

Chapter 1

Science-based agroforestry and the achievement of the Millennium Development Goals

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Abstract

The Millennium Development Goals (MDGs) of the United Nations (UN) are at the heart of the global development agenda. This chapter examines the role of agroforestry research for development in light of the MDGs. It reviews how agroforestry is materially assisting to achieve the goals. And it discusses how the agroforestry science agenda can be realigned to further increase its effectiveness in helping developing countries to meet their MDG targets. Promising agroforestry pathways to increase on-farm food production and income contribute to the first MDG, which aims to cut the number of hungry and desperately poor by at least half by 2015. Such pathways include fertilizer tree systems for smallholders, and expanded tree cropping and improved tree product processing and marketing. These advances can also help address lack of enterprise opportunities on small-scale farms and child malnutrition. The rate of return to investment in research on tree crops has been shown to be quite high (88%). But enterprise development and enhancement of tree product marketing have been badly neglected. Tree domestication, and the commercial processing and marketing of tree products and services is a new frontier for agroforestry research for development. A major role is also emerging in the domain of environmental services, particularly the development of mechanisms to reward the rural poor for the watershed protection, biodiversity conservation, and carbon sequestration that they provide to society. Agroforestry research for development is contributing to virtually all of the MDGs. But recognition for that role must be won by ensuring that more developing countries have national agroforestry strategies, and that agroforestry is a recognized part of their development agenda.

Introduction

Achieving the Millennium Development Goals (MDGs) is at the heart of the global agenda. The goals embody the world's aspirations to eliminate desperate hunger and poverty, ensure decent health, enable universal education and elevate the status of women, while conserving and regenerating the global environment. Attaining these goals is the greatest challenge of our generation. Their accomplishment will bring benefits to everyone, including greater economic abundance,

peace, and security to all people on the globe. Success in achieving the MDGs requires overcoming hunger and poverty in ways that are more thorough, comprehensive and holistic than ever before. We must attack these problems at their roots, through development that permeates the heart of rural poverty in the developing world.

A clear vision is evolving that articulates how agroforestry research and development can contribute

materially to achieving these goals and aspirations. The vision drives a strategy that harnesses the best of global science. This chapter lays out that vision and strategy, providing a framework for the sections and chapters that make up the remainder of this volume.

Where agroforestry fits in

Trees play a crucial role in almost all terrestrial ecosystems. They provide a wide range of products and services to rural and urban people. As natural vegetation is cleared for agriculture, trees are integrated into productive landscapes – the practice known as agroforestry.

Agroforestry is practised by millions of farmers, and has been a feature of agriculture for millennia. It encompasses a wide range of working trees that are grown on farms and in rural landscapes, and includes the generation of science-based tree enterprise opportunities that can be important in the future. Among these are: fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition and income; fodder trees that improve smallholder livestock production; timber and fuelwood trees for shelter and energy; medicinal trees to combat disease, particularly where there is no pharmacy; and trees that produce gums, resins or latex products (Garritty 2004). Many of these trees have multiple uses, each providing a range of benefits.

An estimated 1.2 billion rural people currently practise agroforestry on their farms and in their communities, and depend upon its products (World Bank 2004). Their tree-based enterprises help ensure food and nutritional security, increase their income and assets, and help solve their land management problems. Trees play a

particularly pivotal role wherever people depend on fragile ecosystems for survival and sustenance.

During the past 30 years, agroforestry has progressed from being a traditional practice with great potential to the point where development experts agree that it provides an important science-based pathway for achieving important objectives in natural resource management and poverty alleviation. Despite its ubiquitous use by smallholder farm families, there is inadequate awareness about the potential of agroforestry to benefit millions of households trapped in poverty. We need a global ‘agroforestry transformation’ to mobilize science and resources to remove the socio-economic, ecological and political constraints to widespread application of agroforestry innovations, and thereby help attain the MDGs.

Building on three decades of work with smallholder farmers in Africa, Asia and Latin America, coupled with strategic alliances with advanced laboratories, national research institutions, universities and non-governmental organizations (NGOs) across the globe, the World Agroforestry Centre and its partners are poised to foster such an agroforestry transformation.

Aiming for an ‘agroforestry transformation’

The World Agroforestry Centre’s mission is to advance both the science and practice of agroforestry to help realize this transformation. The target is a future in which millions of poor farming households have access to a wide variety of adapted and productive tree enterprises that improve livelihoods in a holistic way (World Agroforestry Centre 2005). Underpinning this is crucial scientific research that will ensure

a stream of necessary technical, policy and institutional innovations. The Centre has identified seven major global challenges related to the MDGs to which we aim to contribute. These challenges are:

1. To help eradicate **hunger** through pro-poor food production systems in disadvantaged areas based on agroforestry methods of soil fertility replenishment and land regeneration.
2. Reduce rural **poverty** through market-driven, locally led tree cultivation systems that generate income and build assets.
3. Advance the **health and nutrition** of the rural poor through agroforestry systems.
4. Conserve **biodiversity** through integrated conservation-development solutions based on agroforestry technologies, innovative institutions, and better policies.
5. Protect **watershed services** through agroforestry-based solutions that enable the poor to be rewarded for their provision of these services.
6. Enable the rural poor to adapt to **climate change**, and to benefit from emerging carbon markets, through tree cultivation.
7. Build **human and institutional capacity** in agroforestry research and development.

Mission goals

To address these seven global challenges, the Centre is pursuing four mission goals:

Goal 1

Enhance access by smallholders to high-quality tree germplasm and expanded market opportunities for smallholder tree products.

Goal 2

Advance understanding of the role of trees in practical and productive land and farm management and to foster integrated farming systems based on appropriate

agroforestry systems for key agroecological domains.

Goal 3

Increase recognition and deployment of pro-poor agroforestry strategies that generate local benefits while providing global environmental services.

Goal 4

Greatly improve the capacity for effective research, development and education in agroforestry by a wide range of individuals and institutions in the developing world.

The Centre's collaborative advantage in addressing these challenges lies in its role in being able to synthesize and integrate the science and practice of agroforestry at multiple levels. Scientific teams deploy the necessary experience in research, development and education to produce agroforestry innovations in accordance with local needs and priorities. Collaboration with local development partners helps integrate these innovations into their work with the rural poor. Our research in more than 30 developing countries allows for learning and synthesis across a wide range of social, economic, ecological and institutional contexts.

Four integrated research and development-support themes

The mission goals are addressed through four global themes, each related to a corresponding goal.

Theme 1 – Trees and Markets

This theme focuses on the key smallholder tree commodities, their cultivation, value-added processing and the market environment for tree-based products. Poor farmers in less-favoured environments often cannot compete advantageously in the production of basic food commodities. They need to

meet their basic needs while diversifying towards higher-value products. This requires a new approach. New tree species need to be domesticated. New strategies and methods for tree product development and the diversification of cultivation systems need to be pursued to better meet the needs of farmers and markets. The theme focuses on four aspects of this: tree domestication with intensification of tree cultivation systems; sustainable seed systems and management of genetic resources of agroforestry trees; enterprise development and enhancement of tree product marketing; and farmer-led development, testing and expansion of tree-based options.

Theme 2 – Land and People

This theme focuses on the household farm system and the integration of trees into productive enterprise portfolios that meet family needs. It seeks to understand the basis for the role of trees in sound land management and quantifies the long-term consequences of agroforestry practices on small-scale agriculture in order to derive locally relevant land management options. Smallholders need integrated portfolios of tree enterprises that address their basic needs and provide cash income. These are being assembled and disseminated in a range of agroecological domains, along with the best-bet agroforestry management options. The components of these systems include trees for improving soil fertility, fruits and vegetable trees for nutrition, fodder for livestock, live fencing, timber, fuelwood, and services such as microclimate regulation. Smallholder tree cash crops (coffee, cocoa, rubber) are a major contributor to rural incomes in many tropical countries. Work on diversifying these systems through integrating other valuable agroforestry trees into them enables smallholders to buffer their incomes in the face of volatile and declining cash crop prices.

The poor are often enmeshed in highly complex poverty traps. Thus, we are developing and fostering pro-poor participatory technology development approaches and the enabling policies to address these complex constraints.

Theme 3 – Environmental Services

This theme aims to develop pro-poor agroforestry strategies for both local benefits and global conservation. The work focuses on watershed protection, biodiversity conservation and climate change mitigation and adaptation. The goal is to identify agroforestry systems and landscape mosaics that meet farmer needs for food and income while enhancing these services. Centre scientists are refining the principles and practices to enable communities to farm sustainably while protecting watershed services. Our recent breakthroughs in cost-effective methods for rapidly assessing land quality have greatly enhanced this work. These are combined with the methods of integrated natural resource management (INRM) that the Centre has helped pioneer in its research around the world.

The work in this theme is also advancing the understanding of, and capacity to manage biodiversity in human-dominated landscape mosaics in the tropics. This work is helping to develop the scientific basis for 'ecoagriculture' – an approach to increasing agricultural productivity while protecting natural biodiversity. Agroforestry is also playing a critical role in developing integrated biodiversity conservation approaches for the most critical global hotspots while enhancing the livelihoods of the rural poor in adjoining areas. Centre teams are on the ground in many of these areas, working to develop a global network of successful cases, in collaboration with the Center for International Forestry Research (CIFOR) and other partners.

We are also clarifying the processes for smallholder adaptation to climate change by developing more resilient tree-based farming systems. ICRAF is also working to successfully demonstrate how smallholder farmers can benefit by adopting agroforestry systems that sequester carbon and contribute to climate change mitigation. And we are providing science-based evidence on the tradeoffs and complementarities between land use for environmental services and for livelihoods of smallholder farmers.

Theme 4 – Strengthening Institutions

Agroforestry is a relatively new field of science and development. The Centre recognized early on that there is a major need to build the capacity of regional, national and local institutions to effectively participate in generating and applying innovations in agroforestry and INRM. The work in this theme thus supports the development of high-quality and relevant education programmes, knowledge sharing networks, and mechanisms to link with farmers for effective sharing and management of knowledge for development. It adds value to the efforts of national agricultural, forestry and natural resource institutions by enhancing their ability to develop vibrant agroforestry research programmes and link that research to human development.

The Centre has fostered the development of two major networks that support educational institutions throughout Africa and Asia. They incorporate multidisciplinary approaches to land management into curricula, and develop and improve teaching and learning resources and techniques in INRM. Recognizing that agroforestry is an excellent means through which to convey environmental concepts in elementary schools, the Centre and the Food and Agriculture Organization of the United Nations

(FAO) have launched a global programme called Farmers of the Future to foster this approach in the primary and secondary school systems of developing countries.

Strategic links have also been established with farmers' groups and development-oriented organizations to bolster awareness among policy makers and development institutions and improve access to knowledge products on agroforestry and INRM. This work is fostering innovative community-based approaches to sustainable land management. These include Landcare, a farmers' movement that exhibits great promise in Asia and Africa.

Cross-thematic issues

Agroforestry and the advancement of women

In the developing world 60–80 percent of farmers are women. Rural women in developing countries grow and harvest most of the staple crops that feed their families. This is especially true in Africa, where women account for 75 percent of household food production (UNDP 1999, as cited in Bread for the World Institute 2003). Food security throughout the developing world depends primarily on women. Yet they own only a small fraction of the world's farmland and receive only a fraction (less than 10 percent) of agricultural extension services.

Agroforestry offers many entry points to improve the status, income and health of women and children. Rainwater harvesting and tree-growing on farms reduces the drudgery of fetching water and fuel from distant areas. Research on gender and agroforestry is examining these issues, and exploiting important entry points through which women's property rights can be

enhanced, and how household agroforestry systems can specifically address their nutritional, health and economic needs.

Agroforestry linkages with better health and nutrition

Advances in agroforestry can improve the health and nutrition of the rural poor. The expansion of fruit tree cultivation on farms can greatly increase the quality of children's nutrition. This is particularly important because indigenous fruit tree resources in local forests are often overexploited. Work with national partners to domesticate a range of nutritious wild indigenous fruits seeks to save these species from overexploitation and develop them for local and regional markets. These efforts will contribute to MDG 4 on reducing child mortality.

There are many complex linkages between agroforestry and the fight against HIV/AIDS. Forty million people currently live with HIV. There is potential for agroforestry to generate much-needed income, improve nutrition, reduce labour demands and stabilize the environment in AIDS-affected communities. The range of threats and the various opportunities have yet to be thoroughly explored, and incorporated into the research and development agenda.

Regional programmes

The Centre focuses primarily on seven regions where the problems of poverty, food insecurity and environmental degradation are most acute. High population density, extreme poverty and land degradation overlap to create strategic entry points for the establishment of an agroforestry transformation.

At the regional level, we concentrate on research, education and development priorities for different agro-ecological

zones including dryland areas, humid forest zones, and tropical highlands. The Centre also assists its partners in developing national agroforestry plans and incorporating agroforestry into poverty reduction strategies, and food security and environmental policies. Research networks and policy initiatives provide leverage to promote agroforestry and increased impact.

Africa

Forty-eight percent of the African population is desperately poor – the highest proportion in any region of the world. Per capita food production is declining, and malnourishment and poverty continue to increase. But the global community is mobilizing its resources to address this intolerable situation. An analysis of the farming systems in Africa by FAO (Dixon et al. 2001), and recent comprehensive studies by the InterAcademy Council of Scientific Societies (2004) and the UN Millennium Project (2005) have provided a thorough picture of the constraints and possibilities in attempting to alleviate hunger and rural poverty in Africa. These studies identify hotspots where focused efforts can enhance farm productivity, increase rural incomes and transform agriculture to become a more dynamic driver of economic growth. In their recommendations on how to address the constraints, these studies highlight agroforestry as a crucial pathway toward greater prosperity.

The World Agroforestry Centre currently invests three-quarters of its income in its four African regional programmes. We foresee a series of ‘evergreen revolutions’ in Africa based on the intensification and diversification of farming systems that have demonstrated potential for major productivity increases. The Centre has teams on the ground investigating key opportunities for science-based agroforestry to help

overcome poverty in nearly all of the key hunger spots. This will involve bringing together the best technology for trees, crops, and livestock into integrated farming systems suited to the diverse ecologies, backed by better markets, more vibrant rural institutions, and a more conducive policy framework for development.

Asia

On this vast continent the Centre has two regional programmes: Southeast Asia and South Asia. In Southeast Asia we focus on improved land-use practices that integrate productive trees into agroforest landscapes that provide important environmental services. The incidence of desperate poverty is decreasing in this region, but poverty remains concentrated in the less-favoured upland environments. These areas are particularly well suited to agroforestry. A unique network; Rewarding the Upland Poor for Environmental Services (RUPES) is investigating the nature of these services and developing the basis to recognize property rights and transfer benefits. These advances are based on the deployment of negotiation support systems, a methodology that provides a science-based approach to managing the trade-offs among competing interests in managing critical environments. In South Asia we focus on four main ecosystems with large populations of rural poor. We work in collaboration with a strong, well-established research, development and education system, and are linking South Asian agroforestry science with African regions that have similar ecologies.

Latin America

Here we participate with the Amazon Initiative. This is a consortium that brings together a number of international and national research institutions to focus on reversing natural resource degradation, while improving the livelihoods of the rural

poor. In Latin America, Southeast Asia, and the African Humid Tropics regions, we are building on our long-term involvement with the system-wide programme of the Consultative Group on International Agricultural Research (CGIAR) known as Alternatives to Slash-and-Burn (ASB). ASB focuses on the landscape mosaics (comprising both forests and agriculture) where global environmental problems and poverty coincide at the margins of the remaining tropical forests.

Connecting to the global policy environment

Agroforestry is one of the few productive land uses that contribute directly and synergistically to the objectives of all the key international environmental and sustainable development conventions. In particular, it contributes to the goals of the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC) and its Clean Development Mechanism (CDM), the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Forum on Forests (UNFF). The Centre also strives to ensure that the science and practice of agroforestry reaches the mainstream within such international policy fora and initiatives as the New Partnership for Africa’s Development (NEPAD). Similarly, the MDGs provide important milestones that have helped to mobilize and channel the interests of developing country governments, development banks and donor agencies.

Forging strategic partnerships and alliances

The science and practice of agroforestry are inherently complex, integrating a range of disciplines, communities and institutions. Thus, partnerships and alliances are crucial to fostering an agroforestry transformation.

Our partners include farmers and farming communities, national and international research organizations, government agencies, development organizations, NGOs, advanced research laboratories and other CGIAR centres. Successful management of agroforestry research, development and educational programmes hinges on the balance and coordination of available expertise to achieve synergy.

In forging partnerships with such institutions, we are able to bring together and focus a critical mass of relevant disciplines and resources to design effective agroforestry strategies, programmes and activities. We need to span the continuum from analysis of research needs through technology development, testing, adoption and implementation of agroforestry innovations. And, in doing so, tap into opportunities provided by institutions and organizations that have knowledge, experience, mandates and resources that complement those of the Centre. We must continue to promote local participation in advancing agroforestry science and practice, thereby incorporating indigenous knowledge and expertise into our work, and vigorously ensure the scaling up and long-term sustainability of agroforestry as a science and a practice.

In conclusion

In the study by John Bene and his colleagues (1977) – upon which the creation of a global centre dedicated to agroforestry was based – it is written:

“A new front should be opened on the war against hunger, inadequate shelter and environmental degradation. This war can be fought with weapons that have been in the arsenal of rural people since time immemorial, and no radical change in their lifestyle will be required... Beyond question, agrofor-

estry can greatly improve life for people in the developing world, and do so within a reasonably short time.”

A quarter-century ago, when this Centre was created, the world was a very different place in many respects. Then, as now, about a billion people lived in desperate poverty and there was food insecurity for hundreds of millions in the developing world. But one thing that has changed since then is that the global community is many times wealthier than it was, and has the benefit of the intervening decades of development experience. Perhaps most important of all it has united behind a set of definitive goals, with explicit measurable targets to hold us accountable for solving each problem. They enable us to focus together on what is really important in our world today: to eliminate hunger and desperate poverty, the most complex, demanding problems that the human community faces. Clearly, there is a tremendous responsibility that scientists and development professionals must bear. We have considerable freedom in choosing the problems on which we work, including the very complex intellectual challenges that tax our intelligence and creativity. This is a special privilege. The issue is what we do with that privilege, with that special opportunity to make a difference. I only hope that in another 25 years our efforts will be judged to have been adequate to that task.

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