UK: CABI Publishing p. 221–244; Cheryl A. Palm, Stephen A. Vosti, Pedro A. Sanchez and Polly J. Ericksen, eds. 2005. *Slash and burn Agriculture: the search for alternatives*. New York: Columbia University Press.

adapt. Indeed, each of these livelihood benefits occur as the system becomes better established, rising from a few tons of carbon per hectare to 80 tons of carbon per hectare or more.

Globally, the area available to generate such benefits is substantial. The IPCC estimates that 600 million hectares of unproductive crop and grazing land could be converted to medium carbon, high productivity agroforestry, and an additional 300 million hectares of existing agroforestry could be enhanced through better management. Such an effort would also support initiatives designed to halt deforestation. By all accounts, demand for wood and fibre will increase rapidly in the future as many countries become wealthier. If the world is to succeed in reducing deforestation rates, increased wood and fibre production on farms will be important. For example, India is already meeting half of its demand for wood products through smallholder agroforestry. The proportion of national wood demand being met by on-farm tree production is similar for many other countries, and is growing rapidly.

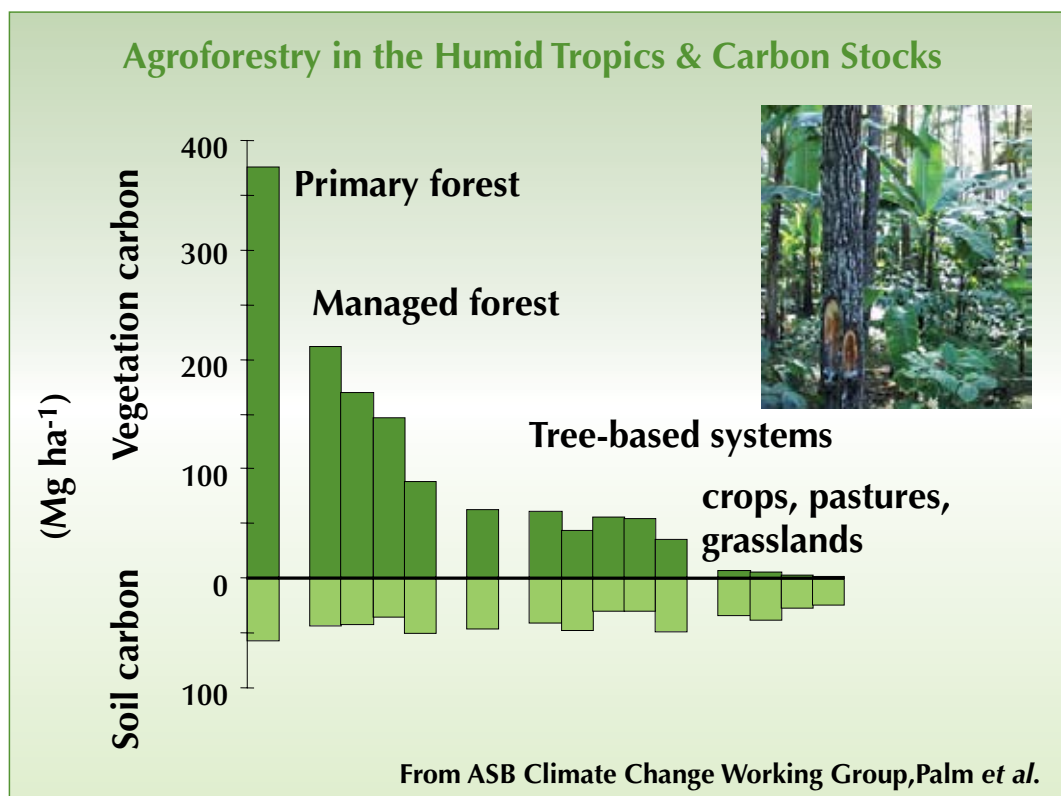
Carbon finance could provide the lynch pin needed to make a connection between poverty, transformation of degraded areas and global climate change. The global climate change community recognizes that it must address the challenge of reducing emissions from deforestation and degradation which produces about

20% of total carbon emissions. Avoided deforestation with sustainable benefits can generate both local and global payback, but there is need to better understand the risks of perverse incentives and disincentives.

Best practices are emerging on the types of national and local mechanisms that countries can apply to reduce carbon emissions from avoided deforestation, potentially with much lower transaction costs than current Clean Development Mechanism (CDM) projects. Incentive and rights-based mechanisms can be put in place to reduce carbon emissions from avoided deforestation, while sustaining the asset base, rights and well-being of people dependent on those resources. Countries such as Costa Rica and Mexico already have substantial experience in implementing such mechanisms at the national and sub-national scale. Large-scale afforestation programmes, such as those currently being implemented in Indonesia, China and India, could be revisited to better address avoided carbon emissions. Forest, landscape and watershed management projects can be redesigned to provide greater incentives to avoid carbon emissions through avoided deforestation.

Agroforestry and land degradation

Land degradation is a hidden cost to development that undermines the capacity of ecosystems to provide a better future for people, trapping people in poverty,





Experts recognize the potential of agroforestry for desertification control.

and leading to conflicts over land. There is increasing awareness that ecosystems may emerge in such degraded states quite suddenly once thresholds are exceeded. One example of this is the transformation of Lake Victoria, the world's second largest freshwater lake, to a eutrophic state in a matter of only a few decades, largely as a result of the cumulative effects of land degradation and soil erosion in the lake's watersheds. Agroforestry is cited in the UNCCD as a potential win-win land use system in providing key rehabilitation and other ecosystem services while also generating production and income for land users. A major priority is the drylands where grazing pressure and declining soil fertility are exacerbated by effects of climate variability such as drought.

Agroforestry systems can contribute to the conservation and restoration of agropastoral drylands and be deployed in three ways. First, they can reduce grazing pressure and the risk of grazing damage to other conservation investments. Throughout the agropastoral systems of Africa, fodder trees are utilized as an alternative feed source for livestock. In East Africa, an

estimated 200,000 smallholder dairy farmers are now using fodder trees as a source of high quality nutritious feed. Second, rotational woodlots can reduce pressure on the wood resources of dryland areas while increasing the fertility of the soil. And third, they can contribute to the stabilization and re-vegetation of degraded lands. In the Sahel, agroforestry innovations such as live fences and improved fallows are helping to regenerate and revitalize the parklands. In the Shinyanga region of Tanzania, more than 300,000 hectares of degraded dryland were successfully rehabilitated through the indigenous 'ngitili' system, which combines natural regeneration with traditional management of trees by local communities.

All three approaches demonstrate the potential for agroforestry to foster synergies in addressing biodiversity conservation (i.e. reducing grazing pressure and enhancing natural regeneration), land degradation (i.e. rehabilitation through management of trees) and climate change (i.e. restoring ecosystem resiliency and sequestering carbon).

Through engagement of the UNCCD, these synergies can be fully exploited in dryland areas. For example, by declaring the 2007 theme for World Day to Combat Desertification as Desertification and Climate Change — One Global Challenge, the UNCCD called for a synergistic approach to tackle this dual challenge. The UNCCD also recognizes the potential of agroforestry for desertification control and has established a Thematic Programme Network (TPN) on Agroforestry and Soil Conservation. Through the TPN, WorldAgroforestry is engaged with regional programmes such as the *Comité Permanent Inter-Etats de Lutte Contre la Sécheresse au Sahel (CILSS)* and the Institut du Sahel (INSAH) to further strengthen the role of agroforestry. The newly launched TerrAfrica programme of the New Partnership for Africa's Development represents a major opportunity for achieving synergies in sustainable land management through agroforestry.

Agroforestry and water

Water scarcity is becoming increasingly severe,¹⁵ with many countries already experiencing water shortages or severe scarcity. Recent findings suggest a decline in rainfall throughout several regions in Africa (De Wit and Stankiewicz 2006). Under their scenario, the water use and water balance effects of trees will be critical to the management of agricultural landscapes and water catchments across North Africa, the Sahel, Southern Africa and Madagascar. Because of the inherent controversy about links between land use and

15 [UNDP] United Nations Development Programme. 2006. Human Development Report 2006. Power, poverty and the global water crisis. New York: United Nations Development Programme.

hydrological cycles, WorldAgroforestry has a strong research focus on the role of agroforestry in watershed management with emphasis on identifying the 'right tree for the right place'. Priority areas of concern include the roles of trees, forests and agroforests in water cycles and reducing risks of floods, landslides and seasonal water shortages.

Water for livelihoods and productivity is the embodiment of how important inter-linkages are in the landscape. Management of water is critical with respect to erosion, leaching, nutrient availability, competition, rooting patterns and lateral flows. Little progress can be made in agroforestry without continuous attention to issues of water flows and availability. Trees that are integrated into agricultural systems can increase the efficiency of water use, while plantations of fast-growing trees can exacerbate water shortages.

WorldAgroforestry's research involves identifying the tradeoffs on the water use and water balance effects of trees, that have implications for water management, forestry and agroforestry. This work is particularly important for the semi-arid and arid regions. In agricultural landscapes, the use of deciduous tree species that produce high value products helps smallholder farmers optimize water use efficiency while harnessing new economic opportunities. At the same time, avoiding plantations of fast-growing trees that exacerbate water shortages will decrease the impact of climate change and declining rainfall. A growing understanding of these tradeoffs will help to foster synergies for sustainable land management through agroforestry.

Payments for Environmental Services

The concept of Payments for Environmental Services (PES) represents an important milestone in the history of environment and development. PES is a new market-based approach to conservation that aims to change incentives for land use to maintain or restore natural ecosystems so that they continue to provide environmental services. The basic principle is that those who 'provide' environmental services should be rewarded for doing so.¹⁶ This is achieved through a variety of arrangements that transfer rewards from those who benefit from an environmental service to those who conserve, restore and manage the natural ecosystem.¹⁷ These services can be provided *inter alia* through agroforestry and tree planting. The World Agroforestry Centre-led initiative on Rewarding Upland Poor for Environmental Services (RUPES¹⁸) is



Management of water is critical to control soil erosion.

helping to address many of the complexities associated with PES.

Over the past five years, the RUPES initiative has fostered several major innovations including the development of a *negotiation support system* that empowers the upland poor to harness PES opportunities. The NSS combines knowledge of ecosystems services functions with spatial models of upstream-downstream linkages in watersheds to enhance understanding of PES opportunities for both 'providers' and 'buyers'. Current practices and innovations in 16 countries have shown that PES initiatives with short-term commitments have little chance of success. Long-term commitments are more likely where watershed services are at stake than when biodiversity outside of protected areas is the primary concern. Accountability for environmental outcomes is more effective than payments for labour and effort. However, ecological restoration tends to be slow and the reward programmes need to be realistic in terms of what downstream users can actually get for their money.

A WorldAgroforestry-led pan-tropical scoping study¹⁹ in 2006 showed that overall experience with PES mechanisms is most advanced in Latin America (especially Meso America), followed by Southeast Asia. In 2007, WorldAgroforestry launched a new initiative on Pro-Poor Rewards for Environmental Services in Africa (PRESA) initiative with support from the International Fund for Agricultural Development (IFAD). It appears likely that interest and experimentation in PES mechanisms will continue to grow.²⁰ Concerns about the potential negative impacts of PES mechanisms on the poor are clearly legitimate,

¹⁸ See www.worldagroforestry.org/sea/rupes.org

¹⁹ The Scoping Study was commissioned and funded by the International Development Research Centre (IDRC), and involved a range of partners in Africa, Latin America and Asia.

²⁰ For example, strategic programming for GEF 4, includes Fostering Markets for Biodiversity Goods and Services.

¹⁶ WWF International. 2006. *Payments for environmental services: An equitable approach for reducing poverty and conserving nature*. Washington DC: WWF

¹⁷ See Wunder S. 2005. *Payments for environmental services: Some nuts and bolts*. CIFOR Occasional Paper No. 42. Jakarta: Centre for International Forestry Research.

although it does appear that there is some potential to build public PES mechanisms to minimize those risks and accentuate the positive benefits for the poor. It appears unlikely that PES mechanisms for watershed services will be a major solution to rural poverty problems. Yet with greater appreciation of PES in the developing world, opportunities for fostering synergies through agroforestry abound.

Conclusion

Agroforestry holds great potential for leveraging synergies and inter-linkages between the conventions. The scientific foundation is now in place to effectively exploit these opportunities. With climate change, land degradation and loss of biodiversity as major challenges, WorldAgroforestry is poised to contribute towards mainstreaming the science and practice of agroforestry. Over the last year, the Centre has redefined its science agenda to focus and align more

effectively with these global challenges. We are building on our ongoing engagement in policy discourse related to the conventions, and on our existing institutional links to fully harness the potential of agroforestry as a significant component of the future of global land use.

Institutional partners and platforms promoting synergies

'Agroforestry at the heart of the three conventions' provides a unique opportunity to foster synergies and inter-linkages through innovations that benefit agriculture, biodiversity and environment. Several major institutional mechanisms have been established to harness the range of agroforestry opportunities outlined in this brief. WorldAgroforestry is engaged in several such mechanisms to help leverage agroforestry innovations.

ASB Partnership for Tropical Forest Margins

<http://www.asb.cgiar.org/>

The ASB Partnership for the Tropical Forest Margins is a systemwide programme of the CGIAR, hosted by WorldAgroforestry. The goal of ASB is to raise productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services. The partnership brings together local knowledge, policy perspectives, and science, to understand trade-offs between conservation and development goals, and to identify and develop innovative policies and practices that work for both people and nature. Scientists from the ASB Partnership for the Tropical Forest Margin use both plant taxonomic and plant functional attributes (PFAs) to assess and predict biophysical response and thus, biodiversity, to land use impact and determine tradeoffs. These response characteristics include (a) richness patterns in certain key plant and animal groups, (b) above-ground carbon and (c) soil nutrient availability. By linking these results to agricultural productivity and profitability data, ASB researchers are able to examine the trade-offs that exist between global environmental benefits and the local economic benefits to farmers and suggest options for optimizing those trade-offs as well as present policy recommendations for national, regional and international stakeholders.

CIFOR-ICRAF Biodiversity Platform

http://www.cifor.cgiar.org/Research/ENV/Themes/Bio/biodiversity_platform.htm

The CIFOR-ICRAF Biodiversity Platform was established in 2006 with the generous support of the Swiss Development Corporation (SDC) and the Finnish Ministry of Foreign Affairs. By working jointly through the Platform, CIFOR and WorldAgroforestry seek to strengthen integrated research on the agriculture-forestry-environment nexus in multifunctional landscape mosaics. The Platform enhances dialogue and networking to catalyse the development of new thinking, approaches, and practice of biodiversity conservation and sustainable use in multifunctional landscapes. In addition, it provides opportunities for learning across disciplines, sites and scales, mobilizing synergies (e.g. of resources, skills, mandates), and adding value (e.g. through syntheses and generalization). The Platform aims to collaboratively deliver international public goods on the following themes:

- Relationships between biodiversity and livelihood security in multifunctional landscapes.
- Ecological processes and spatial dynamics of biodiversity in landscape mosaics.
- Opportunities for and constraints to providing incentives for biodiversity conservation, sustainable use and equitable benefit sharing in landscape mosaics.
- Potential for harmonization of customary and statutory rules and laws in relation to multifunctionality of landscape mosaics.

Ecoagriculture Partners

<http://www.ecoagriculturepartners.org>

'Ecoagriculture' describes landscapes that support both agricultural production and biodiversity conservation, working in harmony to improve the livelihoods of rural communities. This definition reflects an underlying principle for enhancing synergies through innovative land use practices. Ecoagriculture Partners comprise dozens of institutions and thousands of individual experts whose work is geared toward ensuring that agricultural landscapes are increasingly managed to achieve three complementary goals: to enhance rural livelihoods; conserve biodiversity; and sustainably produce crops, livestock, fish and forest products. Agroforestry land use embodies these three goals, and therefore represents a major opportunity for achieving synergies in many agro-ecologies around the world. As a partner, WorldAgroforestry helps to develop tools and methods for assessing best practice options that can be leveraged through the network.

Global Partnership on Forest Landscape Restoration

<http://www.unep-wcmc.org/forest/restoration/globalpartnership>

The Global Partnership on Forest Landscape Restoration brings together more than 25 government agencies and organizations to foster innovative and practical approaches for restoring degraded forest ecosystems. The partnership harnesses strengths and expertise of the various institutions to identify, negotiate and implement practices that restore an optimal balance of the ecological, social and environmental benefits of forests and trees within a broader pattern of land uses. Agroforestry is recognized as a priority option for landscapes restorations because of its potential importance in transition zones around forests and protected areas. As a member of the partnership, WorldAgroforestry leverages its scientific strength in evaluating tree-based options that have high potential for income generation by smallholder farmers. By targeting the right trees to the right places, WorldAgroforestry can help harness biodiversity conservation and ecosystem resiliency through investments in agroforestry for landscape restoration.

Collaborative Partnership on Forests

<http://www.fao.org/forestry/site/cpf/en/>

The Collaborative Partnership on Forests (CPF) is an informal, voluntary arrangement between 14 international organizations and secretariats with substantial programmes on forests. The mission of CPF is to promote the sustainable management of all types of forests and to strengthen long-term political commitment to this end. It does this by supporting the work of the United Nations Forum on Forests (UNFF) and its member states, and fostering increased cooperation and coordination on forests. The partnership creates a forum for sharing experiences and building on them to produce new benefits for their respective constituencies. Partners also collaborate to streamline and align their work and to develop new ways of solving problems related to forest management, use and conservation and the production and trade of forest products. As a scientific partner in the CPF, WorldAgroforestry plays a key role in raising the profile of trees outside forests, including potential for agroforestry to strengthen forest management in multifunctional landscapes.

Global Strategy for Plant Conservation

<http://www.plants2010.org/>

The Global Partnership for Plant Conservation (GPPC) is a network of international, regional and national organizations committed to supporting implementation of the Global Strategy for Plant Conservation (GSPC), which was adopted by the Conference of the Parties of the CBD at its sixth meeting in 2002. The GPPC provides a framework to facilitate harmony between existing initiatives aimed at plant conservation, identify gaps where new initiatives are required, and promote mobilization of the necessary resources. Through its engagement with other members, WorldAgroforestry is helping to evaluate agroforestry options for GSPC targets that relate to trees on farms or trees outside forests. This includes understanding and documenting the diversity of high value trees, improving access to and application of conservation and tree management through capacity building, education and public awareness, and fostering the sustainable use of tree-based systems for food security, poverty reduction and environmental sustainability.



Highlights for 2006

Highlights for 2006 at the World Agroforestry Centre

JANUARY – MARCH 2006

Project to help spread agroforestry innovations in Cameroon

The United States Government, through its embassy in Cameroon, will fund a joint initiative by WorldAgroforestry and CARE to the tune of USD 3.5 million over three years. The grant falls within the framework of the 2006 Food for Progress programme, and will help leverage agroforestry practices in the West and Northwest Provinces of Cameroon. WorldAgroforestry's African Humid Tropics (AHT) programme will bring to the project technical expertise in Participatory Tree Domestication of high-value indigenous tree species and medicinal plants. Dr Zac Tchoundjeu, AHT Regional Coordinator, said the grant showed that donors have started to consider domestication techniques developed in AHT as a powerful tool to improve livelihoods of resource-poor farmers, while safeguarding threatened environments.

Centre equips Malian institute with technology for soil analysis

WorldAgroforestry installed a multipurpose infrared spectrometer in a laboratory at the Institut d'Economie Rural (IER) in Sotuba, Mali. Principal scientist Keith Shepherd led the installation and trained the institute's staff in partnership with Bruker Optics. Now, IER will be able to analyze not only soils and crops, but also a wide range of agricultural inputs and products, including manures, fertilizers, animal feeds, grains, milk as well as agroforestry products such as wood, charcoal and shea butter. Analysis of livestock wastes will also provide farmers with important information on animal nutrition and health.

International Cacao Symposium highlights role of agroforestry

The World Agroforestry Centre co-sponsored the International Cacao Symposium entitled *Theobroma cacao: The Tree of Change*, held on 9–10th February 2006. The meeting reviewed recent scientific findings on cacao — from its potential to improve health, to the preservation of tropical ecosystems where cocoa is grown. Trees and Markets Theme Leader Tony Simons spoke about the role of cacao agroforestry systems in rural economic growth and the conservation of biodiversity. The meeting highlighted new opportunities for providing social, economic and environmental benefits to millions of farmers who depend on the crop.

WorldAgroforestry and CIFOR support community forestry in Liberia

WorldAgroforestry, CIFOR and the Liberia Forestry Development Authority organized a four-day workshop on community forestry with support from the United States Agency for International Development (USAID). The workshop brought together nearly 100 participants representing a cross-section of stakeholders involved in forestry. The workshop was the first of its kind for Liberia. The workshop resolved that all stakeholders work together to ensure wealth from Liberia's forests reached all Liberians. The social, legal and institutional framework to make this happen will benefit immensely from experiences elsewhere on the continent, the workshop noted. CIFOR and WorldAgroforestry have been challenged to mobilize their collective strengths in generating knowledge and innovations to help the Liberian people sustainably manage their forestry resources.

WorldAgroforestry hosts Africa Herbal Antimalaria Meeting



The Africa Herbal Antimalaria Meeting was held at the World Agroforestry Centre in March 2006 to share information on current and future use of plant products in the control of malaria. Participants included experts in botany and agronomy, farmers, phyto-medicine manufacturers, researchers and practitioners of herbal medicine, quality assurance and regulatory specialists, public health administrators, financial experts and businessmen involved in marketing and distribution of pharmaceuticals, donors and representatives of the government. The meeting, which was co-hosted with the Centre for Development of Enterprise, developed a collaborative action programme for Africa-wide production and distribution of appropriate herbal antimalarials.

WorldAgroforestry leads global study on Compensation for Ecosystems Services

The World Agroforestry Centre led a diverse group of organizations in a Global Scoping Study on Compensation for Ecosystem Services (CES) commissioned and funded by the International Development Research Centre (IDRC). The study provided a broad and rich reflection of the potential for market, financial and incentive-based instruments for conserving ecosystem services and reducing poverty in the tropics. In addition to overviews of relevant CES developments in Africa, Asia and Latin America, desk studies generated several country-level inventories of CES projects. Legislative and policy reviews were also conducted. Findings were shared through regional workshops and compiled into a series of Working Papers. Key partners in the study included African Centre for Technology Studies (ACTS), Corporacion Grupo Randi Randi (CGRR), Forest Trends, Institute for Social and Economic Change (ISEC), The World Conservation Union (IUCN) and the United Nations Environment Programme (UNEP).

Workshop synthesizes watershed management research

A landmark workshop was held on March 17–20 2006 to synthesize two decades of WorldAgroforestry's watershed research. The synthesis developed at the workshop is intended to inform policy debates and guide future research. Primarily involving WorldAgroforestry staff and select partners, the workshop concentrated on plot-level and landscape-level research and reviewed the policy implications of the findings.

APRIL – JUNE 2006

WorldAgroforestry at Global Horticulture Initiative launch

A new milestone in the fight against poverty and hunger was set on March 26, 2006, during the launch of the Global Horticulture Initiative (GHI) at the National Higher Institute of Agronomy in Montpellier, France. More than \$2.5 million was pledged to develop horticultural systems in the world's poorest countries. The seeds for the creation of this initiative were sown in December 2005 by CGIAR centres, including the World Agroforestry Centre, together with other institutions such as the International Society of Horticultural Science and Common Fund for Commodities. In Montpellier, the idea was turned into reality and the World Vegetable Centre took lead of the GHI. The initiative will focus on increasing the production and consumption of tropical fruits and vegetables and reducing childhood malnutrition and mortality, while guaranteeing a quality environment.

Top honours for collaboration in Mali

The World Agroforestry Centre's West and Central Africa Region received an honours award during the Agricultural Research Week of Mali held in June, 2006. The award, received by the new Regional Co-ordinator, Dr Harold Roy-Macauley, recognized the excellent collaboration that the Centre has developed with the National Agricultural Research System (NARS) of Mali. The award is strongly associated with Mr Amadou Niang, former Sahel Regional Coordinator, who was instrumental in the creation of strong synergies between the NARS and the Centre.

CGIAR Media Event: Combating desertification through Science

As part of events organized to mark the International Year of Deserts and Desertification, the CGIAR organized a press conference to publicize ground-breaking scientific innovations and research-for-development activities that are helping communities in Africa cope better with desertification and dryland degradation. The event was co-hosted by the International Livestock Research Institute (ILRI) and the World Agroforestry Centre which presented case studies on how their research activities are making a difference to Kenya's dryland communities and averting desertification. WRENmedia interviewed Principal Soil Scientist Keith Shepherd on combating desertification. The interview formed part of an AGFAX radio pack on agricultural science that was sent out to radio stations in Africa, Asia and Europe.



Landscape management project launched in Guinea

The Landscape Management for Improved Livelihoods (LAMIL) project, which aims to improve environmental management in the Fouta Djallon highlands of Guinea, was officially launched in June 2006. Funded by USAID and implemented by the World Agroforestry Centre and CIFOR, the LAMIL project was designed to ensure that forested landscapes of Guinea are sustainably co-managed by government and community organizations to enhance local livelihoods and biodiversity. The project has two key areas of focus: Landscape Management (conserving biodiversity, governance) and Improved Livelihoods (poverty alleviation, rapid impact, sustainability). The main objective of the project is to have Livelihoods, biodiversity and governance improved in target landscapes as the basis for a new approach to landscape management in Guinea.

JULY – SEPTEMBER 2006

Trees on Farm Network (TOFNET) hosts *Jatropha* conference

The 1st National *Jatropha curcas* Conference and Exhibition was held in July 2006 at the World Agroforestry Centre's Nairobi campus. Co-hosted by the Heinrich Böll Foundation (HBF), Trees on Farm Network (TOFNET) and Vanilla Development Foundation (VDF) the conference focused on the theme *Towards Bio diesel production in Kenya, Jatropha as a tool to combat energy poverty*. The event provided the global and regional *Jatropha* fraternity an opportunity to network and share the latest information and technology with a view to promoting trade of high quality *Jatropha* products. It also showcased the potential of *Jatropha* bio-diesel uses from *Jatropha* oil and related by-products.

Director General delivers keynote speech at Swiss Centre event

Trees for poverty alleviation was the theme of the Annual Conference of the Swiss Center for International Agriculture (ZIL), held in June 2006 in Zurich. The event deliberated on the use of trees to improve livelihoods in developing countries. Dennis Garrity, Director General of ICRAF, and Angela Cropper, Board Chair of CIFOR were key speakers. ICRAF and CIFOR also presented a poster on the joint biodiversity platform.

Scientist honoured for promoting agroforestry in Tanzania

A former World Agroforestry Centre country representative in Tanzania, Remen Swai, was on August 28, 2006, awarded a national certificate for leading the agroforestry programme in the Western Zone of Tanzania. The award, which also included a cash prize of Tsh 1.5 million, was presented during a national ceremony held in Dodoma at the Parliament grounds. Swai also served as Leader of the Domestication Programme of Indigenous Fruit and Medicinal Tree Species in Tanzania.

Parliamentarians visit Kenyan CGIAR centres

A group of international parliamentarians from ten countries visited World Agroforestry Centre headquarters in Nairobi on September 11, 2006. They attended a panel discussion where a group of experts discussed the opportunities and challenges for agricultural development in sub-Saharan Africa. The group, which had earlier been to ILRI, also visited the field to see for themselves how



smallholder farmers were using agricultural innovations introduced by the CGIAR and partners. The innovations include fodder trees to increase milk production of dairy cattle and goats, grafted fruit trees and improved potato varieties. The legislators are members of the Parliamentary Network on the World Bank (PNoWB).

Scientific Renewal: Strategy workshop adopts new mission statement

In September, 2006, a strategic planning workshop established a new and invigorated pathway for scientific renewal and repositioning of the World Agroforestry Centre for the future. The three-day workshop was designed to address strategic priorities and emerging science for the Centre. It identified and agreed on a number of principles and processes that will guide the Centre's scientific renewal. A new draft mission statement was adopted. It reads: *We use science to understand the complex role of trees in agricultural systems and their effects on livelihoods and the environment, and promote use of this knowledge to improve decisions and practices impacting on the poor.*

OCTOBER – DECEMBER 2006

WorldAgroforestry at World Food Day seminar in Finland

The World Agroforestry Centre was among four CGIAR centres that attended a seminar organized by University of Helsinki and Finland's Ministries of Foreign Affairs, Agriculture and Forestry to mark the World Food Day. The others were CIFOR, ILRI and IFPRI. In line with the Day's theme — Investing in agriculture for food security — the seminar focused on research as a means of showcasing the Finnish government's commitment to science. The opening speech highlighted government support for efforts towards achieving the Millennium Development Goals

through investment in agriculture. The World Agroforestry Centre's Director of Strategic Initiatives, Mohamed Bakarr, made a presentation entitled *Research to tackle soil health and 'hidden' hunger in Africa*. The talk showcased the Centre's work on integrated soil fertility management and domestication of fruit trees for nutritional security. Heidi Vanhanen of the Finnish Forestry Research Institute (METLA) described the evolving partnership between the World Agroforestry Centre and the Institute as a model for food security research. The seminar also discussed opportunities for collaboration among various international research organizations and CGIAR centres.

Workshop evaluates land management experiences in Africa

In November, 25 extension and research partners from the eastern and southern Africa region attended a workshop on land management organized by the Regional Land Management Unit (RELMA), a project of the World Agroforestry Centre, in Nairobi. The workshop, whose theme was *Synthesis of RELMA's Experience in Land Management*, distilled lessons learnt from RELMA's development activities over the last three decades. The workshop was opened by the Swedish Ambassador to Kenya, Anna Brandt. Its outputs will be developed into a series of concise, easy-to-read briefs to reach a larger audience as lasting footprints on land development experiences in the region.

RELMA was started as and operated as a Swedish International Development Agency project until 2004, when it was absorbed into World Agroforestry's Eastern Africa Region as a project on improved land management for sustainable development. RELMA empowered smallholders by providing technical advice, including through a wide range of easy to read publications. The project is due to end in December 2006.

CGIAR centres and partners in talks with West African parliamentarians

The World Agroforestry Centre took part in the first CGIAR-organized dialogue between CGIAR scientists, their partners and parliamentarians in West Africa. The meeting, which took place in Dakar, Senegal, on October 30, 2006, was chaired by Dr Pape Abdoulaye Seck, now Director General for WARDA. The meeting convened about 30 people, mostly Senegalese parliamentarians, the private sector and representatives of the following CGI centres: IFPRI, ICRAF, ICRISAT, CIAT, ILRI and WARDA. Each centre made a presentation of its most relevant research results that could contribute to agricultural development. ICRAF's presentation was made by the Regional Coordinator Dr Harold Roy-Macauley, and was titled Agroforestry innovations for improving the prosperity of Sahelians.

Partnership to train Indonesia's scientists



In October 2006, Dennis Garrity led a delegation from the World Agroforestry Centre to Indonesia's Ministry of Forestry. The Centre reported on the success of the Negotiation Support System work that is benefiting forests and farmers, jungle rubber agroforestry and involvement in the tsunami-affected area of Aceh. After the discussions, a memorandum of understanding was signed between the Ministry of Forestry and World Agroforestry Centre to enhance research collaboration between the institutions, especially with regards to the Centre facilitating Indonesian researchers to work on their PhD degrees.

Amazon Initiative partners collaborate on training programme

In November 2006, the World Agroforestry Centre organized the first trio of three-day courses *Genetic improvement and domestication in agroforestry and silviculture* (Module VI of the course 'Agroforestry in the Peruvian Amazon'). Co-hosted and organized by Instituto Nacional de Investigación y Extensión Agraria (INIEA), the course was conducted by the World Agroforestry Centre tree domestication specialists Jonathan Cornelius and Julio Ugarte, IIAP researcher Carlos Oliva and EMBRAPA scientist Marcos Deon Vilela de Resende, the author of the comprehensive text *Genetics, biometry and statistics in the improvement of perennial plants*. Thirty-two researchers and educators attended the course, which was financed by STC-CGIAR. It was organized under the INCAGRO-financed project *Management, conservation and use of genetic resources of Amazonian fruit species through collaboration in the framework of the Amazon Initiative (INIEA-ICRAF-IIAP)*.

World Agroforestry joins UNEP in Billion Tree Campaign



On the occasion of the 12th COP of the Climate Change Convention, UNEP with a range of partners launched *Plant for the Planet: The Billion Tree Campaign*. Under the patronage of Nobel Prize Laureate Prof Wangari Maathai and Prince Albert II of Monaco, the campaign encourages individuals, organizations and countries to plant and care for one billion new trees globally. The World Agroforestry Centre, the main science advisor to the project, will guide choice and targeting of trees for long-term benefits to people and the environment.

Scientists attend MPs' Conference in Cameroon

The First International Conference of Members of Parliament on the *Sustainable Management of Central African Forest Ecosystems* was held in Yaoundé, Cameroon, in October. Participants discussed forest taxation, partnerships as well as national legislation and international agreements. Other topics included forest certification, women's participation in natural resource management and innovative tools for managing forests. The World Agroforestry Centre presented two papers: *Involvement of the people representatives in rural poverty reduction through participatory domestication of high-value indigenous fruit trees* (by Zac Tchoundjeu) and *Enterprise Development: an innovative approach to the conservation and management of natural resources for poverty alleviation* (by Divine Foundjem Titta). The World Agroforestry Centre's West and Central Africa Regional Office staff took the opportunity to create awareness about our work.

World Agroforestry hosts Climate Change Conference events

The World Agroforestry Centre hosted most of the side events at the Climate Change Conference, held on November 6–17, 2006. The Centre also organized its own side event during which Principle Scientist Lou Verchot presented a paper on *Smallholder carbon development projects: linking climate change mitigation with poverty reduction*. The paper highlighted the need for Clean Development Mechanism (CDM) projects to generate concrete development and environmental benefits in host countries. Two other scientists at the Centre, Jonathan Haskett and Keith Shepherd, also contributed to the discussions. The three scientists guide the Centre's climate change adaptation and mitigation research.

Regional tree domestication course benefits researchers in Congo

The West and Central Africa Programme held a regional Tree Domestication Training Course in Kinshasa, Democratic Republic of Congo, in December 2006. The course consisted of theory modules and practical sessions on all aspects of domestication of indigenous trees. It targeted lecturers and extension staff working in forestry, agroforestry and natural resource management. The training was a key component of the World Agroforestry Centre's regional programme to provide scientific knowledge to extension services, and ensure it reaches and impacts on the lives of vulnerable populations. The course was funded by the International Fund for Agricultural Development (IFAD).

Technology to monitor plant water intake attracts media interest

The World Agroforestry Centre got a lot of publicity in the media towards the end of the year for its research on water use by trees. Of particular interest was the use of a sap flow meter developed jointly with the University of Western Australia to measure how different trees use water across seasons. The device has been used to monitor and compare seasonal water use of bamboo and eucalyptus in the headwaters of the Mara and Kagera rivers in East Africa in order to predict their impact on the river flows into Lake Victoria. The studies will help determine whether bamboo can replace eucalyptus as a timber species and a cash crop without depleting water resources.



Board approves organizational realignment plan

In December 2006, the World Agroforestry Centre's Board of Trustees approved the Organizational Realignment Plan, to be implemented as of 1 January, 2007. Major changes include the realignment of the roles of the Deputy Director General (Programmes) and Director of Strategic Initiatives, streamlining of Corporate Services and strengthening of the theme-region matrix to improve programmes implementation. The alignment is in line with the Centre's scientific renewal and will result in fewer, more carefully chosen research, development-support and education (RDE) priorities.



Science Reports

TREES AND COWS

A winning formula for Africa's dairy farmers

Smallholder dairy farming is a booming business in the East African region. An essential component for successful and profitable production is providing high-quality animal fodder during periods of poor rainfall. For more than a decade, World Agroforestry Centre scientists have helped bridge this gap by developing a menu of several fodder shrubs, each suited to a different agro-ecological niche. In recent years, fieldwork by World Agroforestry and national research institutes has emphasized ways to scale-up the proven methods. The 'take-off' point has probably been reached, with an estimated 200,000 households now using fodder shrubs in four countries.

With grazing land in short supply, raising animals in East Africa is a risky business that can easily defeat even the most skilful farmer. More than 200,000 farmers in four African countries have learned to mitigate that risk, however, using a novel technology known as fodder shrubs.

Fodder shrubs are easy to grow, they tolerate drought and improve the soil by fixing atmospheric nitrogen. The trees can be well-established in about 12 months and are then ready to be pruned continuously and fed to cows and goats for many years.

Planting fodder shrubs does not involve cash expenditures and they can often be planted in otherwise unused niches on the farm. Instead, farmers substitute small amounts of family labour for cash that would otherwise be spent purchasing commercially processed feeds.

Benefit-cost analyses show that farmers who plant an average of 500 fodder shrubs have increased farm income by USD 95 to 120 per year. Because at least half the farmers are women, the funds are typically used to pay for school fees or household improvements. Annual net returns in 2006 totalled some USD 8 million per year in Kenya alone.

According to Steve Franzel, scientist at the World Agroforestry Centre, returns can be quite attractive. In

Kenya, for example, an investment of USD 150,000 by the CGIAR resulted in nearly 20,000 farmers planting 4 million shrubs that are generating ongoing profits of nearly USD 800,000 per year.

Franzel notes that the need for an inexpensive and plentiful source of high-protein animal feed has plagued dairy farmers in East Africa for generations and limits animal production in other parts of the developing world as well. The experience of our fodder shrub work in Africa has applications for a great many locations, he says.

The basics of fodder shrubs

Farmers usually grow fodder shrubs along boundaries and pathways or in lines along terraces, a practice that reduces soil erosion, protects local watersheds and provides a source of firewood that can be grown on farm rather than collected from local forests and woodlands. The trees usually do not need replanting until after about a decade or longer.

Fodder shrubs also free up women's labour for more productive enterprises. As women are usually responsible for feeding the family's livestock, access to a home-grown source of feed saves them time and energy by eliminating the need to cut and carry fodder over long distances. ►

Estimated number of farmers planting fodder shrubs in Kenya, Uganda, Rwanda and Tanzania (Franzel and Wambugu 2007)

Country	# of organizations promoting fodder shrubs	# of farmers planting according to records	Rough estimate of additional farmers planting	Total	# of trees per farmer	% of planters who are women
Kenya	60	51,645	30,000	82,000	75	57
Uganda	80	77,369	5,000	82,000	306	59
Tanzania	15	17,519	10,000	28,000	99	
Rwanda	69	9,590	4,400	14,000	266	48
Total	224	156,123	49,400	206,000	184	



Households using fodder shrubs say they help increase the amount of milk available for the family's consumption and sale to generate income.

The practice also helps contain destructive cattle grazing in nearby forests and woodlands.

Social benefits from the trees are also proving highly significant. Households using fodder shrubs claim that they help increase milk availability and consumption among family members. Cash earned from the sale of milk or fodder is used to buy food, soap and other household items or to pay school fees.

The expansion of fodder shrubs in East Africa, extension specialist Charles Wambugu observes, is the end-product of a research-for-development partnership involving some 300 local agencies in Kenya, Uganda, Rwanda and Tanzania. Partnership activities, he says, help link local organizations across international borders and encourage farmers to adopt improved varieties and practices. The partners also work closely with Academy for Educational Development (AED), a US non-governmental organization (NGO) that uses social marketing and communications tools to bring about social change.

Fodder shrub research began in the late 1990s in central Kenya, when WorldAgroforestry and the Kenya Agricultural Research Institute began testing improved fodder shrub varieties with farmer groups and promoting their use through extension agencies and NGOs. Since then, the initiative has come to include scores of organizations, including 3 international research centres, 12 national ministries and more than 300 local farmer groups. Financial support is provided by a consortium of donors, including DFID and USAID.

Nine fodder shrub species have been selected and are currently available for extension in environments ranging

from the hot humid coastal lowlands to semi-arid tropics and mountain ecosystems up to 3,000 m above sea level.

Small-scale dairy producers are the principal beneficiaries of the new varieties. However, dairy processors, milk collectors and seed dealers are also benefiting. Dairy interests have come to recognize, Wambugu says, that fodder shrubs reduce the cost of production, greatly improve milk quality and help stabilize milk supplies during the dry season.

The new research has also helped seed dealers and nursery operators form their own associations and improve the quality and availability of planting material, thus expanding an important market for smallholder seed and plant producers.

Increases social capital

Similarly, participation in the initiative has helped increase social capital, i.e. the empowerment benefits that accrue when the rural poor begin working effectively together in groups. Thus far, the results have validated the project's strategy for achieving impact at scale.

Lastly, the project has shown that policy support is critical to success. Surprisingly, however, the support of local policy makers was shown to be more important than that of national policy makers. Studies indicate that local policy makers frequently act as advocates for fodder shrubs and have worked to sensitize their constituents to their utility and value.

Indicative of this is the work conducted in Uganda where local policy makers allocated land and funds to help farmer associations establish nurseries and seed orchards. These actions were observed by other communities. They

helped promote adoption and increased the scope and reach of the programme.

As a result of such efforts, the World Agroforestry Centre fodder shrub specialists are confident that the approaches used to extend the technology can be used to assist a half million additional farmers — roughly a quarter of the region's dairy producers — to plant and use fodder shrubs by 2010.

At the same time, World Agroforestry Centre scientists and participating national programmes are working to increase the number of available fodder shrub species by screening new indigenous and exotic varieties. Species diversification, project scientists say, is important for improving animal nutrition and in reducing the effect of pests and diseases. Additional species help expand the potential for fodder shrub technologies to have impact in new eco-zones, including semi-arid or cooler, high-altitude areas.

Leaf meal from fodder trees

The processing and marketing of leaf meal made from fodder trees, while common in Asia, is still largely unknown across much of sub-Saharan Africa. In northeastern Tanzania, however, researchers have documented how farmers there produce and sell leaf meal to traders, who in turn sell it to urban dairy farmers. Among 5,400 dairy farmers surveyed in three districts, nearly 3,300 used leaf meal made from fodder shrubs. According to ICRAF economists, more than 1,500 farmers now sell the shrubs to a network of traders. Collectors and traders benefit from the practice during the dry season, when there are few alternative opportunities to earn cash. For dairy farmers the meal provides a cheap source of protein and nutrients. Likewise, poultry farmers use the meal because it is



A woman feeds her dairy goat on fodder shrubs: The trees can be well established in about 12 months and are then ready to be pruned continuously and fed to cows and goats for many years.

nutritious and darkens egg yolks, making their eggs more attractive for the market. The potential for using leaf meal in manufactured feed is thought to be substantial. The Bayslick Company, Tanzania's third largest producer of dairy cow mineral supplements, for example, includes in its processed feed products leaf meal made from fodder shrubs, all of which it buys from local women's groups. Our research is focusing on how to facilitate the spread of leaf meal processing to other areas and to assess the feasibility of using leaf meal in other feed products. ■

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Farmer enterprises open markets for agroforestry products

Global markets remain out of reach for hundreds of thousands of small-scale farmers in developing countries. Yet local markets offer viable opportunities to earn cash, as the case shows for a Farmer Enterprise Development initiative being implemented by the World Agroforestry Centre's West and Central Africa regional office. At last count, about six thousand farmers were taking advantage of tree domestication methods and training in better marketing methods, across a six-country swathe of the region's humid tropical forest zone. Extending lessons learned in Cameroon to other areas like Gabon and Democratic Republic of Congo, scientists at the Centre are seeing significant increases in farmer incomes from a growing palette of newly domesticated agroforestry tree species.

Farmers in developing countries find it difficult to take full advantage of the existing and potential national, regional and international market for lesser-known but high value tree products. The seasonality of these products, poor roads, limited knowledge of markets, inadequate networking as well as processing and storage methods contribute to the low incomes obtained from the sale of tree products. Research in the humid tropical forest region of West and Central Africa is demonstrating that empowering farmer households to market agroforestry tree products collectively can help individual farmers to overcome these constraints.

Through the Farmer Enterprise Development (FED) initiative, World Agroforestry Centre scientists have

conducted research with Cameroonian farmers since 2003 to develop a robust domestication approach that can be applied across the region to improve smallholders' access to markets. The objective is to enhance the increasing on-farm production generated through participatory tree domestication (see Box). The FED model uses several steps:

- Market survey research to identify existing markets and channels, marketing problems, specifications and opportunities.
- Workshops and training to widen access to methods for increasing fruit and timber tree production, and post-harvest and marketing skills. Training modules include: group dynamics, leadership skills, conflict management and basic financial management; plus tree

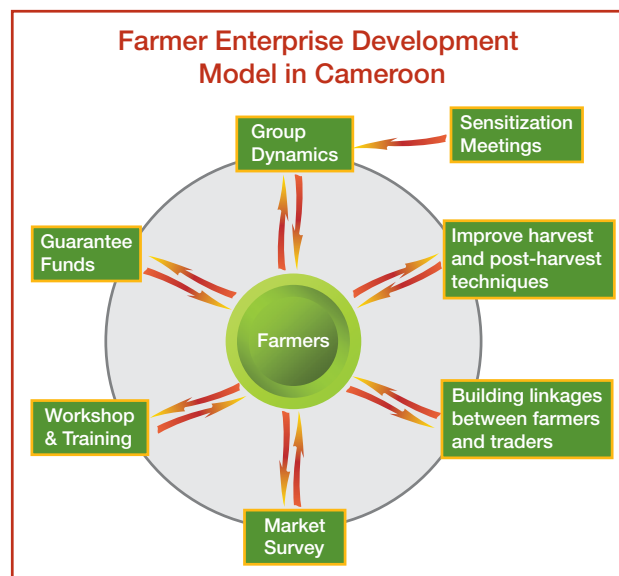


Empowering farmer households to market agroforestry tree products collectively can help individual farmers improve their incomes.

domestication techniques, basic marketing principles and development of marketing strategies.

- Building links between farmers and traders as a prerequisite for building strong business values and capacity.
- Improving harvest and post-harvest techniques: enhancing local knowledge with focused research; developing and testing appropriate technologies to improve product processing, quality, harvesting, storage and packaging.
- Guarantee funds, providing financial backup for farmers who want to delay their sales until peak-price season.

In 2006, the FED model was initially tested with two farmers' groups in Cameroon: The Mixed Farming Common Initiative Group (MIFACIG) in Belo, Northwest Province, and the 'Association de Development des Exploitants Agricoles du Centre' (ADEAC) based in Akonolinga, Central Province. Both groups have developed viable market options for kola nuts (*Cola* spp.) and 'njansang' (*Ricinodendron heudelotii*), two high value tree products common in the humid tropics of West and Central Africa. As a result, increased income from sales of the two products surpassed the 10% target set for the second year of the scheme.



For 'njansang', farmers received about USD 5,652 from the sale of 3,000 kg in 2006, up from USD 1,420 from the sale of 833 kg in 2005. Furthermore, 'njansang' farmers increased their selling price by an average of 31%, thanks to negotiation skills they acquired during their training sessions.

Group marketing has yielded other visible impacts. These include better use of available forest resources with ►

PARTICIPATORY TREE DOMESTICATION TAKES OFF IN THE HUMID TROPICS OF WEST AND CENTRAL AFRICA

Participatory Tree Domestication is the process by which wild species are brought into cultivation through the processes of selection and production on farm. Rural communities select, propagate and manage trees according to their own needs, in partnership with scientists, civic authorities and commercial companies. The new tree products are usually first oriented to local markets. The approach combines indigenous knowledge and genetic selection based on horticultural science principles and methods. Techniques in West and Central Africa include rooting of juvenile cuttings using non-mist propagators, simple grafting and air layering methods.

With these techniques, the flowering and fruiting time of selected tree species are considerably reduced (from 15 to 3 years for the kola nut — *Cola* spp. — and from 8 to 3 years for the African Plum tree — *Dacryodes edulis*). Moreover, farmers choose exactly which tree they want to reproduce, based on preferred traits such as the tree's fruit colour, size or taste, as these characteristics are genetically controlled. Pressure on the wild populations of these trees has declined as a result. Improved varietal materials are now available for fruit tree species such as *Irvingia gabonensis*, *Dacryodes edulis*, *Ricinodendron heudelotii*, *Cola* spp., *Chrysophallum albidum*, *Allanblackia* spp.; medicinal plants such as *Prunus africana*, *Pausinystalia johimbe*, *Enantia chlorantha*, *Fagara heitzii*, *Fagara macrophylla*; spice trees such as *Afrostryax lepidophyllus*, *Monodora myristica*, *Zanthoxylum macrophylla*; and vegetables like *Gnetum africanum*.

About 6000 farmers in Cameroon, Nigeria, Democratic Republic of Congo, Gabon and Equatorial Guinea have successfully taken up this low-cost technology. The Participatory Tree Domestication suite of options owes its success primarily to a scaling-up component built on multi-level partnerships and efficient targeting. Other key aspects being investigated include agroforest development, marketing and enterprise development, soil fertility management, capacity building and communications.

The adoption and adaptation of tree domestication techniques by resource-poor populations of West and Central Africa is strong evidence of the shift from a tree-harvesting culture to a tree planting culture in the region.

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Reinforcing group dynamics was one of the objectives of FED. Here, members of ADEAC are attending a testing workshop for communication tools.

the possibility of increasing managed stocks on farms through tree domestication practices, alternative sources of income, especially for women and girls, and increased capacity of producers.

World Agroforestry Centre scientists are documenting the group marketing approaches that work best, validating and then replicating them in other areas. In this regard, two new communities have been identified in the South and Central provinces of Cameroon to evaluate the approach

with two additional high value agroforestry products: *Gnetum* spp. and *Irvingia* spp.

Enhancement of tree product market chains through agroforestry research for development offers a critical pathway for achieving sustainable use of biodiversity in the humid forest margins. Recognizing this, the World Agroforestry Centre will continue targeting high value trees that create on-farm assets for smallholder farmers. Such trees could also be sources of indirect income from climate change mitigation through smallholder carbon sequestration investments; they could also foster sustainable land use to reduce forest loss in the humid tropics. ■

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A trial run of a machine that is expected to greatly improve processing of 'njansang', a high value tree product common in the humid tropics.

LANDCARE VIBRANTLY DEVELOPING IN AFRICA

Asian success prompts African nations to follow suit

Over a ten-year period, multiple levels of local and national institutions have developed and disseminated a successful integrated approach to soil conservation, known as Landcare, on thousands of Philippines upland farms. The World Agroforestry Centre played a pivotal role in providing science-based assessments and testing farmer innovations that strengthened the approach. Today Landcare groups are active in 40 municipalities across central and southern Philippines. During 2006, the Philippines National Economic Development Authority co-opted Landcare as a key component of the national land management programme, setting the stage for wider application of the approach. The lessons learned in the Philippines are now being tested and adapted in Africa.

An innovative approach to natural resources management first developed and tested in Asia is attracting the attention of African scientists and policy makers and is rapidly establishing itself in pilot communities in Eastern and Southern Africa.

Landcare is a process that evolves innovative solutions to natural resource management by linking farmers with the broader community and helping them to influence NRM policies in their locales. The essence of Landcare is that it empowers people to take collective action on local conservation issues, its proponents say.

Landcare was first established in Australia in the mid-1980s, to tackle deep-seated land degradation problems. Today, 17 countries are using the Landcare approach to reduce some of their most serious conservation problems and reverse years of misuse. In Australia alone, 4,000 communities practise Landcare.

In tropical Asia, Landcare grew out of WorldAgroforestry initiatives in the early 1990s to promote soil conservation technologies in the southern Philippines. At the time, farmers and scientists working with the Landcare concept jointly discovered that natural vegetative strips (NVS) provided an unusually effective way to control soil erosion. Natural vegetative strips are narrow strips of grass that are left unploughed along the contours of sloping farms where they serve as soil erosion buffers (see picture).

Increases in adoption

The NVS technique not only provided exceptional control of soil erosion, but also proved far less costly than the next best alternative, contour farming. Indeed, by 2003, more than 1,800 farmers — nearly a quarter of the community in the test site — had adopted combined regimens of NVS and improved agroforestry practices.

The use of natural vegetative strips as part of a Landcare approach to natural resources management led to unprecedented increases in adoption when compared with



Natural vegetative strips laid out along the contour line of a sloping farm.

official, top-down efforts to promote contour farming, says Delia Catacutan, an internationally recognized authority on Landcare.

“Landcare in this part of the Philippines succeeded because it evolved in an environment in which locally adapted technologies could emerge and because local government was supportive of closely coordinated grassroots initiatives,” she says.

Catacutan, who serves as WorldAgroforestry’s international Landcare Coordinator, notes that the Centre’s contribution to the process was to provide research support to the community and local officials.

“Naturally we wondered if the success of Landcare in the southern Philippines would transfer to other locations,” she adds. “Our hypothesis was that Landcare could be adopted elsewhere with progressively fewer requirements for technical and institutional input from an external agency, at least in theory. What was required was a study to provide hard data.”

The outcome of the research was impressive. Within five years, 15,000 farmers in distinctly different environments in the Philippines were using community Landcare strategies ►



A farmer's Landcare nursery.

on anywhere from 15% to 25% of their holdings. Moreover, by 2006, the Philippines' National Economic Development Authority, the government's highest planning body, was promoting Landcare as a strategy for upland development.

But will it work in Africa?

Landcare is attracting a lot of attention in Africa because of its success elsewhere and because it fits so well with local customs, needs and conditions, says Joseph Tanui, WorldAgroforestry's Landcare Coordinator for sub-Saharan Africa.

Tanui notes that the countries with the most active Landcare programmes are South Africa and Uganda, but there is also considerable interest in Kenya, Rwanda and Tanzania to move forward.

"We think that Landcare can help break down the barriers that have led to low adoption rates of natural resources management techniques in the past. What Landcare does is to bring farmers' traditional knowledge to the table and combine it with the best science-based approaches," says Tanui.

Eastern Africa does not yet have a Landcare programme, he adds, but already uses Landcare approaches informally and on a wide scale. We think the region is primed to take advantage of the success seen in Asia and Australia.

Catacutan seconds that sentiment, noting that past research indicates that the following preconditions will be needed for successful scaling up:

- First, Africa will need a set of widely adoptable agroforestry technologies. Fortunately, many options already exist, including a variety of science-based conservation techniques and portfolio's of improved germplasm. In those cases where science-based technologies do not already exist, she suggests using locally adapted practices as a starting point.
- Second, Landcare is more likely to succeed in areas where farmers are wholly focused on farming and

where conservation is actively promoted by local authorities. In the absence of these conditions, Landcare should be implemented to include NRM-based livelihood options and greater involvement of large holders and agribusiness.

- Third, Landcare has better prospects where local politics are stable, allowing partnerships to prosper. She notes that Africa, despite public perception in the West, is moving in that direction. However, in those cases where local government support is limited or where the political situation is less than stable, a committed and competent non-governmental agency is needed to offset the immediate need for local government support. There are many international NGOs operating in Africa and many of them are increasingly committed to using Landcare, she says.
- Fourth, a competent research presence is needed to provide technical backstopping to development agencies. With WorldAgroforestry's presence in



Men and women engaged in various Landcare activities.



Landcare promotes science-based conservation techniques.



A Landcare awareness meeting in Uganda.

the region, and with increasing investment in national research, conditions are such that Africa should be able to provide much of the research capacity needed for Landcare programmes to succeed.

- Finally, she says, effective training, communication and facilitation are essential ingredients to successful Landcare programmes. Without farmer-based extension practices, Landcare will not be feasible.

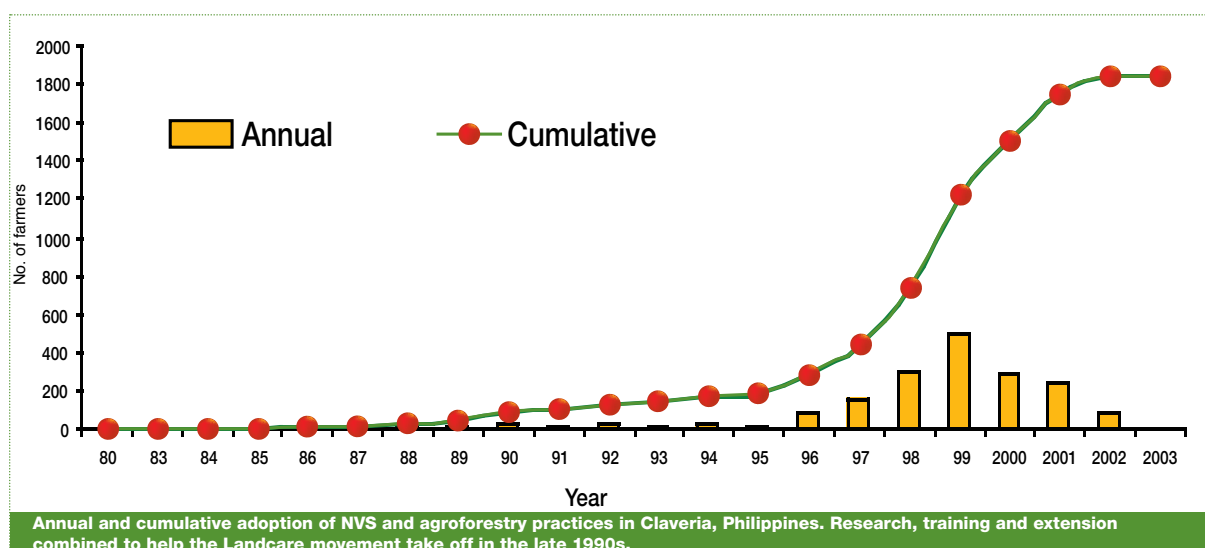
Tanui notes many of the preconditions cited by Catacutan are being to be seen in Africa and that Landcare was recently taken on by the African Grassroots Innovation for Livelihoods and the Environment (AGILE) project in Uganda working through the CGIAR's African Highlands Initiative. Efforts are also underway, he says, to test the spread of Landcare through the African Landcare Network

(ALN), an effort involving South Africa, Kenya, Tanzania, Uganda and Ethiopia.

WorldAgroforestry Director General Dennis Garrity says Australian institutions and the Australian Government through AUSAID deserve much of the credit for the success of the Landcare movement.

"AUSAID has been a consistent supporter of our efforts in Southeast Asia and is encouraging us to pursue an expanded agenda in Africa. Without their support, both intellectual and financial, establishing a Landcare programme in Africa would not have been feasible for at least several more years. I am happy to see that Landcare is now vibrantly developing in eastern and southern Africa." ■

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Helping to shape policies to save tropical forests

In the absence of visible positive impact, several donors have eliminated support for Indonesian government forestry programmes. Investors are seeking a more robust analysis of the many issues and policy changes impacting Indonesia's rich forest resource. At heart is a failure to separate or distinguish between 'forest functions' and 'contested land ownership' in the overall debate. At the forefront of this debate, the World Agroforestry Centre is providing policy analysis as well as real-time examples of rehabilitated forest landscapes where appropriate policy reforms are implemented.



Taking the message of forest conversion, climate change and agroforestry options to the field level: training course with local government officials in Gorontalo Province.

A recent World Bank forestry report provides new insights into a variety of critical issues, including the gap between Indonesia's high capacity for wood processing, its dwindling supply of timber and the gap between the decline of its forests and increases in the coverage of functional trees planted outside of forests but within the agricultural landscape.

The report, entitled 'Sustaining Economic Growth, Rural Livelihoods, and Environmental Benefits: Strategic Options for Forest Assistance in Indonesia' concludes, in part, that Indonesia needs to restructure its wood processing sector and that much of the debt it incurred in building its processing capacity will have to be written off. It also urges

a 'rethink' of the rationale used to categorize existing forest and land categories and associated policies.

The report, produced in cooperation with the World Agroforestry Centre, CIFOR and other leading research institutes, responds to a request from donor agencies for better analysis of the country's forest sector, a synthesis of key issues and the identification of entry points for productive engagement. The report highlights the importance of recognizing local property rights and technical support for rehabilitation activities. In recent years, WorldAgroforestry and its partners have engaged in extensive study and dialogue in these key areas, prompting the development of important policy reforms.

Indonesia's Ministry of Forestry, for example, recently introduced a new concept known as 'Peoples' Plantation Forests' that focuses on the rehabilitation of degraded forest lands by smallholders who are granted land leases of up to 100 years for intensive wood production. The new policy offers important potential advantages over existing large-scale plantation approaches that simply focused on the planting of monocultures. WorldAgroforestry scientists have emphasized, however, that this approach will only be successful when farmers are allowed to choose the tree species they plant, and when the policy barriers are eliminated that reduce commercial competitiveness.

Forests without trees

"Until now the inclusion of productive tree-based systems, including commodities such as 'rubber' or 'coffee' grown in forest mosaic landscapes, was simply ignored in the country's forest policy dialogue," argues WorldAgroforestry Senior Policy Analyst Chip Fay. Fay, a contributor to the report, notes that for Indonesia's farmers and agroforesters more integrated approaches are both logical and more likely to be productive. "It's a concept that is also relevant in other parts of the tropics," he says.

Fay notes with a sense of irony that Indonesia is now home to vast tracts of "forests without trees" in areas officially categorized as state forest areas. "These treeless forests," he says, often exist alongside large 'non-forest areas' that host substantial tree cover and are created and managed entirely by local communities and smallholders.

As a result of Fay's research and the work of numerous co-operators, the World Bank and other key players in the Indonesian forest sector are calling for a comprehensive review of the country's forest estate and better management of natural and planted trees in these areas. Fay notes that this effort includes an examination of both the legal and biophysical realities in Indonesia's rural landscapes and should lead to a more rational classification of those areas that require a higher degree of environmental protection. This includes both remaining natural forests and converted areas that can be rehabilitated by local communities in a deregulated setting.

Fay's colleague and co-contributor to the report, ecologist Meine van Noordwijk, adds that rapid forest conversion continues throughout the tropics and is contributing to global climate change. Indonesia, he adds, now has the dubious distinction of being the world's third largest emitter of greenhouse gasses, following the USA and China, and has the largest emissions of any country resulting from deforestation and land conversion.

"Negative news like this," van Noordwijk says, "makes headlines and leads to defensive responses and intense debates about potential solutions." He notes, however, that many so-called solutions are designed without adequate understanding of underlying problems and bear little resemblance to actual landscape realities.



Some of the 'forest lands without trees' in Indonesia look like this. New strategies must concentrate on getting incentives right for smallholders and communities to restore environmental services.

The ongoing crisis in Indonesia's forest sector, he adds, has resulted in the loss of natural biologically rich forests, transforming whole landscapes into less diverse ecosystems.

In recent years, remote-sensing analysis and field research by WorldAgroforestry scientists in Southeast Asia have challenged the view that this loss of forest is a actually a 'crisis'. "It's more like a tragedy," says van Noordwijk, "where the loss of biodiversity and other environmental values implies missed opportunities for long-term global welfare, without necessarily placing human lives at stake. It is also a tragedy in the sense that good intentions may actually stand in the way of identifying real opportunities for productive solutions because the main actors panic, as they often do in a classical drama."

Incentives for communities

As a result, the design and focus of new strategies must emphasize better performance and concentrate on getting the incentives right for smallholders and communities to restore environmental services. These strategies, he notes, will be successful only if they are based on a re-examination of existing regulatory frameworks.

Such strategies need to recognize that restricting land use options for local people in the name of the protection of environmental services that no longer exist is a prescription for failure. Such counter-productive restrictions are all too common across the world's tropical forests.

"Once land use restrictions are lifted," he says, "what often emerges as the most viable and competitive land use systems are those that combine tree-based products with food and commercial crops." ■

The report 'Influencing the Strategic options for Forest Assistance in Indonesia' is available at <http://www.worldagroforestry.org/sea/>

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FARMERS OF THE FUTURE

Schools as catalysts for agroforestry knowledge-to-action

To meet the developing world's need for skilled natural resources managers, especially in the context of the global environmental conventions (on Climate Change, Biodiversity and Desertification), a new cadre of well-trained human resources must be generated. How can schools impart to students the knowledge and skills required? For more than five years, the World Agroforestry Centre, through its Farmers of the Future programme, has been implementing a knowledge-to-action approach to address this tremendous challenge.

The future farmers, policy makers, scientists, educators and development workers are pupils and students at schools, colleges and universities.

The World Agroforestry Centre, through its Strengthening Institutions theme works with policy makers, education managers and educators to incorporate multi-disciplinary approaches to land management into curricula.

The 'Farmers of the Future' initiative integrates agroforestry and natural resources management into primary and secondary education. Putting the local context at the centre of teaching and learning improves the quality and relevance of education. Young people acquire useful

knowledge and skills related to agroforestry and natural resources management, which enables them to act as catalysts for positive action in their communities.

Launched in 2001 by the World Agroforestry Centre, the project uses an innovative approach to integrate relevant education on food security and environmental sustainability into schools and surrounding communities within the frameworks of the UN Decade of Education for Sustainable Development (2005–2014) and the FAO/UNESCO Education for Rural People flagship. Activities include development of learning resources, training and research and policy influencing, mainly in sub-Saharan Africa.



Agroforestry activities are being used as examples to make the school curriculum more relevant to local situations.



Agroforestry learning resource centres in schools allow inter-generational sharing of local and scientific knowledge.

Since natural resources management issues are nested in an interdisciplinary mix of scientific, social, economic, political and cultural aspects, project activities blend a variety of perspectives. Partners include government ministries, NGOs, primary and secondary schools, colleges, universities, research institutes, development agencies, international organizations and the private sector.

Improvement of learning resources

Schools often lack resources for teaching natural resource management. Farmers of the Future reviews existing materials, encourages the use of agroforestry and natural resources management to contextualize learning, and organizes participatory and innovative activities to develop learning materials suited to the needs of specific areas.

For example, in the Sahel, a manual on the introduction of agroforestry in schools was developed in participatory workshops with teachers and other interest groups. In Southern Africa, teaching and learning materials on farming with trees were developed in partnership with *Action*¹, a regional environmental and health magazine. In East Africa, Farmers of the Future contributed to the agroforestry and home gardening sections of a monthly education newspaper, *The Young African Express*.²

In Kenya, the project piloted an innovative new model in collaboration with ANAFE (African Network for Agriculture, Agroforestry and Natural Resources

Education). In this initiative, a team of teachers and scientists developed examples on how agroforestry can be contextualized in the teaching of mathematics. Also in Kenya, Farmers of the Future contributed to the development of Eco-Schools learning materials on agriculture and biodiversity.

The project has also worked with the Pan-African Conservation Education project to produce an educational film and accompanying teaching and learning materials for use in several countries.

Since 2006, 30 schools in Kenya and Malawi have gone a step further and established Agroforestry Learning Resource Centres. Students and visitors gather at these hubs to share knowledge and experiences through demonstration projects and information campaigns.

Learning resource centres

Schools choose the focus of their centres, establish and manage them, while the World Agroforestry Centre and partners provide technical support. Agroforestry technologies demonstrated include fodder shrubs, fruit production, processing and marketing, tree nurseries, fertilizer trees, mixed intercropping and woodlots.

Teachers interpret and deliver the curriculum, so teacher-training is a critical component of Farmers of the Future. Training workshops for primary and secondary teachers, lecturers from teacher training colleges and polytechnics, and education officials focus on educational methods, school-community links, health and nutrition, learning resource centres and field visits. ►

¹ *Action*, which is also a teacher guide, is recommended by the ministries of education in Botswana, Lesotho, Namibia, Swaziland Zambia and Zimbabwe.

² A monthly educational newspaper targeting Kenya, South Sudan, Tanzania and Uganda.

Research conducted on school-community linkages in natural resources management, the relevance of basic education, and agricultural education and training, has led to policy recommendations for governments and other stakeholders. Our research in Kenya, Mali and Zimbabwe showed that integrating agroforestry and natural resources management in school curricula strengthens links between schools and communities around them. Children practice new skills at home, convincing parents of the value of education and encouraging them to keep their children in school.

In Kenya, a recent study on the effects of Farmers of the Future on perceptions concluded that the approach led to positive attitudes towards natural resources management. It also showed that the initiative equally benefits female and male learners—as well as schools, which generate cash through the sale of agroforestry products.

In 2006 Farmers of the Future conducted research for the World Bank on the supply and demand of post-primary agricultural education and training in sub-Saharan Africa. The results were integrated into World Bank reports to be published in 2007. Policy recommendations have been made based on a continent-wide literature

Schools choose the focus of their centres, establish and manage them, while the World Agroforestry Centre and partners provide technical support.

review and country case studies in Benin, Burkina Faso, Ethiopia, Kenya, Mozambique and Rwanda.

Farmers of the Future approaches are set to be integrated into national programmes in Ethiopia, Kenya and Rwanda. In West Africa, stakeholders want activities to cover all teacher training colleges in the region. However, research is still needed on content and modes of

agricultural and environmental education and training needed. There is also a need for studies on how knowledge and skills are being taught, what is actually being learned as well as to what extent pupils and students are applying at home what they learn in school.

Farmers of the Future has been supported by various investors, including Flemish Association for Development Cooperation and Technical Assistance (VVOB), UK Department for International Development (DFID), the European Commission's Poverty Reduction Effectiveness Programme (EC-PREP), the World Bank, Action for Nature, Earthwatch Institute and Volvo Adventure. ■

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NEW COURSE INDUCTS POSTGRADUATE STUDENTS INTO PRACTICAL RESEARCH

In training tomorrow's researchers, universities take on the intricate task of providing disciplinary knowledge plus a conceptual understanding of research approaches and methods. Host CGIAR centres offer practical experience and the coaching and mentoring needed to tie it all together. However, students are often lacking required skills in research approaches and methodologies. For many graduate students, a major hurdle in successful completion of their degree is the often constricted view of how true research is carried out in practice.

In 2006, the World Agroforestry Centre and the International Livestock Research Institute (ILRI) introduced an induction course for postgraduate students. The course is designed to address gaps in university training by equipping students with improved knowledge, attitudes and skills in scientific methods, including research design. The course addresses such areas as problem solving, field and laboratory techniques, data handling and scientific writing besides building the students' confidence.

Organized by the ILRI-World Agroforestry Research Methods Group in collaboration with World Agroforestry's Training Unit, the course was sponsored through the SII/ICRAF training project on Strengthening Agroforestry Research and Development through Training and Education. It brought together 37 Masters and PhD degree students, mostly from Africa, collaborating with CGIAR scientists on an agricultural or natural resources management research projects. Resource persons were experienced CGIAR scientists and development specialists who routinely supervise and mentor degree students.

Evaluations conducted during and at the end of the event showed that participants appreciated the training and even felt that their university supervisors can also benefit from such training sessions. Students took their current understanding of research methods and statistics, refined it, and placed it into a context, thus making the connection between current knowledge and how this knowledge can be used in true research.

Based on the evaluation of this inaugural course, a subsequent one, to be held in 2007, will blend online training with face-to-face sessions where students can interact with their colleagues and trainers. The course covers such areas as problem solving, connections between research and development, scientific thinking as well as skills in study design and data handling and analysis.

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THE RIGHT TREE FOR THE RIGHT PLACE

Agroforestry science provides tools to address water scarcity

Intense competition for scarce water resources in many parts of the tropics has overstretched available supplies. Food production for millions of people is constrained by water shortages. However, research by the World Agroforestry Centre has shown that more efficient use of water for agriculture — which takes 70% of the freshwater withdrawals from rivers and groundwater — in mixed farming systems can boost yields and reduce poverty while benefiting the environment.

Is there enough land, water and human capacity to produce food for a growing population over the next 50 years — or will we “run out” of water? This is the question that the Comprehensive Global Water Assessment for Agriculture, released in 2006, sought to answer. More than 700 experts worked on the landmark report. They agreed that water scarcity was one of the world’s biggest challenges. But they also concurred that it is possible to produce the required future volume of food only if we act to improve water use in agriculture.

The report, released at the 2006 World Water Week in Stockholm, Sweden, coincided with the presentation at the same forum of a series of four syntheses of the World Agroforestry Centre’s research on water use efficiency in agricultural landscapes across the tropics.

The four syntheses, presented at a side event during the global forum, brought together findings from two decades of research, pointing out major implications for policy and water management practices. The research reinforced the findings of the global assessment that “increasing water’s productivity — gaining more yield and value from water — is an effective means of intensifying agricultural production and reducing environmental degradation.”

The syntheses present scientific evidence from extensive research from East Africa and Southeast



Winning poster

For the fourth year running, the World Agroforestry Centre in 2006 won a top award at the annual World Water Week in Stockholm, Sweden. Above is the poster that won first prize last year. It featured the Centre’s work to assess the adoption of rainwater harvesting to mitigate the impact of land use change in the Great Rift Valley, Kenya.

Asia. They show that mixed farming systems that optimize water use boost land productivity, raising prospects for securing the livelihoods of millions of farmers in areas facing water scarcity.

The studies demonstrated that certain trees integrated into farmlands can increase the efficiency of water use, while plantations of some fast-growing species can exacerbate water shortages.

Research done in Kenya found that deciduous trees that shed their leaves during the long dry seasons — which sometimes last up to six months — are best suited for semi-arid and arid dry areas. They regulate their water needs with the seasons. Most of these trees are indigenous species that have been neglected by agricultural research and extension systems, in favour of heavily promoted faster-growing exotic trees.

These findings have far-reaching implications for water management, forestry and agroforestry in the dryland tropics, where vast areas are predicted to receive less rain in the future due to the effects of climate change. All over Africa, such areas are being converted to farmlands as population pressure drives people from more productive highlands.

Often, the migrant farmers, who lack knowledge of dryland agroforestry practices and water conservation techniques, introduce water-hungry species such as *Grevillea robusta* and *Eucalyptus*, thus straining the locally meagre ground water resources. ►



Researchers take measurements at a landslide site. Studies have shown that strategic use of trees can stabilize degraded land.

The cultivation of less thirsty deciduous trees, instead of evergreen species, can have immense benefits for farmers. Over the years, WorldAgroforestry scientists identified many such species that compete less with crops during the short growing seasons. In addition, many of these species — including *Paulownia fortunei*, *Melia volkensii*, *Croton macrostachys* and *Cordia africana* — have multiple uses. They produce good timber, fruits, as well as flowers that attract bees for honey production on the farms.

The research has also shown that although trees

compete with crops for water to some extent, they are able to improve the overall productivity of the farm system. Crops use a low proportion of available water within their limited growing seasons. In India, for instance, sorghum transpiration accounts for 41% of rainfall, while in Niger millet accounts for 6–16% of annual rainfall, with the remainder going to evaporation.

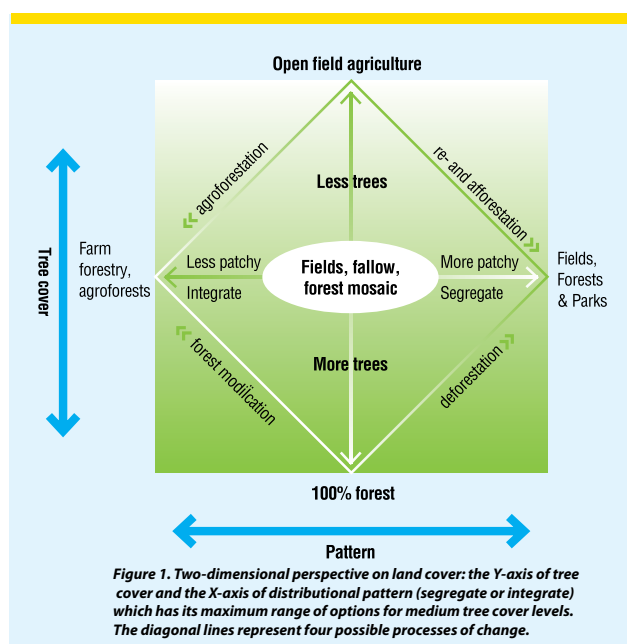
The trials have confirmed that tree intercropping systems result in a much higher overall utilization of rainfall. For example, in agroforestry systems combining *Grevillea* with maize, transpiration accounted for 75% of annual rainfall, with only 25% being lost to evaporation.

Besides preferential intercropping of water-thrifty multipurpose trees with crops, scientists recommend root and shoot pruning to help farmers get increased overall benefits from their agricultural systems.

Muddy rivers — due to lack of trees?

Forest conversion often leads to erosion and muddy rivers, but only because the resulting land use is not protecting the soil. There are many ways to protect soils without the presence of forest, once the key processes involved are clarified. Research results from a major watershed study by WorldAgroforestry in Indonesia have clarified the potential role of trees in the landscape, outside of forests.

Rapid deforestation and conversion to smallholder agriculture has exposed important watersheds across the humid tropics. However, attempts to restore forest cover have had a low success rate, despite considerable public expenditure.



In most current public debate on watershed functioning in the tropics, it is assumed that the problems are due to deforestation, and that reforestation is the answer. While the dichotomy can be valid in regions where land uses are dominated by segregation (Figure 1: right end of x-axis), it is not the case in much of the tropics where integrated land uses are more pronounced.

If one wants to understand the cause of ‘muddy rivers’, a focus on the pathways of water flow and on the river bed is likely to provide direct evidence.

The total sediment transport from an area is based on multiple sources and complex interactions. A ‘sediment budget’ provides a check on whether or not inflows and filter effects have been accounted for.

During the last two decades, the World Agroforestry Centre has also accumulated a rich knowledge on how agroforestry systems, creating a mosaic of land uses in a watershed, with abundant filtering options including buffer strips of grasses and/or trees, are highly effective in controlling soil erosion on sloping lands in the absence of forest vegetation.

This points to better strategic use of trees and grasses in converted lands to check sediment flow into rivers, and

to stabilize degraded land, short of complete restoration of forests. Such solutions also improve the livelihoods of smallholder farmers in hilly areas, unlike many other interventions that seek to fully reforest degraded areas.

For example, the research found that a combination of trees and grasses can serve as anchors and bind soils on riverbanks and slopes more effectively, considerably reducing sediment flow into rivers.

These and other findings presented at the World Water Week demonstrated that watershed policies that balance human and environmental interests can be developed and implemented on the basis of sound scientific evidence relevant to local contexts. Scientists at the World Agroforestry Centre have developed several tools (see box) that shift watershed science to generate data that helps policy makers and other stakeholders to support varied interventions to address the complex challenges of managing watersheds across the developing world. ■

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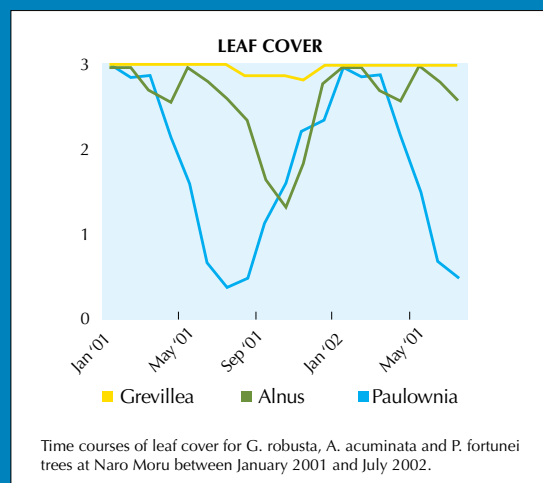
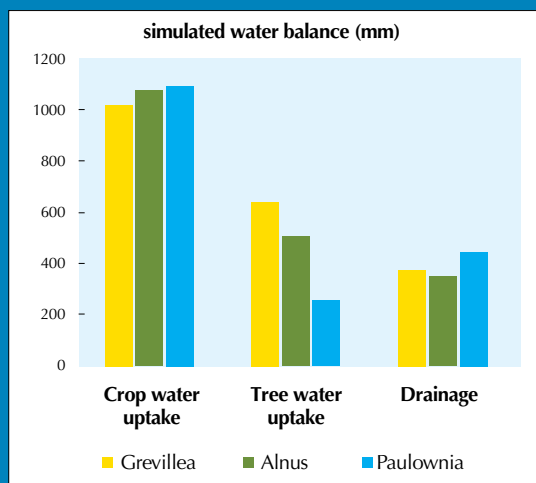
MEASURING TREE WATER USE IN NARO MORU, KENYA

The Water, Nutrient and Light Capture in Agroforestry Systems model is a cost-effective way to assess competing demands for water and nutrients on farms. It has two parts. One is used to capture data on climate and soils as well as crop and tree parameters. The second is a modeling tool where stimulations are made with the data, including tree and crop growth, water use and other aspects of the system.

A key study using this model evaluated the impact of tree leafing behaviour on crop performance and soil water balance in Naro Moru, Kenya. This is an area where shortages of arable land, triggered by population growth, have pushed farmers from high rainfall areas to arid and semi-arid lowlands.

Scientists from the World Agroforestry Centre and the Jomo Kenyatta University of Agriculture and Technology tested the simple hypothesis that deciduous trees could help farmers reduce water requirements, using three species: *Grevillea robusta* (evergreen), *Alnus acuminata* (semi-deciduous) and *Paulownia fortunei* (deciduous).

The study concluded that lower water use by deciduous trees should increase stream flow compared to evergreens. It concluded that such trees are suitable for dry areas and provide viable alternatives to non-deciduous species.



List of projects for 2006

THEME: TREES AND MARKETS

WorldAgroforestry Project TM.1:

Market analysis and support to tree product enterprises

Project Goal: To improve the marketing of and demand for agroforestry tree products (AFTPs).

WorldAgroforestry Project TM.2:

Sustainable seed and seedling systems for sound conservation and use of genetic resources of agroforestry trees

Project Goal: To determine and encourage sustainable tree seed and seedling systems and wise management of agroforestry tree genetic resources.

WorldAgroforestry Project TM.3:

Tree domestication with intensification and diversification of tree cultivation systems

Project Goal: To encourage farmers to cultivate superior trees to improve the productivity, profitability and diversity of individual agroforestry tree species and tree cultivation systems including peri-urban systems.

WorldAgroforestry Project TM.4:

Farmer-led development and scaling up of tree-based options

Project Goal: To develop agroforestry practices and facilitate their wide-scale adoption for improving rural livelihoods.

WorldAgroforestry Project TM.5:

Enhanced utilization of tree diversity at the landscape level

Project Goal: To improve farmers' livelihoods by promoting the better utilization of tree diversity at landscape levels within agricultural systems.

THEME: LAND AND PEOPLE

WorldAgroforestry Project LP.1:

Improving Rural Livelihoods through Integrated Soil Fertility Management

Project Goal: To identify the principles for using agroforestry systems in integrated soil fertility management strategies of smallholder farming systems.

WorldAgroforestry Project LP.2:

Conserving soil and water for productive agricultural landscapes

Project Goal: To identify the principles for integrating agroforestry into soil and water conservation strategies.

WorldAgroforestry Project LP.3:

Sustaining productive farming systems through improved agroforestry management

Project Goal: To identify the principles for managing agroforestry systems in order to enhance crop and livestock productivity and resilience.

WorldAgroforestry Project LP.4:

Reaching the poorest land users with land management interventions

Project Goal: To mainstream a pro-poor research and development agenda into agroforestry innovations for improved land management.

THEME: ENVIRONMENTAL SERVICES

WorldAgroforestry Project ES.1:

Watershed management: Pro-poor strategies to enhance the positive contributions of agroforestry to watershed functions

Project Goal: Pro-poor watershed management programmes enhance the positive contributions of smallholder agroforestry systems to valuable watershed functions.

WorldAgroforestry Project ES.2:

Use and conservation of biological diversity in multi-functional landscapes

Project Goal: Agroforestry systems contribute to the conservation and enrichment of biodiversity in landscape mosaics that integrate protected areas with agriculture and other resource uses.

WorldAgroforestry Project ES.3:

Climate change mitigation and adaptation for rural development

Project Goal: Agroforestry systems contribute simultaneously to buffering farmers against climate variability and changing climates and to reducing atmospheric loads of greenhouse gases.

WorldAgroforestry Project ES.4:

Environmental policy: Harmonizing policy for environmental stewardship and rural development

Project Goal: Multi-lateral, national and local policies and programmes are designed to better harmonize goals related to environmental stewardship and sustained and equitable rural development.

THEME: STRENGTHENING INSTITUTIONS**WorldAgroforestry Project SI.1:****Strengthening agricultural research institutions and systems**

Project Goal: Research partners in developing countries have the capacity to carry out agroforestry research and to share results with among others, educational and development institutions.

WorldAgroforestry Project SI.2:**Strengthening the agroforestry capacity of development institutions and systems**

Project Goal: Improved adoption of agroforestry innovations by farmers.

WorldAgroforestry Project SI.3:**Strengthening educational institutions and systems**

Project Goal: To improve opportunities for future generations to derive quality livelihood from agriculture — Well prepared policy makers, scientists, educators development workers and future farmers.

WorldAgroforestry Project SI.4:**Fostering inter-institutional collaboration and knowledge management**

Project Goal: To develop mechanisms and tools that foster better sharing of agroforestry knowledge systems and innovations.

System-wide programmes coordinated by WorldAgroforestry**Alternatives to Slash and Burn (ASB) Outputs — Partnership for the Tropical Forest Margins****ASB Output 1: Knowledge on development-conservation trade-offs in the tropical forest margins**

Knowledge generation and communication to influence science, policy, private sector, and public awareness of development-conservation trade-offs and thereby raise the level of awareness of real challenges, public debate about alternatives, and support for appropriate policy reform and research, development and education investments.

ASB Output 2: Global network for the tropical forest margins

Sustaining and developing the only global network devoted to work on the tropical forest margins. Development and diffusion of new organizational learning and change processes that link integrative science with policy and practice in the search for better approaches to poverty reduction, natural resource management and rainforest conservation.

ASB Output 3: Enhanced capacity of partners to generate knowledge and develop workable interventions

Training and other investments to strengthen capacity of ASB partners to lead and sustain their own programmes of integrated assessment, research, development, communication, education and action for poverty reduction, natural resource management and rainforest conservation.

ASB Output 4: Improved NRM practices and governance

Participatory development, diffusion and broad adoption of new natural resource management practices, including improved germplasm, technological innovations, and institutional initiatives that improve rural livelihoods while conserving biodiversity and essential environmental services.

ASB Output 5: Improved natural resource management incentives

Create appropriate incentives and correct market failures so that rural people are rewarded for nurturing their land and forests.

African Highlands Initiative (AHI) Projects

Project 1: Support is provided by AHI partners to local policy makers and development stakeholder groups/ organizations to improve their analysis, formulation and implementation of improved institutional arrangements and policies that reverse land and biodiversity degradation and improve livelihoods.

Project 2: AHI partners develop and use an integrated, participatory INRM approach and associated methods to develop and adapt practical technologies and practices that improve land use, increase returns to land and labour, arrest land and biodiversity degradation in highland watersheds and empower/build capacity of local communities to sustain these efforts.

Project 3: Strengthen the capacity of NARS, and other service provider institutions to use integrated, participatory NRM approach across the densely populated ecoregion ensuring that efforts to improve livelihoods and land management are sustainable by improving AHI knowledge management, coordination and information sharing mechanisms including incorporation of local knowledge.

Selected Publications for 2006



Journal Articles

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Board Statement on Risk Management

The Board of Trustees and Management of the World Agroforestry Centre have reviewed the implementation of the risk management framework during 2006 and the Board is satisfied with the progress made.

The Board of Trustees has responsibility for ensuring that an appropriate risk management process is in place to identify and manage current and emerging significant risks to the achievement of the Centre's business objectives, and to ensure alignment with CGIAR principles and guidelines as adopted by all CGIAR centres. These risks include operational, financial and reputation risks that are inherent in the nature, *modus operandi* and locations of the Centre's activities. They are dynamic owing to the environment in which the Centre operates. There is potential for loss resulting from inadequate or failed internal processes or systems, human factors or external events. Risks include:

- low impact science (and therefore irrelevance);
- misallocation of scientific efforts away from agreed priorities;
- loss of reputation for scientific excellence and integrity;
- business disruption and information system failure;
- liquidity problems;
- transaction processing failures;
- loss of assets, including information assets;
- failures to recruit, retain and effectively utilize qualified and experienced staff;
- failures in staff health and safety systems;
- failures in the execution of legal, fiduciary and Centre responsibilities; and
- subsidisation of the cost of projects funded from restricted grants and/or partial non-delivery of promised outputs, due to inadequate costing of restricted projects.

The Board has adopted a risk management policy — communicated to all staff — that includes a framework by which the Centre's management identifies, evaluates and prioritises risks and opportunities across the organization; develops risk mitigation strategies, which balance benefits with costs; monitors the implementation of these strategies; and periodically reports to the Board on results. This process draws upon risk assessments and analysis prepared by staff of the Centre's business unit, internal auditors, Centre-commissioned external reviewers and the external

auditors. The risk assessments also incorporate the results of collaborative risk assessments with other CGIAR centres, System Office components, and other entities in relation to shared risks arising from jointly managed activities.

The risk management framework seeks to draw upon best practices, as promoted in codes and standards promulgated in a number of CGIAR member countries. It is subject to ongoing review as part of the Centre's continuous improvement efforts.

Risk mitigation strategies include the implementation of systems of internal controls, which, by their nature, are designed to manage rather than eliminate risk. The Centre endeavours to manage risk by ensuring that the appropriate infrastructure, controls, systems and people are in place throughout the organization. Key practices employed in managing risks and opportunities include business environmental scans, clear policies and accountabilities, transaction approval frameworks, financial and management reporting, and the monitoring of metrics designed to highlight positive or negative performance of individuals and business processes across a broad range of key performance areas. The design and effectiveness of the risk management system and internal controls is subject to ongoing review by the Centre's internal audit service, which is independent of the business units, and which reports on the results of its audits directly to the Director General and to the Board through its Audit Committee.

The Board also remains very alive to the impact of external events over which the Centre has no control other than to monitor and, as the occasion arises, to provide mitigation.



Eugene Terry
Chair, Board of Trustees
World Agroforestry Centre

Investor support in 2006

Donor Name	Unrestricted US\$ '000	Restricted US\$ '000	Total US\$ '000
Sweden (SIDA)	440	3,217	3,657
United States of America (USAID)	644	2,985	3,629
World Bank	2,139	578	2,717
Canada (CIDA)	728	1,570	2,298
The Netherlands	381	1,524	1,905
United Kingdom (DFID)	1,138	410	1,548
Cooperation of Common Fund for Commodities		1,290	1,290
Ireland	1,138	-	1,138
Association for Strengthening Agricultural Research in Eastern and Central Africa		1,066	1,066
International Fund for Agricultural Development		970	970
Norway	558	122	680
Denmark	481	193	674
International Development Research Centre		671	671
Multidonor — Gender & Diversity		636	636
Australia	189	327	516
United Nations Environmental Programme		496	496
Global Environment Facility		472	472
Finland	443	27	470
The Rockefeller Foundation		410	410
Switzerland	407	-	407
The Ford Foundation		376	376
Germany	304	-	304
Belgium		303	303
European Union		294	294
Royal Swedish Academy of Agriculture and Forestry — KSLA		277	277
Spain		241	241
World Conservation Union		215	215
Katholic University		187	187
International Food Policy Research Institute		172	172
Earth Institute — Columbia University		168	168
Conservation International Foundation		168	168
Austria		122	122
Italy		110	110
Japan	20	90	110
Consultative Group on International Agricultural Research		105	105
United States Department of Agriculture		100	100

Donor Name	Unrestricted US\$ '000	Restricted US\$ '000	Total US\$ '000
RSSP		100	100
Swiss Development Corporation		99	99
Peru		89	89
Unilever		84	84
Upland Development Programme in Southern Mindanao		69	69
Global Mountain Programme		57	57
Centro Internacional de Agricultura Tropical, Colombia		55	55
Oregon State University		54	54
INIA-Spain		46	46
Centre for Cultural and Technical interchange between East and West, Inc		40	40
North Carolina State University		38	38
Plan International		37	37
International Rice Research Institute		34	34
Centre for the Development of Enterprise (CDE)		33	33
Millennium Development Goals		31	31
Brazil		27	27
Kenya		26	26
Mars Inc		26	26
Cornell University		25	25
Centro Internacional de la Papa, Peru		25	25
International Institute of Environment and Development		22	22
ACDI/VOCA Rwanda		22	22
Academy for Educational Development		21	21
International Livestock Research Institute		21	21
South Africa	20	-	20
China	20	-	20
Others (Less than 20,000 each)	15	248	263
Total	9,065	21,219	30,284

Financial Summary for 2006

WORLD AGROFORESTRY CENTRE

STATEMENT OF FINANCIAL POSITION AS AT 31 DECEMBER 2006 and 2005 (In US Dollar '000)

	2006	2005
ASSETS		
Current Assets		
Cash and cash equivalent	13,268	12,063
Accounts receivables		
Donor	7,038	7,423
Employees	94	108
Other CGIAR centres	874	1,422
Other	2,313	3,805
Inventories - net	88	87
Prepaid expenses	33	99
Total current assets	23,708	25,007
Non-Current Assets		
Property, Plant and Equipment - net	5,993	6,317
Total Non-current assets	5,993	6,317
TOTAL ASSETS	29,701	31,324
LIABILITIES AND NET ASSETS		
Current Liabilities		
Accounts payable		
Donor	6,588	7,578
Employees	524	277
Other CGIAR centres	140	323
Other	1,795	2,245
Accruals	2,663	1,795
Total current liabilities	11,710	12,218
Non-Current Liabilities		
Accounts payable		
Employees	4,988	5,250
Total Non-current liabilities	4,988	5,250
TOTAL LIABILITIES	16,698	17,468
NET ASSETS		
Unrestricted		
Designated	9,168	9,168
Undesignated	3,835	4,688
	13,003	13,856
TOTAL LIABILITIES AND NET ASSETS	29,701	31,324

STATEMENT OF ACTIVITIES For the Years Ended 31 December 2006 and 2005 (In US Dollar '000)

	2006				2005
	Unrestricted	Temporarily Restricted	Challenge Programs	Total	Total
Revenue, Gains and other Support					
Grant Revenue	9,065	21,178	41	30,284	30,554
Other revenue and gains	1,190	-	-	1,190	457
Total Revenue and gains	10,255	21,178	41	31,474	31,011
Expenses and Losses					
Programme related expenses	8,771	20,041	41	28,853	27,586
Management and general expenses	4,650	66	-	4,716	4,260
CGIAR Gender and diversity programme	-	1,071	-	1,071	954
Sub Total expenses and losses	13,421	21,178	41	34,640	32,800
Overhead cost recovery	(2,313)	-	-	(2,313)	(2,310)
Total expenses and losses	11,108	21,178	41	32,327	30,490
Net Surplus / (Deficit)	(853)	-	-	(853)	521

Board of Trustees as of 31 December 2006

EUGENE TERRY	Chair; Implementing Director, African Agricultural Technology Foundation (AATF), Nairobi, Kenya
DENNIS GARRITY	Director General, World Agroforestry Centre, Nairobi, Kenya
LYNN HAIGHT	Chief Financial Officer, Foresters, Toronto, Canada
SEYFU KETEMA	Executive Director, Association for Strengthening Agricultural Research in East and Central Africa (ASARECA), Entebbe, Uganda
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RAGNHILD LUND	Professor of Geography, Department of Geography, Norwegian University of Science and Technology (NTNU) Dragvoll, Norway
SARA J. SCHERR	Director, Ecosystem Services, Forest Trends, Washington DC, USA
KIYOSHI TANAKA	President, Forestry and Forest Products Research Institute (FFPRI), Ibaraki, Japan
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BARBARA WELLS	President and CEO, ArborGen LLC, USA
JUAN MAYR	Former Minister, Colombia
ERIC TOLLENS	Professor, Department of Agricultural & Environmental Economics, Catholic University, Leuven

Staff List as of 31 December 2006

PROFESSIONAL STAFF

OFFICE OF DIRECTOR GENERAL

GARRITY DENNIS	Director General	Nairobi, Kenya, HQ
DISII CLAUDETTE	Snr Administrative Assistant	Nairobi, Kenya, HQ
KEINO SHEILA	Executive Assistant — DG&DSI	Nairobi, Kenya, HQ

AUDIT UNIT

NG'ENY ALISON	Internal Auditor	Nairobi, Kenya, HQ
KIUNGA SAMUEL	Assistant Internal Auditor	Nairobi, Kenya, HQ

OFFICE OF DEPUTY DIRECTOR GENERAL — PROGRAMMES

LAARMAN JAN	Deputy Director General Programmes	Nairobi, Kenya, HQ
OBERG ANNE-LIE	Manager, Programme Planning & Resources	Nairobi, Kenya, HQ
KARIUKI ELIZABETH	Programme Administrative Officer	Nairobi, Kenya, HQ

OFFICE OF DIRECTOR STRATEGIC INITIATIVES

BAKARR MOHAMED	Director Strategic Initiatives	Nairobi, Kenya, HQ
MBUGUA LUCY	Project Development officer	Nairobi, Kenya, HQ
SHAH WAHIDA PATWA	Research Assistant	Nairobi, Kenya, HQ

OFFICE OF DIRECTOR CORPORATE SERVICES

NWANKWO EMILY	Director, Corporate Services	Nairobi, Kenya, HQ
KIHORI MARION WAMBAIRE	Personal Assistant	Nairobi, Kenya, HQ

COMMUNICATIONS UNIT/LIBRARY

KEAH HUMPHREY	Information Specialist	Nairobi, Kenya, HQ
KIMWAKI JACINTA	Head Librarian	Nairobi, Kenya, HQ
NJUGUNA PATRICK	Web Coordinator	Nairobi, Kenya, HQ
OBANYI GEORGE	Publications Officer	Nairobi, Kenya, HQ
SELVARAJAH-JAFFERY REBECCA	Information Officer	Nairobi, Kenya, HQ

RESEARCH SUPPORT UNIT/GIS UNIT

COE RICHARD	Head, WorldAgroforestry-ILRI Research Methods Group	Nairobi, Kenya, HQ
MURAYA PETER	Data Management Specialist	Nairobi, Kenya, HQ
BUYSSE WIM	VVOB Training Associate	Nairobi, Kenya, HQ
NYABENGE MESHACK	GIS Unit Manager	Nairobi, Kenya, HQ

FINANCIAL SERVICES UNIT

ABEYSEKERA LAKSIRI	Chief Financial Officer	Nairobi, Kenya, HQ
GATORU ERNEST	Manager — Budget and Corporate Finance	Nairobi, Kenya, HQ
MUOKI NZIOKA	Manager — Corporate Accounting	Nairobi, Kenya, HQ
KABUTHA LINUS	Manager — Financial Information Systems	Nairobi, Kenya, HQ
WAMBUGU JANE	ECA Regional Finance Officer	Nairobi, Kenya, ECA
MATHENGE ANTHONY	Senior Assistant Accountant	Nairobi, Kenya, HQ

HUMAN RESOURCE UNIT

OGOSO IDAH	Acting Human Resource Manager	Nairobi, Kenya, HQ
DE SOUZA MARGARET	Human Resources Officer	Nairobi, Kenya, HQ

INFORMATION TECHNOLOGY UNIT

IAN MOORE	IT Manager	Nairobi, Kenya, HQ
LUMUMBA JUMA	Network Administrator	Nairobi, Kenya, HQ
NGURI LAWRENCE	IT Site Manager	Nairobi, Kenya, HQ

PROCUREMENT OFFICE

MATEE FAITH	Procurement Supervisor	Nairobi, Kenya, HQ
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SECURITY OFFICE

OKUMU JOANES	Security Officer	Nairobi, Kenya, HQ
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VISITORS AND CONFERENCE OFFICE

KIIO JIMMY	Visitors/Conferences Services Officer, Acting Operations Officer	Nairobi, Kenya, HQ
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PROTOCOL OFFICE

MBIRIRI GEORGE	Protocol Officer	Nairobi, Kenya, HQ
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TRAVEL OFFICE

HAMOUD MAHMOUDA	Travel Manager	Nairobi, Kenya, HQ
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THEME OFFICES

TREES AND MARKETS

SIMONS ANTHONY	Theme Leader, Trees and Markets	Nairobi, Kenya, HQ
----------------	---------------------------------	--------------------

MUASYA STELLA	Projects Officer	Nairobi, Kenya, HQ
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ONG CHIN	Principal Scientist	Nairobi, Kenya, EA
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SHEPHERD KEITH	Principal Soil Scientist	Nairobi, Kenya, EA
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SOUTHERN AFRICA		
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GONDWE FANNIE	Finance and Admin Officer	Chitedze, Malawi, SA
GONDWE FRANCE	Scaling-up Officer	Chitedze, Malawi, SA
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KADZERE IRENE	Horticulturalist & Country Representative	Harare, Zimbabwe, SA
KATANGA ROZA	Dissemination Specialist	Chipata, Zambia, SA
KITALYI AICHI	Country Representative	Arusha, Tanzania, EA
LINYUNGA KENNETH	Onfarm Research Specialist	Tete, Mozambique, SA
MABIKA-SHETA JULIET	GIS Officer	Harare, Zimbabwe, SA
MASAKA CATHERINE	Regional Administrative and Operations Officer	Maputo, Mozambique, SA

MATARIRANO LIVAI MAUSSE ARNELA DA CELMA MKONDA ALFRED ODUOL PETER ALAN SAMBANE EVELINA WELDESAMAYAT SILESHI ZINAKA CLEVER	Dissemination Specialist Research Assistant Horticulturist M&E Officer Horticulturist Agroforestry Pest Management Scientist Finance and Administrative Officer	Harare, Zimbabwe, SA Maputo, Mozambique, SA Chipata, Zambia, SA Maputo, Mozambique, SA Maputo, Mozambique, SA Chitedze, Malawi, SA Harare, Zimbabwe, SA
SOUTH ASIA NOOR JAMAL PERVEZ SINGH VIRENDRA PAL	Regional Finance & Administrative Officer Regional Representative for South Asia	New Delhi, India, S-ASIA New Delhi, India, S-ASIA
SOUTH EAST ASIA VAN NOORDWIJK MEINE WEYERHAEUSER HORST ACAYLAR GLORILYN ADI DUDY NUGROHO AKIEFNAWATI RATNA	Regional Coordinator South East Asia Senior Natural Resource Management Researcher Country Administrative Officer GIS Assistant Field Manager & Associate Research Officer	Bogor, Indonesia, SEA Beijing, China, SEA Los Banos, Philippines, SEA Bogor, Indonesia, SEA Muara Bungo (JAMBI) Indonesia, SEA Bogor, Indonesia, SEA Visayas, Philippines, SEA Bogor, Indonesia, SEA Visayas, Philippines, SEA Bogor, Indonesia, SEA Claveria, Philippines, SEA Sanggau (West Kalimantan), Indonesia, SEA Bogor, Indonesia, SEA Lampung Sumberjaya, Indonesia, SEA
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BUDIDARSONO SUSENO CAHYANINGSIH NURKA	Agricultural Economics West Lampung NSS Coordinator	
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HE JUN HOANG FAGERSTROM MINH HA ILAHANG ILAHANG	Program Manager Coordinator Field Manager, Agroforester	Bogor, Indonesia, SEA Bogor, Indonesia, SEA Chiang Mai, Thailand, SEA Bogor, Indonesia, SEA Los Banos, Philippines, SEA Lantapan, Philippines, SEA Halimun, Indonesia, SEA Lantapan, Philippines, SEA Muara Bungo (JAMBI), Indonesia, SEA
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MARTOPRANOTO JATI SAGITA JOSHI LAXMAN KANTHATHAM PRAMUALPIS KHASANA N' MATUL LASCO RODEL DIAZ LYNDON ARBES MANURUNG GERHARD MARGATE RAUL MARTINI ENDRI	Budget Officer Ethno-Ecologist Country Administrative Officer Research Assistant — Agroforestry Modelling Philippine Programme Coordinator Landcare Coordinator, (Bukidnon) Phil-Australia Landcare Project Agroforestry Tree Specialist Researcher Biodiversity Researcher	
MERCADO, JR. AGUSTIN MUCHLISH USMAN MULYOUTAMI ELOK PONCO KHUSUSIYAH NOVIANA NUGRAHA ERY NYBERG YLVA PANJIWIBOWO CHANDRA PANTOUW RETNO UTAIRA PASHA RACHMAN PASYA GAMAL PRASETYO JOSEPHINE MARIA PRATIKNYO PURNOMO SIDHI PUTRA ANDREE EKADINATA RAHAYU SUBEKTI ROSHETKO JAMES SABEJON FLORANTE SAIPOTHONG PORNWILAI	Associate Research Officer & Claveria Site Coordinator IT Officer Local Knowledge and Social Science Assistant Research Assistant Agroforestry Coordination Officer (Muellaboh) Research Assistant Researcher for RUPES Officer Management Services Leader, Southeast Asia RUPES Community Facilitator NSS Fellow Regional Administrative Officer Site Manager Remote Sensing Specialist Database Manager/Secretary Tree and Market Specialist Research Assistant, ICRAF-AECI Project Associate Research Officer	

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SANTOSO SONYA DEWI
SIRAIT MARTUA
SUPRIANA BETHA LUSIANA
SUSANTO SUSANTO

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Spatial Analyst
Environment Policy Researcher
Research Officer-Ecological Modelling
Hydrologist

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Landscape Modeller/Associate Research Officer
Environmental Economist
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TABBADA ALEXANDRA
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Agroforestry Livelihood Specialist
Montane Mainland SEA Coordinator
Office Manager/Technical assistant
Desktop Publisher
Social Forestry Specialist
Multimedia Specialist
Researcher, ICRAF-RUPES Project
Spatial Analyst

WEST AND CENTRAL AFRICA

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BAH ALPHA OUMAR
BALDE ELHADJ GARANKÉ
DIALLO ABDOURAHMANE DALY
ADANDEDJAN CLAUDE
ANEGBEH PAUL
ASAAB EBENEZAR
BAH LAMOU
BARRY BOUBACAR
BEERNAERT FRANK
COUMBASSA MAMADOU
DAMBA MORLAYE
DEMERS NICOLE
DIALLO ALASSANE AMADOU
DIALLO MAMADOU SALIOU
DIALLO ALPHA ALIMOU
DIALLO MOHAMADOU
DIALLO ROKIATOU
FACHEUX CHARLY
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KAYA BOCARY
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KEITA SOULEYMANE
KONE BREHIMA
MARANZ STEVEN
MASTERS ELIOT
MBILE PETER
SERIGNE TACKO
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TCHOUNDJEU ZACHARY
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TRAORE CHEICK

Regional Coordinator
Adm & Financial Officer
Agronomist
Forestry
Senior Education Fellow
Tree Domestication Researcher
Vegetative Propagation Assistant Researcher
Accountant
Management
Chief of Party, Guinea
Forestry
Metal Construction
Researcher
Forestry
Community Development
Planning
Management
Finance and Admin Officer
Marketing Specialist
Biotechnologist
HR Administrator
Marketing Specialist
Ecologist
Regional Administrator
Soil Scientist and National IER/WorldAgroforestry Coordinator
Agronomist
Scientific Officer
Scientific Officer
Postdoctoral Fellow
Project coordinator
Integrated Natural Resource Management
Project Coordinator, West Africa DryLands
Scientific Officer
Principle Tree Scientist
ICT Specialist/Consultant in WCA Region
Forestry
Senior Scientific Officer

Bamako, Mali, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Samanko, Mali, WCA
Onne, Nigeria, WCA
Yaounde, Cameroon, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Segou, Mali, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Labe, Guinea, WCA
Conakry, Guinea, WCA
Samanko, Mali, WCA
Yaounde, Cameroon, WCA
Labe, Guinea, WCA
Samanko, Mali, WCA
Yaounde, Cameroon, WCA
Samanko, Mali, WCA
Yaounde, Cameroon, WCA
Samanko, Mali, WCA
Labe, Guinea, WCA
Segou, Mali, WCA
Samanko, Mali, WCA
Samanko, Mali, WCA
Yaounde, Cameroon, WCA
Segou, Mali, WCA
Samanko, Mali, WCA
Yaounde, Cameroon, WCA
Bamako, Mali, WCA
Labe, Guinea, WCA
Samanko, Mali, WCA

SYSTEM-WIDE AND ECOREGIONAL PROGRAMMES

ALTERNATIVES TO SLASH-AND-BURN

KASYOKI JOYCE
TOMICH THOMAS
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Administrative Officer
ASB Global Coordinator
Programme Associate

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Nairobi, Kenya, HQ
Nairobi, Kenya, HQ

AFRICAN HIGHLANDS INITIATIVE

GERMAN LAURA
GETE ZELEKE
NAKABUGO SARAH
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Socio-Ecologist
Research Fellow — Rural Urban Linkage Program
Finance and Administrative Officer
Research Fellow
Landcare Coordinator

Kampala, Uganda, AHI
Addis Ababa, Ethiopia, AHI
Kampala, Uganda, AHI
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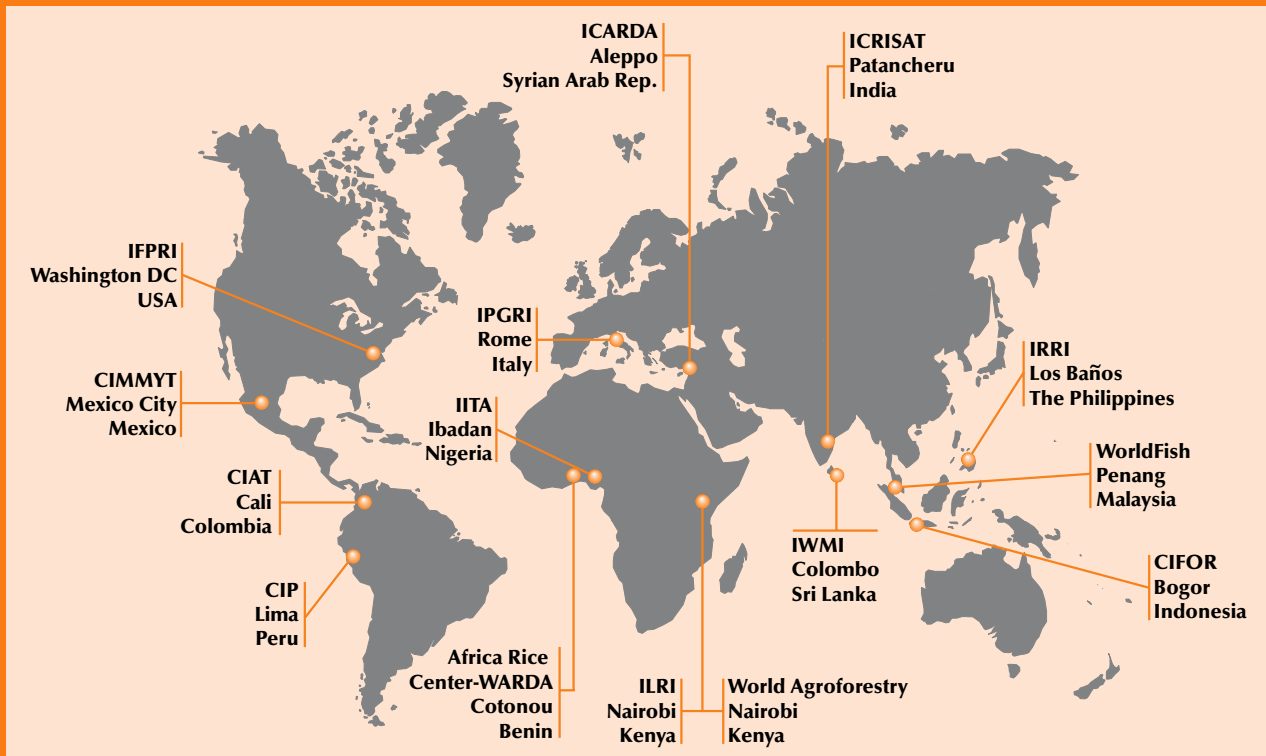
GENDER AND DIVERSITY PROGRAMME

BOMETT PAULINE
WILDE VICKI LYNN
GOH HUI XIN AMELIA

Administrative Officer
Leader Gender and Diversity Programme
Seconded Researcher

Nairobi, Kenya, HQ
Nairobi, Kenya, HQ
Nairobi, Kenya, HQ

The Alliance of the CGIAR Centres



The World Agroforestry Centre is one of 15 food and environmental research organisations known as The Alliance of the CGIAR centres. The centres, located around the world, conduct research in partnership with farmers, scientists and policy makers to help alleviate poverty and increase food security while protecting the natural resource base. The centres are principally funded through the 58 countries, private foundations, and regional and international organizations that make up the Consultative Group on International Agricultural Research (CGIAR).

In 1998 the centres supported by the CGIAR created Future Harvest as a charitable and educational organization designed to advance the debate on how to feed the world's growing population without destroying the environment, and to catalyse action for a world with less poverty, a healthier human family, well-nourished children, and a better environment. Now known as The Alliance of the CGIAR centres, the group reaches out to media, academics, scholars and scientists in the world's premier peace, environment, health, population, and development research organisations, as well as to policymakers and civil society, and enlists world-renowned leaders to speak on its behalf. The Alliance raises awareness and support for research, promotes partnerships and sponsors on-the-ground projects that bring the results of research efforts to farmers' fields in Africa, Asia, and Latin America.

CGIAR Centres

CIAT — Centro Internacional de Agricultura Tropical

CIFOR — Center for International Forestry Research

CIMMYT — Centro Internacional de Mejoramiento de Maíz y Trigo

CIP — Centro Internacional de la Papa

ICARDA — International Center for Agricultural Research in the Dry Areas

ICRISAT — International Crops Research Institute for the Semi-Arid Tropics

IFPRI — International Food Policy Research Institute

IITA — International Institute of Tropical Agriculture

ILRI — International Livestock Research Institute

IPGRI — International Plant Genetic Resources Institute

IRRI — International Rice Research Institute

IWMI — International Water Management Institute

Africa Rice Center (WARDA) — West Africa Rice Development Association

World Agroforestry Centre (WorldAgroforestry) — International Centre for Research in Agroforestry

World Fish Centre — International Centre for Living Aquatic Resources Management



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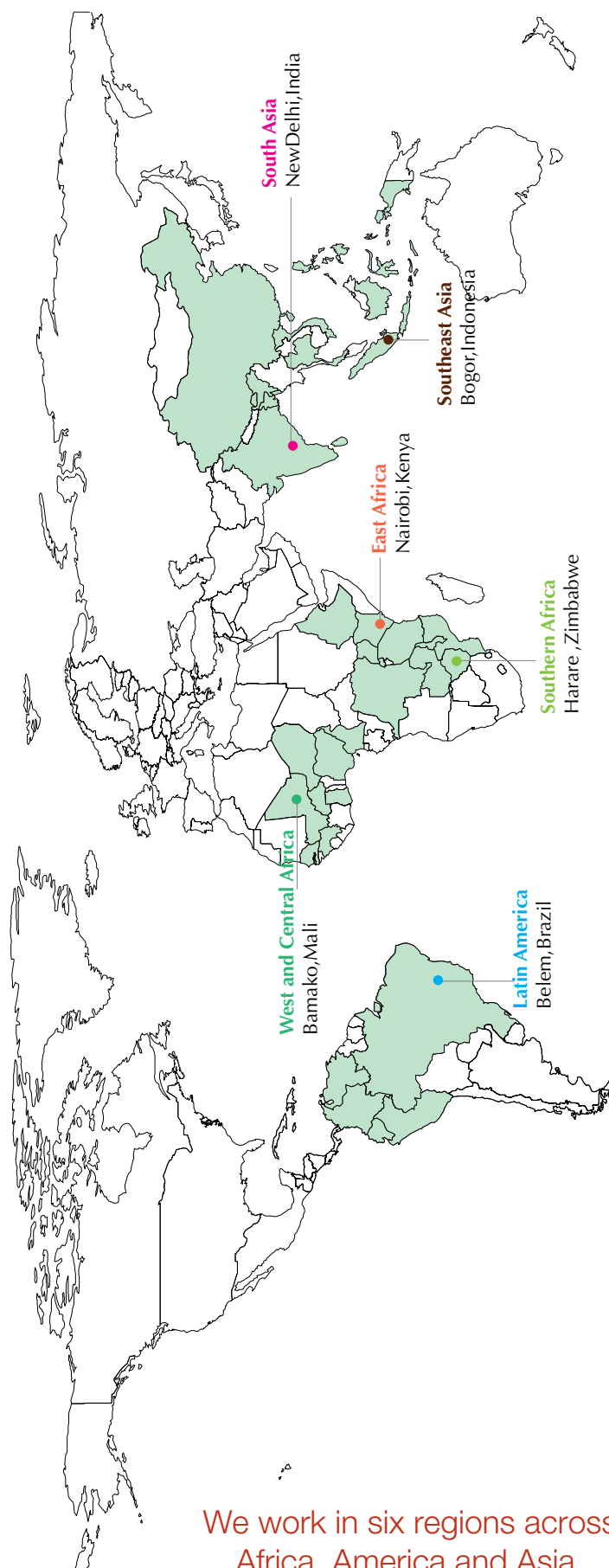
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Where we operate



We work in six regions across Africa, America and Asia.

LATIN AMERICA

Our focus in Latin America is on land use in the Amazon Basin, the world's largest remaining tropical rainforest. Our work is integrated into the Amazon Initiative – a consortium that includes the Amazon Basin countries – which we facilitate along with our sister centre, the International Centre for Tropical Agriculture (CIAT). The Amazon Initiative focuses on research and development to reverse and mitigate natural resource degradation while improving the livelihoods of the rural poor. Agroforestry is a key land use alternative to achieve these objectives. Our research on tree domestication for smallholders in the western Amazon is a key contributor to the Amazon Initiative agenda.

WEST AND CENTRAL AFRICA

This region combines two agroecological zones of major importance for agroforestry: the Sahel, and West Africa's humid tropical lowlands. WorldAgroforestry's work in the Sahel focuses on the semi-arid parkland ecosystem to improve farmer incomes and reduce threats from desertification – through agroforestry-based innovations that combine scientific knowledge with farmers' traditional knowledge and expertise. In the humid tropical lowlands, research focuses on the improvement, management, and marketing of indigenous plants and their products to benefit smallholder farmers, especially women.

SOUTHERN AFRICA

Much of Southern Africa is caught in the downward spiral of poverty – mainly because of land degradation, loss of soil fertility and depletion of renewable natural resources. High HIV/AIDS incidence also reduces family productivity and quality of life. Pressures on the natural ecosystem continue. Research by WorldAgroforestry and partners has shown that soil fertility can be restored significantly by planting nitrogen-fixing fertilizer trees. These trees are generally multipurpose, providing both fodder and fuelwood. The lack of livelihood alternatives for much of Southern Africa's poor means that their future is directly tied to the land and its ability to sustain them. Scaling up of fertilizer trees and an enabling environment, both at policy and market levels, are key to success.

SOUTHEAST ASIA

We concentrate on improved land-use practices that integrate productive trees into agroforestry landscapes, which provide important environmental services in Southeast and East Asia. These areas are particularly well-suited to the use of agroforestry for both poverty alleviation and environmental conservation. We coordinate the Rewarding Upland Poor for Environmental Services (RUPES) network that seeks to reward upland farmers by investigating the nature of their environmental services and developing bases to recognize property rights and transfer of benefits. Our programmes span from the island nations of Indonesia and the Philippines, to the montane Southeastern Asian mainland including Thailand, Laos and Vietnam and the critical watersheds of southwestern China.

SOUTH ASIA

The South Asia region is WorldAgroforestry's newest regional programme. The opening of a regional office in India in 2003 formalized our presence. The regional programme has identified opportunities for research and development in four eco-regions: The mountainous region of northeast India, Nepal, Bhutan and parts of Bangladesh; the Indo-Gangetic Plain of Bangladesh, India, Pakistan and Nepal; The Humid coastal areas of India, Bangladesh, the Maldives and Sri Lanka; and the Semi-arid lands of India, Sri Lanka and Pakistan.

EAST AFRICA

WorldAgroforestry focuses on the densely populated and often degraded highlands of Eastern and Central Africa and the Lake Victoria Basin, the locus of the greatest concentration of rural poverty on the continent. In western Kenya we facilitate a network of 107 organizations that seek to scale up agroforestry and sustainable agriculture: the Consortium for Scaling up Options for Increasing Farm Productivity in Western Kenya (COSOFAP).

We host the Trees on Farm Network of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) – a vehicle to generate and promote the utilization of demand-driven Agroforestry technologies and innovations. The African Highlands Initiative (AHI) uses an integrated approach to improve livelihoods in the highlands of East and Central Africa through better natural resource management.

Credits

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TRANSFORMING LIVES AND LANDSCAPES

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