

Ecosystem Services from Agriculture and Agroforestry

Measurement and Payment

Edited by Bruno Rapidel, Fabrice DeClerck,
Jean-François Le Coq and John Beer

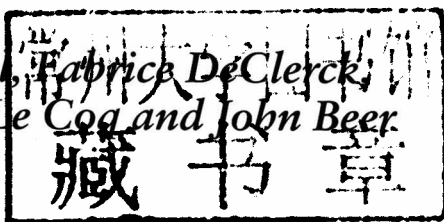


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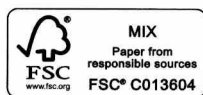
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Foreword I

Sara Scherr

For most of the last century, agricultural landscapes were valued almost exclusively for their role in supplying crop and livestock products for local consumption and national and international markets. The importance of managing lands for ecosystem services – in particular, watershed protection and biodiversity conservation – was widely recognized. But it was assumed that farmlands themselves had little or no ecological value, and that ecosystem services could be provided effectively only *outside* of agricultural lands, mainly through protecting or restoring natural vegetative cover, whether forests, natural grasslands or wetlands. During recent decades, the negative impacts of agricultural intensification and expansion upon ecosystems have become a critical threat in many regions, prompting new policy responses to reduce these effects, both carrots (subsidies for practices reducing agrochemical pollution and erosion, tax incentives for conservation easements) and sticks (regulations, zoning restrictions). The first generation of payments for ecosystem services to farmers – payments made by governments or private actors that are contingent upon producing ecosystem benefits – focused on taking land out of agricultural production, and restoring natural habitat on farms and in the broader landscape. Policy action was framed within a ‘trade-off’ paradigm, in which policy-makers, businesses and farming communities had to decide how much land and water to keep in production and how much to allocate to conservation.

But a rethinking of this paradigm is under way. New scientific evidence is showing that well-planned and well-managed farmed fields and grazing lands can actually *produce* and even *restore* ecosystem services. By including agrobiodiverse land cover and adjusting management systems, they can provide critical supplemental – in some cases, primary – habitat for wildlife. Farmlands

with healthy, high organic-matter agricultural soils; deep-rooted crop, grass and trees producing food and commodities in strategic locations; low-impact tillage practices; year-round vegetative cover; and sensible protections for nearby water resources can protect most important watershed services. Such benefits are especially significant where farmlands are included as part of strategic habitat and watershed planning, coordinated with public and private land conservation in the landscape.

In the Neotropics, the promise of this approach to ecosystem management is especially high. The main agricultural areas of this region, which provide food security and livelihoods to most of the rural population, as well as critical export earnings, are located in or around regionally important watersheds and globally important centres of biodiversity. A rich diversity of indigenous plant species valued for food, medicines, feed and other uses could potentially enrich commercial agriculture. A growing research community is generating new solutions and systems for ecologically friendly farming and ranching that are economically productive and profitable. However, currently, the dominant agricultural and livestock production systems produce relatively low levels of ecosystem services, or undermine the 'natural capital' for producing them. For farmers, shifting to more eco-friendly crop mixes and practices can be costly and risky, and requires new complex knowledge, and there is little public or private funding available for technical assistance or risk management.

Payment for ecosystem services (PES) schemes for farmers and farming communities offer one of the most promising policy and market instruments to accelerate this transition. PES for eco-friendly farming systems needs only to cover the costs of establishment, transition and early risks of local adaptation, and can then be maintained at a low level (or even withdrawn, if the new practice is more profitable than the old). Financing will often still be needed for nature conservation and restoration on private lands; but as these are more expensive (they must compensate farmers for a stream of lost revenues from land taken out of production), they can be targeted at those parts of the agricultural landscape where eco-friendly production is clearly not enough. There are numerous beneficiaries of the ecosystem services produced in these agricultural regions who derive concrete financial benefits from them, so that potential 'buyers' include not only taxpayers financing 'public goods', but also municipal utilities, bottling companies, tourism operators, fishers, agencies managing flood and other risks, as well as the food industry and consumers of agricultural goods who want to establish 'green' credentials.

This is the promise; we are still in the early stages of realizing that promise. This volume provides a synthesis of experience to date. Drawing together the findings of a decade of research by CATIE, CIRAD and many national and international research and development organizations active in the Neotropics, this book presents numerous lessons learned for targeting, designing, managing and monitoring agricultural PES. The contributors apply a rigorous and sceptical scientific eye to the body of experience, describing failures as well as successes, and highlight challenges that have not yet been solved. They also

touch on fundamental questions of social equity, political philosophy and governance. This volume provides numerous ideas for shaping the next generation of agricultural PES in the Neotropics, and is relevant to innovators around the world.

Sara Scherr
President, EcoAgriculture Partners
January 2011

Foreword II

Patrick Caron

Since the hunger riots in 2008, agricultural and food issues have dramatically returned to the forefront of the global political agenda as one of the 21st century's major concerns. As a consequence, it is evident that world agriculture more broadly lies at the heart of the main global challenges: food security due to demographic growth and evolution in food consumption patterns; environment due to climate change, natural resources and fertility management, pollutions, water scarcity and biodiversity concerns; energy due to the growing scarcity of fossil fuels and the potential for biomass use; and the fight against poverty and inequality. To fulfil the multiple functions that are locally and globally expected from agriculture and to address the unpredictable evolution of human consumption patterns, there is no doubt that agriculture should increase production of newer and better commodities. The biggest challenge will be to feed 9 billion people in 2050 while preserving ecosystems which provide other products and services in a changing environment. The unique and globally complex questions regarding the relationships between agriculture, food security, health, energy, economic and social development, and the environment, call for renewed investments in research.

Business as usual is no longer an option and the need to mobilize all knowledge sources for alternative ways of producing and managing resources and rural space is imperative. CIRAD (a French research centre working with developing countries to tackle international agricultural and development issues, www.cirad.fr) has chosen to invest and promote research activities towards ecological intensification, such as new technologies based on imitating rather than forcing 'nature'. This calls for renewed approaches to look at the interactions between agriculture and environment, for a shift in paradigms that

paved the ‘modernization’ of agriculture during the last century and for renewed links between fragmented epistemic and political communities.

In this context, agroforestry is looked upon as a potential option for the stimulation of interactions between trees and crops. The research investment objective is to better understand ancestral or emerging practices and systems and to assess their performances and impacts by taking into account the entire range of expected functions. From an environmental point of view, this relates to biodiversity preservation, an increase in carbon storage, erosion control, and an increase in soil fertility. Agroforestry also provides farmers with essential alternative sources of income. This effort should contribute to innovative and more efficient practices through the mobilization of both farmers’ knowledge and the most advanced academic science.

The integration of environmental concerns into agricultural transformation should not be referred to as the ‘ecologization’ of agriculture. Agriculture is often looked upon as an enemy of nature; however, there is a strong assumption that agriculture can and should provide environmental goods and could be acknowledged for such services. In recent years a movement towards a greener economy through payment for environmental/ecosystem services that prevent environmental degradation or contribute to site improvement has emerged. Hypothetically, management of natural resources could be conducted through the connection between market and public intervention. However, numerous questions regarding the efficacy of this concept remain and assessment of the initial payments for environmental/ecosystem services programmes is necessary, both from the points of view of the payment of services and the economic and ecological advantages and disadvantages of agroforestry systems in comparison to monocultures. Throughout this book we will learn from experiences and case studies while nourishing current thoughts and innovative processes with a remarkable reflexivity!

This book fulfils the main objective of the Mesoamerican Scientific Partnership Platform for Agroforestry Systems with Perennial Crops that is implemented since 2007 by CATIE, CIRAD, Bioversity International, CABI, INCAE and Promecafé, all six partners related to agricultural research and development in Central America. The objective of this platform is to contribute to maintaining and increasing the competitiveness and sustainability of the agricultural sector of Mesoamerica through quantification, valuing and development of all potential products and environmental services of agroforestry systems with perennial crops, in particular coffee and cocoa. This platform was designed as an institutional tool and engagement for securing long-term joint investment on agroforestry systems regarding:

- i) the evaluation of environmental services provided by agroforestry;
- ii) the design of competitive, sustainable and diversified management strategies for agroforestry;
- iii) the assessment of the impacts of agroforestry systems on farmer’s livelihoods and strategies;

- iv) the strengthening of farmers' business organizations; and
- v) the understanding of the institutional arrangements along value chains for agroforestry products and services.

The publication of this book after only four years of study and analysis is a positive signal of the intellectual and institutional dynamics of this partnership. It not only accounts for the joint innovative production of knowledge, but also paves the way for the next activities and opens up promising research avenues for the future.

Patrick Caron
Director General for Research and Strategy, CIRAD
February 2011

List of Acronyms and Abbreviations

AAU	assigned amount unit
AFS	agroforestry systems
ALM	agricultural land management
APFC	Advance Paid Forest Certificate
A/R	afforestation and reforestation
ARESEP	Autoridad Reguladora de Servicios Públicos (Public Services Regulating Authority Bureau)
ARR	afforestation, reforestation and revegetation
ASL	above sea level
AyA	Acueductos y Alcantarillados (Water Piping and Sewage Company)
B	boron
BCCR	Banco Central de Costa Rica
BCS	biological control services
BMP	Bird Monitoring Project
C	carbon
4C	Common Code for Coffee Community
Ca	calcium
CAER	Centre for Agri-Environmental Research (UK)
CAFE	Coffee and Farmer Equity (Starbucks)
CAM	Microbasin Environmental Committee
CAR	Climate Action Reserve
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agricultural Research and Higher Education Center, Costa Rica)
CBD	Convention on Biological Diversity
CCB	Climate Community and Biodiversity Standards
CCOF	California Certified Organic Farmers
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CER	Certified Emission Reduction/Certificate of Emissions Reductions

CH ₄	methane
CIFOR	Center for International Forestry Research (one of 15 centres within the Consultative Group on International Agricultural Research, with headquarters in Bogor, Indonesia)
CIMS	Centre for Sustainable Market Intelligence
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement (French Centre for International Cooperation in Agricultural Research for Development)
Cl	chlorine
CM	crop management
CNFL	Compañía Nacional de Fuerza y Luz (National Power and Illumination Company)
CO ₂	carbon dioxide
COHDEFOR	Honduran Forest Development Corporation
CONAFOR	Comisión Nacional Forestal (Mexican National Forestry Commission)
CONAGUA	Comisión Nacional del Agua
CONANP	National Commission of Natural Protected Areas
CONAPO	National Population Council
COOCAFE	Consortium of Cooperatives of Coffee Growers
CPF	Forest Protection Fund
CREAMS	Chemicals, Runoff and Erosion from Agricultural Management Systems model
CSIC	Consejo Superior de Investigaciones Científicas (Spanish National Research Council)
CVC	citrus variegated chlorosis
DANIDA	Danish International Development Agency
DBH	diameter at breast height
DFG	Dirección General Forestal (General Bureau of Forestry)
DM	dead material
DNDC	DeNitrification-DeComposition model
DOC	dissolved organic carbon
ECD	electron capture detector
EfD Initiative	Environment for Development Initiative (capacity-building programme in environmental economics, focusing on research, policy advice and teaching in Central America, China, Ethiopia, Kenya, South Africa, and Tanzania)
ERPA	Emission Reduction Purchase Agreement
ERU	emission reduction unit
ES	ecosystem/environmental services
ESC	Environmental Services Certificate
ESPH	Empresa de Servicios Públicos de Heredia (Water and Power Utility Company, Heredia)