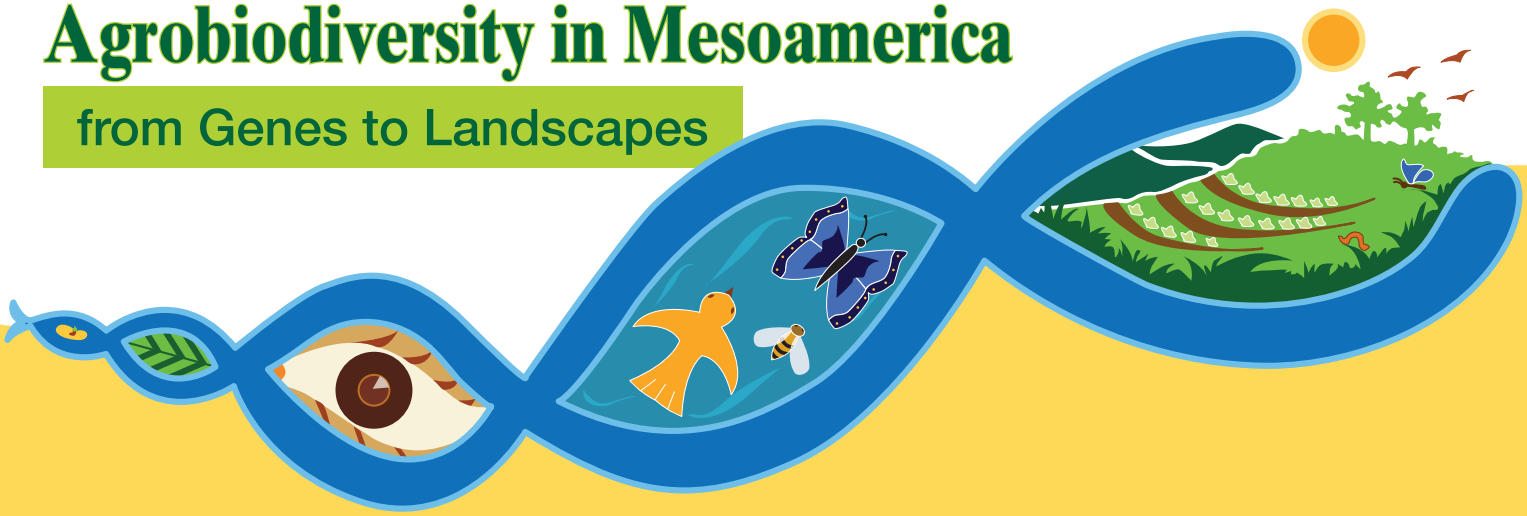
Henry A. Wallace/CATIE – 6th Conference of the
Inter-American Series of Scientific Conferences

Agrobiodiversity in Mesoamerica

from Genes to Landscapes



Conference Program

Turrialba, Costa Rica
September 20-24, 2010

2010 Año Internacional de la Diversidad Biológica

CATIE
Solutions for environment and development
Soluciones para el ambiente y desarrollo

Bioversity International

cirad
AGRICULTURAL RESEARCH
FOR DEVELOPMENT

ecoagriculturepartners
landscapes for people, food and nature

The 6th Henry A. Wallace Inter-American Scientific Conference

September 20–24, 2010

"Agrobiodiversity in Mesoamerica–from genes to landscapes"
Starting points, strategies and stakeholders for making agrobiodiversity more relevant to the future of Mesoamerica

Agrobiodiversity and the future well being of our society

The growing concern for the well being of the Earth is reflected in recent global stock takings– the Millennium Development Goals, the Millennium Ecosystem Assessment, the International Assessment of Science and Technology for multi-functional agriculture and the Intergovernmental Panel on Climate Change. The recent confluence of surging food prices and the biofuels boom with on-going concerns of climate change, poverty reduction and biodiversity has refocused attention on the role of agriculture for the future of our civilization. The productivity and health of agricultural landscapes are intimately linked to the well being of rural populations, influence the size and integrity of natural systems, contribute ecosystem services locally and globally and sustain urban food and other supplies.

At this moment of questioning about the future of agriculture, agrobiodiversity is a useful framework to monitor the status of the multiple functions of agricultural landscapes, to analyze mechanisms to balance the production of commodities (food, fodder, fiber, biofuels), ecosystem services, landscape amenities and cultural heritage and to develop supporting policies and institutions. Agrobiodiversity encompasses the diversity of crop and livestock production species, production support species, crop wild relatives and wild species and the structure, function and distribution of the agro-ecosystems of which they are components.

Background to the Wallace Conference 2010

"The Henry A. Wallace Inter-American Scientific Conference", organized by CATIE since 2001, focuses on issues of critical importance for sustainable agriculture and natural resource management in the tropics, encourages contact and debate among the CATIE community, its member countries and other scientific and educational centers. For the international year of biodiversity in 2010, CATIE, CIRAD and Bioversity International propose to organize the 6th Henry A. Wallace Conference with a focus on agrobiodiversity in Mesoamerica.

CATIE has long given priority to crop diversity with its *ex situ* collections of important Mesoamerican crops and to landscapes with coffee, cocoa and pastures. Recently it has taken leadership on biodiversity and ecosystem services linked to land use and landscape fragmentation patterns. A conference on agrobiodiversity in Mesoamerica is an opportunity for CATIE and Bioversity to expand the analysis of genetic resources beyond the *ex situ* and *in situ* debate and to address emerging issues such as ecosystem services and cultural heritage, particularly of unique Mesoamerican genetic resources, without losing the perspective of productivity, markets and farm households.

Conference objectives

The purpose of the 6th Wallace Scientific Conference is to bring together Mesoamerican and international research and public sector organizations, universities and civil society to study, analyze and act to strengthen agrobiodiversity as an integrating framework to develop and promote sustainable land management. The specific objectives of the conference are to:

1. Profile the current status of agrobiodiversity – landscapes, unique genetic resources and stakeholder interest – and the possible impact of global trends;
2. Identify new strategies for the conservation and use of agrobiodiversity through an exchange among international and national partners;
3. Explore the functional contribution of agrobiodiversity to ensuring human well-being from farm to landscape scales;
4. Expand the focus on *ex situ* conservation of unique genetic diversity with the multiple dimensions of agrobiodiversity;
5. Identify gaps and follow-up actions in the spheres of research, higher education and teaching, policy and development.

Palabras de Bienvenida de José Joaquín Campos
Director General del CATIE

Bienvenidos a la celebración de la VI Conferencia en la Serie Interamericana de Conferencias Científicas Henry A. Wallace, titulada "Agrobiodiversidad en Mesoamérica, de Genes a Paisajes".

Esta conferencia celebra el año 2010 como el "Año Internacional de la Biodiversidad", declarado oficialmente por la Organización de las Naciones Unidas y la Convención para la Diversidad Biológica. El año 2010 representa el año en que las naciones del mundo se comprometieron a demostrar avances significativos en la reducción de la pérdida de la biodiversidad, así como de los bienes y servicios que recibimos de la diversidad de especies que habitan nuestro planeta tierra.

Desafortunamente, hasta la fecha, la mayoría de los indicadores globales de biodiversidad sugieren que aún no existe una reducción en el ritmo al que las especies están desapareciendo. Esperamos que esta conferencia sirva como un espacio para reflexionar, discutir y emprender acciones que permitan la reducción de ésta pérdida, a través de la valoración del papel que la biodiversidad, particularmente la agrobiodiversidad, juega en el mejoramiento de nuestra calidad de vida. La conferencia explorará temas que van desde la diversidad de bienes agrícolas hasta la diversidad ecológica que contribuye a la provisión de servicios ecosistémicos en paisajes agrícolas, tales como el control de plagas, polinización y adaptación al cambio climático.

La estructura en que la conferencia ha sido organizada apunta a promover el análisis crítico, el intercambio de ideas y especialmente el intercambio de lecciones aprendidas. Esperamos identificar posibles nuevas estrategias para la conservación y el uso de la agrobiodiversidad a través de este intercambio de conocimiento entre los participantes.

Esperamos que disfruten de la belleza de nuestro campus y el valle de Turrialba, al igual que esperamos que su participación en la conferencia Wallace logre inspirarlos a reflexionar y a emprender acciones que contribuyan a la conservación de estos preciados recursos.

José Joaquín Campos
Director General del CATIE

Welcome Message from the José Joaquín Campos
Director of CATIE

Welcome to the presentation of the 6th Henry A. Wallace Interamerican Scientific Conference entitled, "Agrobiodiversity in Mesoamerica, from genes to landscapes".

This conference celebrates 2010, the International year of biodiversity as declared by the United Nations and the Convention on Biological Diversity. 2010 represents the year in which the nationals of the World have committed themselves to demonstrating important advances in reducing the significant loss of biodiversity, as well as the goods and services that we receive from the Diversity of species that inhabit our planet.

Unfortunately, to date, most global biodiversity indicators suggest that there is no reduction in the rate at which species are being lost. We hope that this conference will serve as a space to reflect, discuss, and act on how we can slow this loss by valuing the role that biodiversity, particularly agrobiodiversity, plays in improving human well-being. The conference will explore themes ranging from the diversity of agricultural goods to the ecological diversity that contributes to the provisioning of ecosystem services in agricultural landscapes, such as pest control, pollination, and adaptation to climate change.

The format of the conference is aimed at promoting a critical analysis, and a sharing of ideas and lessons learned. We hope to identify new strategies for the conservation and use of agrobiodiversity through this exchange between participants.

We hope that you will enjoy the beauty of CATIE's campus and the Turrialba Valley. We also hope that you participation in the Wallace conference will inspire you to reflect and take action on the conservation of this precious resource.

José Joaquín Campos
Director General del CATIE

Palabras de Bienvenida de Emile Frison
Director General, Bioversity International

En representación de Bioversity International y al igual que nuestros socios, CATIE y Ecoagriculture Partners, quisiera darles la bienvenida a la VI Conferencia Científica Interamericana Henry A. Wallace "Agrobiodiversidad en Mesoamérica, de Genes a Paisajes". En reconocimiento al 2010, proclamado Año Internacional de la Biodiversidad por las Naciones Unidas, esta conferencia apunta a incrementar el conocimiento sobre temas que impactan la conservación de la biodiversidad agrícola, es decir, biodiversidad para la producción de alimentos y agricultura y para definir prioridades futuras dentro de la rama de la investigación y acción dentro de la región.

La tierra depende de la agrobiodiversidad para lograr mantener las funciones ecosistémicas tales como producción de agua, ciclaje de nutrientes y polinización. La humanidad depende de esta agrobiodiversidad para la producción de alimentos, fibras, combustible, forraje, medicinas y nuevos materiales crudos para la gestación de nuevas variedades de plantas y animales. La supervivencia depende de la agrobiodiversidad para permitir que especies y ecosistemas continúen evolucionando y adaptándose, incluyendo la adaptación al cambio climático.

Esta conferencia unirá a todos aquellos que apuestan a la conservación y el uso sostenible de la agrobiodiversidad en Mesoamérica—uno de los ocho centros mundiales de diversidad, en donde cultivos tales como el maíz, frijol común, papas, pimienta, papaya, marañón, cacao y una docena de otros cultivos, frutas y fibras de las cuales depende la humanidad para su alimentación y medios de vida fueron domesticados. Representantes de comunidades locales y la sociedad civil, educadores, investigadores, tomadores de decisiones y organizaciones internacionales discutirán el estado, tendencias y estrategias de la agrobiodiversidad en Mesoamérica, identificando vacíos y proponiendo acciones a futuro dentro de las esferas de la investigación, educación superior y desarrollo de políticas.

Agradecemos y les damos la bienvenida a este importante evento. Recordándoles que debemos aprovechar la oportunidad que nos ofrece el Año Internacional de la Biodiversidad para llamar la atención de los tomadores de decisiones hacia la importancia de invertir más en el uso y conservación de la biodiversidad agrícola.

Emile Frison
Director General, Bioversity International

Welcome from Emile Frison
Director General, Bioversity International

On behalf of Bioversity International and together with our partners, CATIE and EcoAgriculture Partners, I would like to welcome you to the 6th Henry A. Wallace/CATIE Inter-American Scientific Conference "Agrobiodiversity in Mesoamerica: from Genes to Landscapes." In recognition of the United Nations International Year of Biodiversity, this conference aims to increase understanding of the issues that impact on the conservation of agricultural biodiversity, that is, biodiversity for food and agriculture, and to define priorities for future research and action in the region.

The earth depends on this agrobiodiversity to sustain ecosystem functions such as production of water, nutrient cycling and pollination. Humankind depends on this agrobiodiversity to provide food, fibre, fuel, fodder, medicines and new raw materials for breeding new varieties of plants and animals. Survival depends on agrobiodiversity for enabling species and ecosystems to continue to evolve and adapt, including adaption to climate change.

This conference will bring together those who have a stake in the conservation and sustainable use of agrobiodiversity in Mesoamerica--one of the world's eight global centers of diversity where crops that humankind depends on for food and livelihoods such as maize, common bean, sweet potato, pepper, papaya, cashew, cacao and a dozen other crops, fruits and fibre plants were first domesticated. Representatives of local communities and civil society, educators, researchers, policy makers and international organizations will discuss the status, trends and strategies for agrobiodiversity in Mesoamerica, identify gaps and propose follow-up actions in the spheres of research, higher education and policy development.

We welcome your participation in this important event. We must take the opportunity of The International Year of Biodiversity to draw the attention of decision makers to the importance of investing more in the use and conservation of agricultural biodiversity.

Emile Frison
Director General, Bioversity International

Palabras de bienvenida de Robert Habib

Bienvenidos a la VI Conferencia Wallace "Agrobiodiversidad en Mesoamérica, de Genes a Paisajes".

El incremento en la producción agrícola es aún una de nuestras mayores prioridades, sin embargo, estrategias para la intensificación de la producción agrícola basadas en el uso masivo de pesticidas, fertilizantes químicos, agua y combustibles fósiles están, en la actualidad, siendo seriamente cuestionadas. Es el momento de romper con el modelo de la producción agrícola convencional en la cual los sistemas son exponencialmente artificiales y uniformes, produciendo ecosistemas severamente estresados. Los sistemas agrícolas deberían ser diseñados para utilizar los procesos y funciones ecosistémicas para muchos y diferentes propósitos. Estos incluyen el control de pestes biológicas, reducción de malas hierbas y especies invasoras, haciendo más efectivo el uso de recursos escasos (como el agua), y mejorando los servicios ecosistémicos (almacenamiento de carbono, biodiversidad, prevención de erosión y otras llamadas catástrofes naturales). Esta es la premisa de la intensificación ecológica. Involucra el manejo de sistemas vivos, reconociendo y contribuyendo a su complejidad y diversidad, y utilizando un amplio rango de interacciones que regulen estos ecosistemas.

El uso de la biodiversidad de esta manera significa el estudio de la asociación de plantas y animales en el espacio y el tiempo; al igual que la utilización de procesos biológicos, a través de ambos tanto la competencia entre ellos como su complementariedad. Para lograr esto, primero requerimos caracterizar esta biodiversidad y sus funciones, pero también, obviamente, necesitamos conservarla.

Apoyamos esta conferencia, económicamente y a través de la participación de nuestros científicos ubicados en CATIE a través de la Plataforma de Intercambio Científico "PCP Sistemas Agroforestales con Cultivos Perennes". Esperamos que los debates e intercambios iniciados o que las decisiones tomadas durante esta conferencia hagan una contribución significativa al reto de utilizar la biodiversidad para el beneficio de los finqueros pobres de esta y de las siguientes generaciones.

Robert Habib
Director Científico, Cirad

Welcoming words of Robert Habib, Scientific Director, Cirad

Welcome to the sixth Wallace conference «Agrobiodiversity in Mesoamerica, from Genes to Landscapes».

Increasing agricultural production is still a major priority, but intensive agricultural strategies based on massive use of pesticides, chemical fertilizers, water and fossil fuels are now seriously put into question. It is time to break with the conventional agricultural model in which systems are increasingly artificial and uniform, and also severely strain ecosystems. Agricultural systems should be designed to use ecological processes and functions for many purposes. These include controlling biological pests, reducing weeds and invasive species, making more efficient use of scarce resources (such as water), and enhancing ecological services (carbon storage, biodiversity, prevention of erosion and others so-called natural catastrophes). This is the premise of ecological intensification. It involves managing living systems, recognizing and supporting their complexity and diversity, and using the broad range of interactions that regulate those systems.

Using biodiversity in this way means studying the association of plants and animals in space and time, as well as using biological processes, through both the competition between them and their complementarity. To this aim, we first require to characterize this biodiversity and its functions, but also, obviously, to conserve it.

We support this conference, through a financial grant and through the participation of our scientists seconded to Catie to the Scientific Partnership Platform "PCP Agroforestry Systems with Perennial Crops". We hope that the debates and exchanges initiated or decisions taken during this conference will make a distinct contribution to this challenge of using biodiversity for the benefits of the poor farmers of this and the next generations.

Robert Habib
Scientific Director, Cirad

Palabras de Bienvenida por parte de Sara J. Scherr
Presidente de EcoAgriculture Partners

En representación de Ecoagriculture Partners, me gustaría unirme a Jose Joaquín Campos y Emile Frison y darles la bienvenida a la VI Conferencia Científica Henry A. Wallace "Agrobiodiversidad en Mesoamérica, de Genes a Paisajes". No hace mucho tiempo, el tema de la agrobiodiversidad era abordado principalmente por un pequeño grupo de científicos especialistas y organizaciones, además de profesionales del desarrollo que a menudo trabajaban fuera de la corriente principal. La conservación de la biodiversidad se enfocaba en especies silvestres y hábitats naturales; el desarrollo agrícola se enfocaba en los pocos cultivos alimenticios y comerciales y en las razas de ganado.

Sin embargo, los últimos años han traído consigo un cambio dramático. La diversidad de las especies agrícolas y las especies silvestres y servicios ecosistémicos asociados a ellas son cada vez más considerados como un componente crucial de la biodiversidad y como una característica crítica de los sistemas agrícolas que serán resilientes ante los efectos del cambio climático. Mientras tanto, a medida que nuestro conocimiento sobre los agroecosistemas se incrementa, científicos y administradores de tierras observan como los beneficios de la agrobiodiversidad dependen más allá de la riqueza de especies. Es decir, necesitamos asegurar la diversidad desde la escala genética hasta la de los grandes paisajes.

Esta conferencia unirá a científicos líderes que compartirán los resultados de sus investigaciones recientes, a través de diferentes escalas y definirá prioridades para las investigaciones futuras y las acciones que deben realizarse para garantizar que conservemos y utilicemos de manera eficiente los ricos recursos de la agrobiodiversidad de manera global y particularmente en Mesoamérica.

Gracias por acompañarnos

Sara J Scherr
Presidente, EcoAgriculture Partners

Welcome from Sara J. Scherr, President of EcoAgriculture Partners

On behalf of EcoAgriculture Partners, I would like to join JJ Campos and Emile Frison in welcoming you to the 6th Henry A. Wallace Scientific Conference on "Agrobiodiversity in Mesoamerica, from Genes to Landscapes." Until not long ago, the theme of agrobiodiversity was addressed mainly by a small number of specialist scientists and organizations, and by agricultural development practitioners often operating outside the mainstream. 'Biodiversity conservation' focused on wild species and natural habitats; 'agricultural development' focused on the few dominant food and commercial crops and livestock breeds.

But the last few years have brought a dramatic shift. The diversity of agricultural species, and the wild species and ecosystem services associated with them, are increasingly seen as a crucial component of biodiversity, and as a critical feature of agricultural systems that will be resilient in the face of climate change. Meanwhile, as our understanding of agroecosystems has deepened, scientists and land managers are seeing that the benefits of agrobiodiversity rely on far more than species richness. Rather, we need to ensure diversity from the genetic scale to large landscapes.

This meeting will bring together leading scientists to share results of recent research, across scales, and define priorities for future research and action to ensure that we conserve and effective utilize the rich resources of agrobiodiversity globally, and particularly in Mesoamerica.

Thanks for joining us

Sara J Scherr
President, EcoAgriculture Partners

Henry A. Wallace/CATIE – 6th Conference
of the Inter-American Series of Scientific Conferences
Agrobiodiversity in Mesoamerica: from genes to landscapes

September 20-24, 2010
CATIE Headquarters, Turrialba, Costa Rica

Monday, September 20	
06:00 - 09:00	Mist-netting birds in CATIE's Coffee Collection
08:00 - 12:00	Guided visit to CATIE's Genetic Collections
08:30 - 12:00	Conference registration open
12:00 - 13:30	***Lunch at CATIE's Cafeteria***
13:30 - 18:00	Registration continues Open meeting: Creating a platform for strengthening agricultural research and development in Latin America and the Caribbean Organized by Simone Staiger (s.staiger@cgiar.org). Location: Training Building, Room 1
17:00-18:00	Chairs and rapporteurs meeting**.** Location: GAMMA Conference Room
Tuesday, September 21	
07:30 - 08:00	Registration continues
08:00 - 08:30	Welcome (Jose Joaquin Campos, Director General, CATIE; John Beer, Director Research and Development Division, CATIE)
08:30 - 09:10	Keynote: What is agrobiodiversity and why is it important? (Víctor Villalobos, Director General, IICA)
09:10 - 09:30	Introduction to conference. Fabrice DeClerck (CATIE)
09:30 - 09:50	***Coffee break***
09:50 - 12:30	**Session 1: Current status of agrobiodiversity in important agricultural landscapes in Mesoamerica—coffee, cocoa, banana, pastures. Session leaders: Charles Staver and Fabrice DeClerck. Rapporteur: Graciela Rusch**
09:50-10:10	Trees on farm. Antonio Trabucco (Catholic University of Leuven)
10:10-10:30	Agrobiodiversity in the Mesoamerican Landscape. Bastiaan Louman, Pablo Imbach and Claudia Bouroncle (CATIE)
10:30 - 10:50	Tree diversity in cocoa agroforestry systems of Central America. Olivier Deheuvels (CIRAD) and Eduardo Somarriba (CATIE)
10:50 - 11:10	Bananas and agrobiodiversity in Mesoamerican agricultural landscapes. Charles Staver (Bioversity)
11:10 - 11:30	Status of coffee. Jeremy Haggar (CATIE)
11:30 - 12:30	*Panel discussion of Session 1*
12:30 - 14:00	***Lunch***
14:00 - 17:15	**Session 2: Current status of the conservation and use of unique genetic resources with their center of origin in Mesoamerica. Session leaders: Xavier Scheldeman and Marleni Ramírez (Bioversity). Rapporteur: Daniel Debouck (CIAT)**
14:00 - 14:30	Keynote: From the cradle: *transcendence of Mesoamerican crops.* David Williams (Bioversity)
14:30 - 14:50	Status of conservation and use of Mesoamerican genetic resources of *Phaseolus* beans. Daniel Debouck (CIAT), Jesús Salcedo and Nora Castañeda

	(Bioversity)
14:50 - 15:10	The conservation and use of the *Capsicum spp*. genepool in Mesoamerica. César Azurdia (Ministry of the Environment Guatemala), Maarten van Zonneveld and Xavier Scheldeman (Bioversity)
15:10 - 15:30	***Coffee break***
15:30 - 15:50	Genetic resources of tree crops. Reinhold Muschler (CATIE)
15:50 - 16:10	Conservation status of forest genetic resources in Mesoamerica. Judy Loo (Bioversity) and Jesús Vargas (Colegio de Posgraduados, Mexico)
16:10 - 16:30	Impact evaluation of CATIE's seed bank. Carolina Rita Girón (CATIE graduate student)
16:30 - 17:15	*Panel discussion of Session 2*
19:00	***Welcome dinner at CATIE's Botanical Garden***

Wednesday, September 22	
08:30 - 17:30	**Session 3: The functional role of agrobiodiversity: from farms to landscapes. Session leaders: Fabrice DeClerck and Jacques Avelino. Rapporteur: Tamara Benjamin and Alejandra Martinez**
08:30 - 09:00	Pest and disease control function of agrobiodiversity at the field scale. Alain Ratnadass (CIRAD)
09:00 - 09:20	Functional agrobiodiversity, a framework for enhancing on-farm ecosystem function. Graciela Rusch (NINA)
09:20 - 09:40	Agrobiodiversity and human nutrition. Fabrice DeClerck (CATIE), Roseline Remans and Cheryl Palm (Columbia University), and Jessica Fanzo (Bioversity)
09:40 - 10:00	***Coffee break***
10:00 - 10:20	The influence of the structure of cocoa-based agroforestry systems on ecological services in Talamanca, Costa Rica. Olivier Deheuvels (CIRAD), Rolando Cerda and Eduardo Somarriba (CATIE)
10:20 - 10:40	Effects of on-farm and landscape botanical diversity on insect pests of coffee agroforestry systems. Sanford D. Eigenbrode, Nilsa A. Bosque-Pérez, Mariangie Ramos and Edgar Varón (University of Idaho)
10:40 - 11:00	Biodiversity and low-external-input crop management in the North Central USA. Matt Liebman (Henry Wallace Chair) and Robin Gomez (Iowa State University)
11:00 - 12:00	*Panel discussion*
12:00 - 13:30	***Lunch***
13:30 - 13:50	The functional role of agrobiodiversity at landscape scales. Teja Tscharntke (University of Göttingen)
13:50 - 14:10	Forests and trees in Mesoamerican agricultural landscapes: functional diversity, environmental services and the effects of global change. Bryan Finegan (CATIE)
14:10 - 14:30	Reduction of quarantine pest populations in ornamental farms: the role of secondary forests and functional traits of cover crops. Tamara Benjamin (Purdue University/CATIE)
14:30 - 14:50	Landscape context and movement of coffee pests. Jacques Avelino (CIRAD), Fabrice DeClerck, Amada Olivas, Cipriano Rivera and Alí Romero (CATIE), and

	Héctor Cruz (University of Tolima)
14:50 – 15:10	Landscape scale diversity and hydrological functions. Heidi Asbjornsen (Iowa State University)
15:10 - 15:30	***Coffee break***
15:30 - 16:30	*Structured panel discussion* on the functional role of agrobiodiversity at farm and landscape levels: key research questions and action points
16:30 - 17:30	Poster session
Thursday, September 23	
08:30 - 12:30	**Session 4: Awareness and understanding of agrobiodiversity among stakeholders in Mesoamerica—public sector, civil society, community-based organizations, university education. Session leaders: Elizabeth Goldberg and Glenn Galloway. Rapporteur: Per Rudebjer**
08:30 - 09:00	Implementing biodiversity-related treaties in Mesoamerica. Marleni Ramírez (Bioversity)
09:00 - 09:30	Engaging stakeholders in the implementation of international agreements in Mesoamerica. Silvana Masseli (Universidad del Valle, Guatemala)
09:30 - 10:00	A network for agrobiodiversity in Mesoamerica. Nevio Bonilla (REMERFI/SICTA)
10:00 - 10:20	***Coffee break***
10:20 - 10:40	Agrobiodiversity in higher education; presentation of pre-conference study. Margarita Baena (Bioversity), Nelly Vásquez (CATIE) and Glenn Galloway (CATIE Graduate School)
10:40 - 11:00	Markets for agrobiodiversity: lessons learned from certification. (Starbucks Coffee)
11:00 - 11:20	Financing biodiversity in production landscapes of Central America. Oscar Murga (BCIE)
11:20 - 11:40	The importance of information for stakeholders. Randall García (INBio)
11:40 - 12:30	*Panel discussion:* Identification of bottlenecks and opportunities for conservation and use of agrobiodiversity
12:30 - 13:30	***Lunch***
13:30 - 15:30	**Session 5: Factors affecting agrobiodiversity over the next 10-50 years—climate change, urbanization, global commodity trends, niche markets, biotechnology, declining farm population, ecotourism, ecosystem services. Session leaders: Jeffrey Milder y Bruno Rapidel**
13:30 - 14:00	Keynote. The prospects for agrobiodiversity in 2050: key economic and policy factors. Sara J. Scherr and Jeffrey Milder (EcoAgriculture)
14:00 - 14:30	Plant genetic resources and climate change: opportunities and challenges. Xavier Scheldeman, Maarten Van Zonneveld and Nora Castañeda (Bioversity), and Andy Jarvis (CIAT)
14:30 - 15:30	Recapitulation of main points of Sessions 1-4 (Panel with sessions rapporteurs)
15:30 - 15:50	***Coffee break***
15:50 - 17:30	**Session 6: Break out session**
15:50 - 16:00	*Introduction to the break out session:* Visions and pathways—how can CATIE and its partners address the threats to and take advantage of the opportunities for agrobiodiversity conservation and use. Bruno Rapidel (CIRAD)

16:00 - 17:30	*Break out session in small groups* 1) Conservation and use of native diversity 2) Functional agrobiodiversity 3) Education for conservation and use of agrobiodiversity 4) Policies for conservation and use of agrobiodiversity 5) Public-private collaboration for conservation and use of agrobiodiversity

Friday, September 24	
08:00 - 8:30	Keynote: Which way forward? Dr. Ronnie deCamino (CATIE)
08:30 - 09:30	Session 6 continues in break out groups
09:30 - 09:50	***Coffee break***
09:50 - 10:50	Report of 5 break out groups in plenary
10:50 - 11:50	Open discussion
11:50 - 12:00	Concluding remarks and closing (Charles Staver and Fabrice DeClerck)

Henry A. Wallace/CATIE –VI Conferencia de la Serie Interamericana de Conferencias Científicas Agrobiodiversidad en Mesoamérica: de Genes a Paisajes

20 al 24 de setiembre de 2010
Sede Central del CATIE, Turrialba, Costa Rica

Lunes 20 de setiembre	
06:00 - 09:00	Capturas de aves en la Colección de Café del CATIE
08:00 - 12:00	Visita guiada a las Colecciones de Germoplasma del CATIE
08:30 – 12:00	Registro de participantes
12:00 - 13:30	***Almuerzo***
13:30 - 18:00	Registro de participantes a la conferencia Reunión abierta: Creando una plataforma para el fortalecimiento de la investigación agrícola y el desarrollo en América Latina y el Caribe Organizada por Simone Staiger (s.staiger@cgiar.org). Lugar: Edificio de Capacitación, Sala 1
17:00	Reunión de encargados de sesión y encargados de síntesis ("Rapporteurs") Lugar: Sala GAMMA
Martes 21 de setiembre	
07:30 - 08:00	Registro de participantes
08:00 - 08:30	Bienvenida (José Joaquín Campos, director general del CATIE; John Beer, director de la División de Investigación y Desarrollo del CATIE)
08:30 - 09:10	Idea central: ¿Qué es la agrobiodiversidad y por qué es importante? (Víctor Villalobos, director general del IICA)
09:10 - 09:30	Introducción a la conferencia. Fabrice DeClerck (CATIE)
09:30 - 09:50	***Refrigerio***
09:50 - 12:30	**Sesión 1: Estado actual de la agrobiodiversidad en paisajes agrícolas de importancia en Mesoamérica—café, cacao, banano, pasturas. Líderes de sesión: Charles Staver y Fabrice DeClerck. Síntesis: Graciela Rusch**
09:50 - 10:10	Árboles en finca. Antonio Trabucco (Catholic University of Leuven)
10:10-10:30	Agrobiodiversidad en el paisaje mesoamericano. Bastiaan Louman, Pablo Imbach and Claudia Bouroncle (CATIE)
10:30 - 10:50	Diversidad de árboles en sistemas agroforestales de cacao de Centro América. Olivier Deheuvels (CIRAD) y Eduardo Somarriba (CATIE)
10:50 - 11:10	Bananos y agrobiodiversidad en paisajes agrícolas de Mesoamérica. Charles Staver (Bioversity)
11:10 - 11:30	Estatus del café. Jeremy Haggar (CATIE)
11:30 - 12:30	Mesa redonda de la sesión 1
12:30 - 14:00	***Almuerzo***
14:00 - 17:15	**Sesión 2: Estado actual de la conservación y el uso de los recursos genéticos únicos con centro de origen en Mesoamérica. Líderes de sesión: Xavier Scheldeman y Marleni Ramírez (Bioversity). Síntesis: Daniel Debouck (CIAT)**

14:00 - 14:30	Idea central: *Desde la cuna: transcendencia de los cultivos mesoamericanos.* David Williams (Bioversity)
14:30 - 14:50	Estado de la conservación y uso de los recursos genéticos de frijoles *Phaseolus spp.* en Mesoamérica. Daniel Debouck (CIAT), Jesús Salcedo (Bioversity) y Nora Castañeda (Bioversity)
14:50 - 15:10	Conservación y uso del acervo genético del *Capsicum spp.* en Mesoamérica. César Azurdia (Ministro del Ambiente Guatemala) y Xavier Scheldeman (Bioversity)
15:10 - 15:30	**Refrigerio**
15:30 - 15:50	Recursos genéticos de los cultivos arbóreos. Reinhold Muschler (CATIE)
15:50 - 16:10	Estado de la conservación de los recursos genéticos forestales de Mesoamérica. Judy Loo (Bioversity) y Jesús Vargas (Colegio de Posgraduados, México)
16:10 - 16:30	Impacto del uso de las colecciones de CATIE. Carolina Rita Girón (estudiante de maestría del CATIE)
16:30 - 17:15	Mesa redonda de la sesión 2
19:00	***Cena de bienvenida en el Jardín Botánico del CATIE***

Miércoles 22 de setiembre	
08:30 - 17:30	**Sesión 3: El papel funcional de la agrobiodiversidad: desde las fincas a los paisajes. Líderes de la sesión: Fabrice DeClerck y Jacques Avelino. Síntesis: Tamara Benjamin y Alejandra Martínez**
08:30 - 09:00	Función de la agrobiodiversidad como controladores de plagas y enfermedades a nivel de finca. Alain Ratnadass (CIRAD)
09:00 - 09:20	Agrobiodiversidad funcional: un marco para mejorar la función ecosistémica en la finca. Graciela Rusch (NINA)
09:20 - 09:40	Agrobiodiversidad y nutrición humana. Fabrice DeClerck (CATIE), Roseline Remans, Cheryl Palm (Universidad de Columbia) y Jessica Fanzo (Bioversity)
09:40 - 10:00	***Refrigerio***
10:00 - 10:20	Influencia de la estructura de sistemas agroforestales con cacao como base en la provisión de servicios ecológicos en Talamanca, Costa Rica. Olivier Deheuvels (CIRAD), Rolando Cerda (CATIE) y Eduardo Somarriba (CATIE)
10:20 - 10:40	Efectos de la diversidad botánica en la finca y del contexto de paisaje sobre las plagas de insectos en sistemas agroforestales de café. Sanford D. Eigenbrode, Nilsa A. Bosque-Pérez, Mariangie Ramos y Edgar Varón (Universidad de Idaho)
10:40 - 11:00	Biodiversidad y manejo de cultivos, con baja utilización de insumos externos, en la zona Nor-central de los Estados Unidos. Matt Liebman (catedrático Henry Wallace) y Robin Gómez (Universidad Estatal de Iowa)
11:00 - 12:00	Mesa redonda
12:00 - 13:30	***Almuerzo***
13:30 - 13:50	El papel funcional de la agrobiodiversidad a nivel de paisaje. Teja Tscharntke (Universidad de Göttingen)
13:50 - 14:10	Bosques y árboles en paisajes agrícolas Mesoamericanos: diversidad funcional, servicios ambientales y los efectos del cambio climático. Bryan Finegan (CATIE)

14:10 - 14:30	Reducción de poblaciones de pestes en cuarentena en cultivos ornamentales: El papel de los bosques secundarios y rasgos funcionales de cultivos con cobertura. Tamara Benjamin (Universidad de Purdue/CATIE)
14:30 - 14:50	Contexto de paisaje y movimiento de las pestes del café. Jacques Avelino (CIRAD), Fabrice DeClerck, Amada Olivas, Cipriano Rivera, Alí Romero (CATIE) y Héctor Cruz (Universidad del Tolima)
14:50 - 15:10	Diversidad a escala de paisaje y funciones hidrológicas. Heidi Asbjornsen (Universidad Estatal de Iowa)
15:10 - 15:30	***Refrigerio***
15:30 - 16:30	Mesa redonda estructurada sobre el papel funcional de la agrobiodiversidad a nivel de finca y paisaje: preguntas de investigación claves y puntos de acción
16:30 - 17:30	Sesión abierta de pósters

Jueves 23 de setiembre	
08:30 - 12:30	**Sesión 4: La concienciación y comprensión de la agrobiodiversidad entre los actores interesados en Mesoamérica—sector público, sociedad civil, organizaciones de base comunitaria, academia superior. Líderes de la sesión: Elizabeth Goldberg y Glenn Galloway. Síntesis: Per Rudebjer**
08:30 - 09:00	Hacia la implementación de los tratados de biodiversidad en Mesoamérica. Marleni Ramírez (Bioversity)
09:00 - 09:30	Comprometiendo a los actores interesados en la implementación de los acuerdos internacionales en Mesoamérica. Silvana Masseli (Universidad del Valle, Guatemala)
09:30 - 10:00	Una red para la agrobiodiversidad en Mesoamérica. Nevio Bonilla (REMERFI/SICTA)
10:00 - 10:20	***Refrigerio***
10:20 - 10:40	Agrobiodiversidad en la educación superior; presentación del estudio previo a la conferencia. Margarita Baena (Bioversity), Nelly Vásquez (CATIE) y Glenn Galloway (Escuela de Posgrado del CATIE)
10:40 - 11:00	Mercados para la agrobiodiversidad: lecciones aprendidas de la certificación. (Starbucks)
11:00 - 11:20	Financiando la biodiversidad en paisajes productivos de Centroamérica. Oscar Murga (BCIE)
11:20 - 11:40	La importancia de la información para tomadores de decisiones. Randall García (INBio)
11:40 – 12:30	Mesa redonda: Identificación de los atascos y las oportunidades para la conservación y el uso de la agrobiodiversidad
12:30 - 13:30	***Almuerzo***
13:30 - 15:30	**Sesión 5: Factores que afectarán a la agrobiodiversidad en los próximos 10 a 50 años—cambio climático, urbanización, tendencias globales de artículos de consumo, nichos de mercados, biotecnología, disminución de la población en las zonas rurales, ecoturismo, servicios ecosistémicos. Líderes de la sesión: Jeffrey Milder y Bruno Rapidel**
13:30 - 14:00	Idea central. Los prospectos para la agrobiodiversidad para el año 2050: principales factores políticos y económicos. Sara J. Scherr y Jeffrey Milder (EcoAgriculture)

14:00 - 14:30	Recursos genéticos de las plantas y cambio climático: oportunidades y retos. Xavier Scheldeman, Maaten Van Zonneveld, Nora Castañeda (Bioversity) y Andy Jarvis (CIAT)
14:30 - 15:30	Recapitulación de los puntos principales de cada sesión (Panel con los encargados de las síntesis de cada sesión)
15:30 - 15:50	***Refrigerio***
15:50 - 17:30	**Sesión 6. Sesión de discusión**
15:50 - 16:00	Introducción a las sesiones de discusión: visiones y trayectorias - cómo pueden el CATIE y sus aliados enfrentar las amenazas a la agrobiodiversidad y aprovechar las oportunidades para su conservación y uso. Bruno Rapidel (CIRAD)
16:00 - 17:30	Sesiones de discusión en grupos pequeños 1) Conservación y uso de la diversidad nativa 2) Agrobiodiversidad funcional 3) Educación para la conservación y el uso de la agrobiodiversidad 4) Políticas para la conservación y el uso de la agrobiodiversidad 5) Colaboración pública-privada para la conservación y el uso de la agrobiodiversidad

Viernes 24 de setiembre	
08:00 - 08:30	Presentación magistral: ¿Cuál es el camino a seguir? Dr. Ronnie deCamino (CATIE)
08:30 - 09:30	Continúa la discusión de la Sesión 6 en grupos pequeños
09:30 - 09:50	***Refrigerio***
09:50 - 10:50	Informe de cinco de los grupos pequeños en plenaria
10:50 - 11:50	Discusión abierta
11:50 - 12:00	Comentarios finales y clausura (Charles Staver y Fabrice DeClerck)

Reunión Preconferencia: Hacia una Plataforma para Fortalecer Capacidades de Investigación y Desarrollo Agrícola en América Latina y el Caribe

Lugar: Sala de Capacitación, CATIE

Contexto
La capacitación se mencionó como una actividad altamente relevante en todos los ejercicios de priorización de investigación y desarrollo en América Latina y el Caribe. En el contexto de la investigación y desarrollo agrícola, la región dispone de varias organizaciones de talla nacional, regional e internacional que implementan programas de entrenamiento. Aún constatamos poca coordinación entre los programas y una falta de recursos humanos y financieros para responder a la alta demanda que ninguna organización es capaz de satisfacer por sí sola.

Los objetivos principales de la plataforma son los siguientes:

1. Lograr una mejor coordinación y promoción de las iniciativas relacionadas con fortalecimiento de capacidades en la región
2. Identificar la demanda y evitar duplicación en la oferta
3. Responder a la demanda a través de alianzas que fortalezcan nuestros socios estratégicos en la región
4. Movilizar recursos para los socios y de esa manera incrementar sus actividades de capacitación

Los objetivos de la reunión son conocer los enfoques y actividades de capacitación de las organizaciones regionales, presentar en más detalle la idea de la plataforma e identificar áreas y socios prioritarios y relevantes para una acción colectiva. CIAT estaría dispuesto a invertir recursos en la coordinación de actividades que faciliten el camino para la creación de dicha plataforma.

Público meta:

- Representantes de los Centros del CGIAR participantes en el evento Wallace
- Representantes de CATIE e IICA
- Participantes del evento Wallace que tengan interés en el tema

Agenda para el 20 de Septiembre pm

14:00 - Bienvenida
14:15 - Enfoques y actividades de capacitación de socios regionales
15:00 - Presentación de la idea de la plataforma
15:30 - Discusión
16:00 - Identificar áreas y socios prioritarias y relevantes para una acción colectiva
16:45 - Próximos pasos
17:00 - Cierre
17:15 - 18:00 Análisis por el grupo organizador
Para confirmar su participación en la reunión y mayor información contactar a Simone Staiger (s.staiger@CGIAR.ORG)

Preconference Meeting: Creating a platform for strengthening capacity for agricultural research and development in Latin America and the Caribbean

Location: Extension Building, CATIE

Context
Capacity building is often cited as a critical element to be prioritized to strengthen agriculture research and development in Latin America and the Caribbean. In the context of agricultural research and development, the region benefits from multiple national, regional and international organizations that implement training programs. Unfortunately there is little coordination between programs and a general lack of human and financial resources to respond to the high demand that no organization is capable of delivering alone.

The objectives of the platform are:

1. Achieve better coordination and promotion of capacity building activities in the region.
2. Identify the sources of demand for said activities and avoid duplicating efforts.
3. Improve our response to demands via alliances that strengthen strategic partnerships in the region.
4. Mobilize resources that foster increased capacity building activities.

The objective of the meeting is to provide a space where regional partners can present the thematic areas in which they provide capacity building activities focusing on the particular strengths of each partner. We will also give a more detailed presentation of the proposed platform. We hope that this meeting will permit use to identify key thematic areas and partners for building a collective action. CIAT is willing and able to invest resources in coordination activities that facilitate the path towards the creation of this platform.

Target audience:

- CGIAR representatives participating in the Wallace Conference
- CATIE and IICA representatives.
- Any participant of the Wallace Conference with interest in participating

Agenda for the meeting

14:00 - Welcome
14:15 – Thematic strengths and capacity building activities of regional partners
15:00 – Presentation on the Regional Platform
15:30 - Discussion
16:00 – Discussion identifying relevant priority areas for collaborative action
16:45 – Next steps
17:00 - Closing
17:15 - 18:00 Analyses by the organizing committee

To confirm your participation in the meeting, or for more information please contact Simone Staiger (s.staiger@CGIAR.ORG)

What is agrobiodiversity and why is it important
Víctor Villalobos, Director General IICA

In 1976 Dr. Víctor Villalobos obtained his Bachelor's Degree in Agronomy at the National School of Agriculture in Chapingo, Mexico; in 1979 he obtained his Master of Sciences in Plant Genetics at the Graduate College of Chapingo; and in 1983 he obtained his PhD at the University of Calgary in Canada (he wrote his thesis on Plant Morphogenesis).

Dr. Villalobos is an internationally recognized expert in the agricultural and biological fields, as well as in the natural and genetic resources fields. He is recognized in the Hemisphere for his many outstanding contributions in these areas. He has worked in a variety of positions such as full professor, research leader, international appointee, government official, administration executive, government mediator, and leader for multidisciplinary groups on analysis and decision-making. In the course of his long career, he has made major contributions and has supported innovations in the areas of plant production and natural resources conservation.

Dr. Villalobos has been appointed twice by the Mexican President as an Undersecretary in the Federal Government, the first time as Natural Resources Undersecretary for the Secretariat of Environment, Natural Resources and Fisheries (SEMARNAP), the second time, as Agriculture Undersecretary for the Secretariat of Agriculture, Ranching, Rural Development, Fisheries and Food (SAGARPA).

He has also been involved with international organizations for technical cooperation. He was the Director of the Agriculture Division (1986-1990) in the Tropical Agronomic Center for Research and Teaching (CATIE). He has also served as the Executive Official on Biotechnology (1990-1995) and President of the Board of Directors (1999-2003) of CATIE. As a researcher, Dr. Villalobos has encouraged the use of agriculture biotechnology as a tool for sustainable production, and to ensure enough food production for Mexico and the world. Based on his long experience and several fields of expertise, Dr. Villalobos has published two books: "Tissue Culture Contribution to Plant Improvement and Conservation" (1982); and "Transgenic Plants: Opportunities and Threats" (2007). Dr. Villalobos has been instructor for undergraduate and graduate programs at the Autonomous University of Chapingo (UACh); the Graduate College in Agriculture Sciences (COLPOS); and the Center for Research and Advanced Studies of the National Polytechnic Institute (CINVESTAV). Internationally, he has been an instructor in the Tropical Agronomic Center for Research and Teaching (CATIE).

Dr. Villalobos has been instructor for advanced courses in around the world. He has received distinguished awards for his outstanding scientific and academic contributions. He is a member Royal Agriculture and Forestry Academy of Sweden; Honorary Doctor's Degree of CATIE (2004); Member of the "Scoping Team" for the Consultant Group on International Agriculture Research (CGIAR); Member of the Science and Technology Commission for the National Council of Science and Technology (CONACYT) and California University (UC-Mexus). The President of Mexico distinguished Dr. Villalobos for his contribution to agricultural biotechnology. He is Professor Ad Honorem for the Graduate College of Chapingo and distinguished alumni of the Autonomous University of Chapingo.

Introduction to the Conference

Fabrice DeClerck[1] and Charles Staver[2]

[1]Division of Research and Development, CATIE, Turrialba, Costa Rica. [2]Bioversity International, Commodities for Livelihoods Program, Montpellier, France.

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It is a rather obvious, but often overlooked fact that what makes planet earth unique in comparison to the other planets that share our solar system is that ours is the only one with a biosphere, a rather thin layer of living, breathing, evolving assemblage of organisms representing a wide diversity of life forms. This biodiversity encompassed by this biosphere has alternatively been described as the "*terrestrial operating system*" and more recently, as the life insurance of life itself. These two metaphors emphasizing the functional contribution that biodiversity makes to our day-to-day lives. 2010 is the International Year of Biodiversity, a time to pause, and take stock the current status of this biodiversity. Unfortunately, the prognosis is not good, with biodiversity numbers continuing to fall, while threats to biodiversity, from genes to landscapes, continue to rise.

The purpose of this conference is to pause, and reflect on a subset of this biodiversity – those species than inhabit agriculturally dominated landscapes, or agrobiodiversity, and even more specifically, the Mesoamerican landscape in particular. The aim of this conference is to bring together partners from multiple sectors of society to take stock of current situation for Mesoamerica, explore the contributions that agrobiodiversity makes to our well-being, and develop a strategic plan for ensuring the long-term conservation and sustainable use of regional agrobiodiversity.

Biographical sketch

I was born in Leuven Belgium but spent the majority of my life in the US. I obtained my BSc. in Plant and Forest Ecology from Humboldt State University, my MSc in Agroforesty from Iowa State University, and my PhD in Biogeography from the University of California Davis. I completed a two-year postdoctoral fellowship with the Earth Institute at Columbia University working on integrating ecology into development strategies. I have been at CATIE since then working as a professor of landscape and community ecology with the Livestock and Environmental Management Group. My research interests span both theoretical and applied ecology, though both focus on the relationship between biodiversity and ecosystem functioning. My theoretical models how changes in species diversity alters such processes as productivity, carbon sequestration, resistance and resilience to disturbance in temperate and tropical forests. My applied work also focuses on biodiversity and ecosystem function, though in developing countries where rates of poverty and environmental degradation are often high. Conservationists have tended to focus on reserves for conservation of biodiversity, while an increasing number have more recently argued that much biodiversity can be maintained in managed landscapes. My work takes this one step further asking whether biodiversity can not only be conserved in managed landscapes, but whether biodiversity can play an active role in poverty alleviation by providing critical ecosystem services? How can biodiversity be managed from fields to landscapes in order to maximize both ecosystem functioning and conservation?

Session 1: Current status of agrobiodiversity in important agricultural landscapes in Mesoamerica – coffee, cocoa, banana, pastures

Session objective: To generate an overview of the status and trend of agrobiodiversity of the principal agricultural landscapes and their relationship to natural areas

Key questions:

1. How can agrobiodiversity be monitored simply and effectively at the landscape level?
2. What are the agricultural landscapes in which agrobiodiversity is declining?
3. What are the major trends in the agricultural landscapes that have been prioritized by CATIE and its partners?
4. What type of agrobiodiversity is increasing and what type is decreasing in different agricultural landscapes?
5. What interfaces between agricultural landscapes and natural areas are most conflictive?
6. What interfaces between agricultural landscapes and natural areas are most compatible?
7. What are priority areas for managing problems and compatibilities within and between agricultural and natural landscapes?

Expected outcomes:

1. Overview of agrobiodiversity status and trends of the landscapes of Mesoamerica
2. Identification of crops and management systems that are most problematic for and most compatible with agrobiodiversity and natural biodiversity
3. Alternative approaches to monitoring agrobiodiversity of different agricultural landscapes

Trees on farm

Trabucco A.[1], Zomer R.[2], Coe R.[3], Somarriba Chavez E.[4], Place F.[3], De Clerck F.[4], Muys B.[1]

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Agroforestry, the inclusion of woody perennials within farming systems, has been both a traditional landuse approach developed by subsistence farmers and a livelihood option promoted by managers and international development efforts. Its practice creates a variation of habitats over mono-stratified croplands, promoting an optimal coexistence between crop production and a rich biodiversity that provides goods and services to both the land managers and global society. However, the extent and spatial distribution of agroforestry has never been quantified leading to widely varied estimates about its importance.

A geospatial analysis of remote sensing derived datasets investigated the global distribution of tree cover on cropland to assess the importance and role of agroforestry among regions. The correspondence and relationships between tree cover, population density and climate datasets in rural areas is analyzed to highlight both existing and potentially achievable tree inclusion levels over cropland as a function of bio-physical constraints.

Among the key results are that agroforestry is a significant feature of agriculture in all regions, that its extent varies significantly across different regions (e.g. more significant in Central America and less in East Asia), that tree cover is strongly positively related to humidity, and that there are mixed relationships between tree cover and population density depending on the socio-cultural contest specific of each region. Specific patterns of tree cover on farms for Central America from this analysis are further explored by farm-level studies on cattle, coffee and cocoa farms in Central America.

Biographical sketch

Antonio Trabucco obtained a BSC/MSC in forestry and hydrology sciences from University of Padua (Italy). Since then, he grew a wide experience and research interest for natural resource management and sustainable development. From 1997 till 2001 he was a post-graduate researcher in remote sensing and eco-hydrological modeling at Center of Space Technologies and Remote Sensing at UC Davis. Soon after, he occupied the position of GIS lab manager at La Selva Biological Station (Costa Rica) with research applications on tropical biology, conservation ecology, natural resources monitoring and management.

In 2004 he moved to the International Water Management Institute (IWMI) in Sri Lanka, where he focused his interest on GIS database development and global analyses of relations between hydrology, vegetation suitability and climate change. In collaboration with ICRAF (Kenya) and ICIMOD (Nepal), he is currently finishing a PhD in Landscape Ecology at the Catholic University of Leuven (Belgium) on the evaluation of trees outside forest for climate change mitigation.

Agrobiodiversity in the Mesoamerican Landscape

Claudia Bouroncle[1], Pablo Imbach[1], Bas Louman[1], Juan Carlos Zamora[1]*

1Global Climate Change Program, Division of Research and Development, CATIE 7170, Turrialba, Costa Rica.
*Presenter

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Mesoamerica is considered one of the most important centers of origin and domestication of numerous plants such as corn and several varieties of chili, beans and cacao. In addition to being cultivated on a large global scale, many of the native crops of the region are still widely grown in traditional systems. Although it is not possible to accurately determine the centers of origin and domestication of many of these crops, the distribution of wild and semi-wild populations of the species selected for analysis identifies two main aspects: (1) they are associated with ancient American cultures and (2) the ecoregions that harbor them are under growing threats from habitat loss, degradation and fragmentation – processes that are accentuated by climate change. We use GIS analysis with recent maps of land use change to analysis and further define the primary threats to the conservation of Mesoamerican wild crop varieties.

Biographical sketch

Claudia Bouroncle specializes in management and conservation of tropical forests and biodiversity. She has addressed this issue both from a research and practice perspective through her work in the design and management of protected area systems, and natural resource management. As a consultant, she works with CATIE and several conservation organizations in Latin America.

Tree diversity in cocoa agroforestry systems of Central America (CATIE, 2007-2008)

Eduardo Somarriba[1], Luis Orozco[1], Olivier Deheuvels[1,2], Marilyn Villalobos[1]

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Cacao is cultivated in Central America by 35 000 poor indigenous and other rural people living in remote zones, often situated around important protected areas of national and international importance. Despite, the cocoa production in Central America (an estimated 5000 tonnes annually) is insignificant in the cocoa world market (over 3.5 million tonnes annually), cacao agroforestry systems are extremely important for these poor farmers, as a source of income, goods (timber, firewood, fruits and medicines) and both, local environmental services (nutrient cycling, pollination, soli quality, ornamental, cultural and aesthetic values) and global services (buffering zone of protected areas, conservation of biodiversity and fixation of atmospheric carbon).

The Central American cacao base line study (1500 households, 250 per country) was jointly implemented between CATIE and eight producer's organizations between March and May, 2007 in 23 districts and 217 communities of six countries. The information was collected to semi-structured interviews, including issues of cacao material and productivity, to producers. Botanical inventories were carried out in 250 temporal plots of 1000 m^2 (20 x 50 m; 25 ha per country) measuring all shade tress (dap ≥10 cm). The livelihoods strategies approach was applied during the cacao base line study. In each country, a local technical team was trained to apply the surveys, forest inventories and manage databases, GPS and others tools.

Our results demonstrate that farmers do not manage (especially pruning) cacao plantations frequently. The shade canopy in cocoa plantations retains 125-153 trees species with a mean density of 121 individuals $ha^{-1.}$. All shade trees managed and used for timber, fruit, firewood and shade. Tree populations were distributed in three vertical strata (low <10 m, medium 10-20 m, and high >20) with a proportion of 35:35:30 (%) of total tree density.

Biographical sketch

Eduardo Somarriba, Nicaraguan, holds a degree in Biology and Natural Resources from UNAN and UCA in Nicaragua. His graduate research explored plant succession on lava flows. He completed his MSc studies at UCR-CATIE in 1983, with an emphasis on sustainable forest management and production. He used models of forest succession based on the of population dynamics of dominant species in the forest. He completed his PhD at the University of Michigan with research on farm diversification in relation social-ecological stability in a border community of Costa Rica. He has held a diversity of posts including working as an plant taxonomist for the Masaya Volcano National Park; as the assistant manager for INTA's rice breeding program; an as a urban forester for the Nicaraguan Ministry of Housing and Human Settlements. He currently is a researcher and professor of tropical agroforestry for CATIE's graduate program, where he has worked on: 1) grazing under forest plantations, 2) population dynamics of natural regeneration of trees in pastures, coffee and cacao, 3) management and design shade coffee and cacao, and 4)

provided advisory services to governments and cooperating in various countries. He is currently Professor of Agroforestry, the leader of CATIE's Central Cocoa Project.

Bananas and agrobiodiversity in Mesoamerican agricultural landscapes

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Abstract:
Bananas are found in four important agricultural landscapes in Mesoamerica – export banana, plantain for export and national markets and smallholder coffee and cocoa. Bananas are also found in small patches and home gardens throughout humid and sub humid regions. Monoculture bananas and plantains occupy over 120,000 and 75,000 hectares respectively. Smallholder coffee with bananas covers roughly 200,000 hectares, while cocoa with banana represents around 20,000 hectares. The agrobiodiversity of each banana landscape was rated using diverse indicators - within crop, associated crops, spontaneous vegetation, pesticide use, nutrient balance, biological control and new pest threats. Export banana is among the least biodiverse landscapes in Mesoamerica characterized by a highly uniform crop and high pesticide and nitrogen use. Positive trends include the increased use of ground cover vegetation, organic soil amendments and biological control and declining nitrogen and nematicide use.

Agrobiodiverstiy is declining in plantain landscapes – more uniform monocrop and increased use of external inputs and irrigation. However, fields are relatively small, the associated land uses are varied and frequent replanting and clean planting material contribute to minimize pesticide use. Banana is the most common secondary crop in smallholder coffee and cocoa fields and produces acceptable yields with minimal external nutrients and no pesticides under moderate tree shade. Few studies document how banana as habitat in mixed systems or monocrop affects faunal diversity. The agrobiodiversity future of banana landscapes depends on factors such as climate change, local and international regulations and the role of science, technology and knowledge (sensu IAASTD study). The compatibility of bananas with trees may provide them with a role in buffer zones and natural area corridors, in view of their potential contribution to habitat diversity.

Biographical sketch

Charles Staver is a senior scientist and coordinator of the sustainable production and marketing project of the Commodities for Livelihoods program at Bioversity International, Montpellier, France. He is the lead scientist of two grants on banana production with trees, bringing together ecophysiology, farmer experimentation and value chains. He has a PHD from Cornell University and worked for 14 years with a CATIE IPM project based in Nicaragua. He has also worked in Peru, Venezuela and Ecuador. He is the co-author of the book Ecological Management of Agricultural Weeds and has published articles on weed management in coffee and bush fallow agriculture and participatory and pro-poor approaches to IPM.

Status of Coffee

Jeremy Haggar[1]

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Coffee production covers 0.9 million hectares and provide livelihoods for 290,000 families in Central America. The majority of this is shaded coffee agroforestry systems, representing over 90% of coffee area in Nicaragua and Costa Rica. A compilation of different studies of tree diversity in coffee across Mesoamerica found a total of 627 species from 98 families, 92% native to the region, though most species were very infrequent. Small-holder farms have been found to have a greater diversity of tree species ranging from 8 to over 20 species per farm. On large farms shade tends to be dominated by legumes such as by *Inga spp*. *Erythrina spp*. or *Gliricidia sepium*. Inventories of tree species diversity on 16 small-holder farms in Nicaragua three years apart indicate a significant turnover among the 110 trees species present. A study of the replacement of coffee agroforestry by other land-uses in Guatemala indicated that other plantation systems can replace coffee agroforests in terms of carbon sequestration and soil and water conservation, but not in terms of habitat structure similar to native forest.

Coffee agroforestry systems provide livelihoods for 291,000 farming families in Central America. Average income from trees and other species associated with the coffee rarely surpasses 20% of gross income from the coffee agroforestry system, though studies in Nicaragua found 80-90% of household needs for cooking bananas and firewood, basic products for food security and energy, were met from coffee agroforestry systems. Nevertheless, a large number of tree species present in small numbers seem to provide no significant benefit to the farmers. In spite of several certification schemes that promote shade in coffee, the only one that requires the presence of a structurally and species diverse shade is the Bird-friendly certification. The biodiversity conserving characteristics coffee agroforests, a unique feature of these systems, thus still does not receive significant compensation or support from society.

Biographical sketch

Jeremy Haggar is Leader of the Tree Crops in Agroforestry Program at the Tropical Agricultural Centre for Research and Higher Education (CATIE). Dr Haggar was trained in tropical agroecology at the University of Cambridge and has worked in the Central America and Mexico on sustainable agriculture, reforestation and agroforestry for the past 20 years. Currently he has is based in Managua, Nicaragua, where coordinates regional projects to reinforce the production and business capacity of producer organizations in Guatemala, Honduras and Nicaragua to produce and sell sustainable and quality coffees. Also he is working on the evaluation of the environmental services that coffee production can provide and how those services may be compensated by socially and environmentally responsible markets. Currently he is developing and validating processes to facilitate adaptation to climate change for coffee producing families and actors in the value chain.

Session 2: Current status of the conservation and use of unique genetic resources with their center of origin in Mesoamerica (Session leaders: Xavier Scheldeman and Marleni Ramírez, Bioversity) Rapporteur: Daniel Debouck

Mesoamerica is an important world centre for crop diversity. It is one of the centres of origin of cultivated plants as designated by the Russian plant explorer Nicolai Vavilov. Many important staple crops such as maize and beans, vegetables such as squashes and peppers, and many fruits, notably papaya, avocado, custard apples, guava and sapote were domesticated in this region. However, information on the conservation status of this diversity, essential for its use by current and future generations, is limited and scattered. For many species, the lack of information on the status of the existing diversity, both in the wild or in farmers' fields and in gene banks is a major constraint limiting the formulation of efficient and effective conservation and use strategies and policies.

This is especially the case for the wild relatives of crops and for several of the so-called underutilized or neglected crops with high nutritional, economic or cultural value. The absence of regional use strategies thus result in the failure to utilize the full potential of the native crop diversity in two critical areas: the pursuit of sustainable agricultural systems and the crafting of adaptive responses to climate change and habitat loss. The Wallace Conference offers a unique opportunity to update the available information on the status of conservation and use of key Mesoamerican plant genetic resources and to inform scientists, educators and policy makers on priority actions for sustainable conservation and use of local diversity.

Session objective:

To discuss the regional status of use and conservation of important Mesoamerican genetic resources to facilitate the definition of regional priorities with regards to their conservation and use to guide future regional action plans

Key questions:

1. What is the *in situ* conservation status of wild relatives of important Mesoamerican crops?
2. What is the *on farm* conservation status of local landraces of important Mesoamerican crops?
3. What is the *ex situ* conservation status of important Mesoamerican plant genetic resources?
4. What are the key actions that will result in enhanced conservation and sustainable use of Mesoamerican plant genetic resources?

Expected outcomes:

1. Updated data on status of conservation and use of plant genetic resources of key Mesoamerican species
2. List with priority actions to enhance the conservation and sustainable use of Mesoamerican plant genetic resources

3. Increased communication and collaboration between different stakeholders active in the field of Mesoamerican plant genetic resources

From the cradle: Transcendence of Mesoamerican crops

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The Mesoamerican region stands out as one of the world's most important centers of agrobiodiversity, where nearly 100 crops were domesticated, of which more than 20 have achieved great importance on a global scale. Of the eight main centers of crop domestication identified by Vavilov, perhaps none has contributed as many crops of such transcendence for humanity as the Mesoamerican region. Mesoamerica was one of the world cradles of agriculture, from whence the diffusion of crops and associated knowledge regarding their cultivation and use emanated beyond the core area to the rest of the hemisphere, including early exchanges with the Andean zone—the other great cradle of plant domestication in the Americas. By the time of the arrival of the Spaniards, the Mesoamerican agricultural complex formed one of the richest assemblages of edible plants in the world. The resulting "Columbian Exchange" was the last great intercontinental merging of agricultural traditions and initiated the present globalization of modern agriculture, through which many Mesoamerican crops have become essential elements of the agricultural production and diets of many countries and cultures on other continents. The globalization of agricultural markets provides opportunities for introducing "new" crops to international markets. The persistence of numerous underutilized native crops, together with their diverse local varieties, their closest wild relatives, and the ancestral knowledge that still exists regarding their management and use represent a tremendous comparative advantage for the Mesoamerican region to exploit those international markets, as well as providing the world with additional options for responding to the challenges of global climate change

Biographical sketch

David Williams was trained as an ethnobotanist, specializing in the domestication and diversification of crop plants in traditional farming systems. He is currently the Coordinator of the CGIAR System-wide Genetic Resources Programme, hosted by Bioversity international in Rome, Italy, where his duties include coordinating and facilitating collaborative activities among the 15 CGIAR Centres, promoting common policies and practices for managing genetic resources, and providing CGIAR-level representation, public awareness, and technical inputs to relevant international fora. Previously, Dr. Williams worked for the USDA Foreign Agricultural Service in Washington, DC, managing bilateral research and technical cooperation programmes between the US and developing countries. Before that, he was a Senior Scientist at Bioversity International's Regional Office for the Americas, located in Cali, Colombia, where he led and coordinated the implementation of Bioversity's mission throughout Latin America and the Caribbean. Prior to that, he worked as a Plant Explorer for USDA's Agricultural Research Service, based in Beltsville, Maryland

Status of conservation and use of Mesoamerican genetic resources of *Phaseolus* beans

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Mesoamerica as traditionally understood harbours 69 out of the 77 species currently recognized in *Phaseolus* beans. Over the last 5,000 years Mesoamerica has been the place of five separate domestication events of five wild species (apart from two other independent domestications in the central Andes). The resulting landraces has been the basic staples of the pre-Columbian civilizations, and after the contact of 1492 important food items in the Americas, Africa and Asia. Our work shows what is currently conserved in *ex situ* genebanks and *in situ* protected areas, and highlights what is still missing to make this conservation more relevant. Two threats, i.e. changes of land uses because of human activities and climate change, are analyzed for the impact on the wild bean species, namely in alterations of habitats, minimum size of populations and survival of pollinating agents, with recommendations for the conservation. Use of the wild bean species has not been up to the extent possible because its evaluation has been rather limited. Yet when evaluation did include wild bean species, the useful variation found was beyond expectations and unmatched in the variability under cultivation. One reason for this seems linked to the founder effect of domestication that was the rule in the five domestication events (likely because of antinutritional factors). With bean breeding facing new challenges (e.g. five bean crops for different agroecologies, hybrid vigour, tolerance to heat, drought and salinity, and nutritional quality), the conservation imperative of the secondary genepools is a priority, so that breeding programs and consumers of Mesoamerica (and of Mesoamerican beans outside it) have more options. A gene stock exchange of wild *Phaseolus* species could in turn favour additional investments in conservation.

Biographical sketch

Born in Brussels, Belgium in 1952 and citizen of that country. Holds a degree of Engineer, a Certificate in Tropical Agronomy and a PhD in plant sciences from the Agronomical University of Gembloux, Belgium. Has worked for the Ministry of Agriculture of Belgium in crop physiology. Has worked for the Food and Agriculture Organization of the United Nations (FAO) in genetic resources of grain legumes. Has worked for the Centro Internacional de Agricultura Tropical together with most Latin American programmes of bean genetic resources. Has worked for the International Board for Plant Genetic Resources in genetic diversity of neotropical crops. Has worked as adviser to the Consultative Group for International Agricultural Research for the preparation of the United Nations Conference on Environment and Development held in June 1992 in Rio de Janeiro, and of the International Treaty on Plant Genetic Resources for Food and Agriculture. Invited lecturer in many international courses on plant genetic resources held in the Americas. Referee for 6 scientific international journals. Currently author and co-author of 22 book chapters and 87 research papers (including one monograph). Has presented 126 scientific communications at conferences held in Europe, Asia and the Americas. Presently leader of the Genetic Resources Program, and working on genetic diversity aspects and evolution of New World crops at the International Center of Tropical Agriculture.

The conservation and use of the *Capsicum* genepool in Mesoamerica

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Abstract

Mesoamerica is considered an important centre of diversity of many important crops, including peppers or chiles. Six *Capsicum* species are found in Mesoamerica. Of the four that are widely cultivated two are native, *C. annuum* - the most important pepper species at world level - and *C. frutescens,* while the two other species, *C. chinense* and *C. pubescens,* were introduced in prehispanic times. Besides these cultivated species, the region also harbours two undomesticated species, *C. lanceolatum* and *C. rhomboideum,* who together with wild populations of *C. annuum* (*C. annuum* var. *glabrisculum*) and *C. frutescens* comprise the wild genepool. The *in situ* conservation status of native *Capsicum* species is fair, considering that over 40 % of the individuals of wild species observed were found within protected areas. Due to the lack of information on genetic diversity however, these individuals may not represent all the intra-specific diversity. Traditional cultivation of local *Capsicum* landraces, grown in small multi-crop plots or in home gardens, is still important in the region and shows high diversity. The absence of regional studies on genetic diversity complicates an assessment of the *on farm* conservation status of the *Capsicum* genepool in Mesoamerica, including ongoing genetic erosion. The *ex situ* conservation status of cultivated species is generally good. Regional and international genebanks hold well-documented and well-evaluated collections. National gene banks in Mexico, Costa Rica and Guatemala also possess good collections but the conserved accessions are poorly documented and scarcely evaluated. Therefore, the materials from international collections are currently the most commonly accessed and used in, mostly international, breeding programmes. The *ex situ* conservation status of the two wild *Capsicum* species is worrying. No material of *C. lanceolatum* nor of *C. rhomboideum* is conserved in any gene bank in the world. There is therefore an urgent need to start targeted germplasm collection of these species.

Biographical sketch

Dr. Azurdia's presentation will be given by Xavier Scheldeman.

Conservation, use and potential of selected fruit trees of Mesoamerica. ***Reinhold Muschler***[1]

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Mesoamerica is the source of many important tree fruits, including tree crops with global distribution and use such as the avocado (*Persea americana*). It also is home to lesser known but regionally important fruit species such as the sapotes and annonas. Here, I review the conservation status and use of Mesoamerican tree species in the Annonaceae, Sapotaceae families as well as the genus *Persea*. I present priorities for the selection of varieties and interesting species that should be developed, consider the conservation challenges and propose opportunities to promote the use of underutilized species as biribá (*Rollinia mucosa*) or the black sapote (*Diospyros digyna*).

Biographical sketch

Dr Muschler received his degrees in Geoecology and Tropical Agroforestry/Farming Systems Research from the University of Bayreuth, Germany, and the University of Florida, USA. For twenty years in Latin America, Dr Muschler served as a professional consultant to many international organizations and projects, and worked for the Center for Research and Education in Tropical Agriculture (CATIE) in Costa Rica as professor of agroecology and agroforestry, team member and head of the CATIE-GTZ Agroforestry Project, and head of the Department of Ecological Agriculture. He spearheaded an organic coffee project with the Organic Growers' Association of Turrialba (APOT) and supported many ecological production initiatives throughout Central America. His publications cover coffee agroforestry systems, coffee quality, sustainability, diversification and organic production. Currently, Dr. Muschler holds the Latinamerican Chair for Agroecology and Agrobiodiversity at CATIE, a position which is co-funded by the Centre for International Migration and Development (CIM), Germany.

Conservation status of forest genetic resources in Mesoamerica

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Mesoamerica is a biodiversity hotspot and its plant species diversity is among the highest in the world. Approximately 4000 woody plant species are native to Mesoamerica, and their genetic resources are under serious threat as a result of deforestation for expanding agriculture and livestock grazing lands, harvesting for timber, firewood, and other uses, sequential droughts, forest fires, and invasive species. The IUCN (International Union for the Conservation of Nature) lists about 12% of Central American tree species as threatened and the proportion of tree species that are threatened in Mexico is reported to be even higher. Conservation and genetic management activities carried out by institutions within the countries and by international organizations, such as CAMCORE, have been limited mainly to a relatively small number of species having economic value. The most significant conservation initiatives in Mesoamerica have been the establishment of protected areas which now cover about 20% of the region. However, some of the protected areas are protected only on paper and even for those with effective protection, species and especially genetic resources contained within species, are not usually considered in protected area design or management. Many tree species are not adequately protected by existing *in situ* conservation in a way that will conserve genetic variability and evolutionary potential. Almost all of the Mesoamerican countries have facilities for *ex situ* conservation of germplasm in seed banks and accessions are maintained for some important tree species, however seed for many tropical species cannot be stored using conventional storage methods. Conservation of genetic resources of forest trees on farms holds potential for some species. Current knowledge is inadequate for effective conservation and management of genetic resources for many tree species, however some economically important tree species such as *Cedrela odorata*, *Swietenia macrophylla*, *Pinus radiata*, and *Pinus caribaea* have been well studied and their conservation requirements are known. Such examples may serve as models for expanding knowledge and conservation action to other priority species.

Biographical sketch

Judy Loo, PhD, is a senior scientist at Bioversity International, based in Rome, Italy, where she coordinates the global project on conservation and sustainable use of forest and other wild plant resources. She was a researcher at the Canadian Forest Service before joining Bioversity in fall, 2009, and her interests were in conservation genetics and genetic resistance of trees to non-indigenous invasive forest pests. She was a member of the North American Forest Genetic Resources Working Group for many years and taught summer courses in conservation genetics at the Colegio de Postgraduados and Universidad Autonoma Chapingo, near Texcoco, Mexico.

Impact evaluation of CATIE's seed bank

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CATIE's collections of plant genetic resources are of global importance for coffee, cocoa, cucurbita, beach palm other tropical fruits and vegetables, which are conserved in field, in seed chambers, *in vitro* and in cryopreservation. The presented study aims to evaluate the impact through use of the germplasm conserved at CATIE for selected crops of major importance (coffee, cocoa, cucurbita, capsicum, canavalia). The data used in this study are the gene bank records, documentation and a survey among users of the collections who received germplasm from 2003 to 2008. Survey respondents include farmers and institutions within Costa Rica and researchers in international organizations. Results show that a major impact had been in higher yields and the reduction of yield losses from pests and diseases. Quality aspects have been particular important for coffee and cocoa. In addition there is a recuperation of traditional varieties for indigenous communities. User satisfaction with the gene bank services is generally good, particularly regarding to requesting procedures, sanity, quality and quantity of distributed germplasm, whereas some respondents were less satisfied with documentation of the germplasm and the diversity available for distribution. Information and awareness about the CATIE collections and the availability of germplasm are still scarce. Most users rely on personal communication and often on direct links with CATIE through projects and staff. More effort needs to be invested in creating awareness of CATIE's collections and related services in order to increase the use of the available diversity of plant genetic resources.

Biographical sketch

Rita Carolina graduated with a degree in agricultural engineering from the Universidad Nacional del Centro del Perú. She currently is Master's student in CATIE's environmental socioeconomics program in Costa Rica where she is developing her thesis question on the "Evaluation of the use, and conservation costs of CATIE's germplasm collection". She is the curator of the Instituto Nacional de Innovaciones Agrarias de Perú – INIA's Andean germplasm collection held at the Santa Ana de Huancayo experimental station. She is generally interested in themes related to genetic diversity of Andean crops, as such, the she is an active member of the biolocial diversity, climate change, normalization and designation of origin of Maca (*Lepidium peruvianum*) from the Junín region of Perú.

Session 3: The functional role of agrobiodiversity: from farms to landscapes

Session leaders: Fabrice DeClerck and Jacques Avelino

Rapporteur: Tamara Benjamin and Alejandra Martinez

Session objective:

To highlight the functional role that biodiversity plays in the provisioning of ecosystem functions in agricultural landscapes from the farm to the landscape scale. This includes both managed biodiversity specifically selected for its functional contributions as well as wild or associated biodiversity found in and around agricultural landuses.

Key questions:

1. What is the functional relationship between agricultural biodiversity and the provisioning of ecosystem functions in agricultural landscapes?
2. What key functions are of interest to stakeholders of mesoamerican landscapes?
3. What are functional mechanisms by which these services are provided?
4. What is the functional role of protected areas (native biodiversity) in providing ecosystem services in agricultural landscapes?
5. Are incentives required to promote the sustainability of these services and what is the role of policy mixes in ensuring the provisioning of these key services?
6. What steps and strategies are needed to progress from the management of single services at the plot level to multifunctional landscapes?

Expected outcomes:

1. Dialogue between stakeholders who benefit from ecosystem services, providers of services and scientists who seek to better understand them.
2. Determination of key research gaps regarding our understanding of the mechanistic drivers behind agrobiodiversity and ecosystem function.
3. Identification of the key services in demand within the mesoamerican context, moving beyond carbon.
4. Defining of the distinct incentive structures in existence, or needed to ensure that inhabitants of the region continue to receive key ecosystem services provided by agrobiodiversity.

Pest and disease control function of agrobiodiversity at the field scale

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Among agrobiodiversity enhancement options, the planned introduction and management of plant species diversity (PSD) in agroecosystems is a promising way of breaking with "agrochemistry" and moving to "agroecology". Besides agronomic and economic benefits, PSD may reduce pest and disease impact via several causal pathways. We report on instances pest and disease regulation processes in tropical cropping systems, emphasizing the soil and field levels. We thus studied the influence of soil organic matter quantity and quality on the status of Scarab beetles associated with upland rice in Madagascar, in view of minimizing their role as pests and optimizing their function as ecosystem engineers in multiple species-based Direct-seeding, Mulch-based Cropping (DMC) systems. We also studied in West Africa the various host plants of sorghum panicle-feeding bugs, in order to manage these pests (and grain molds they transmit) via a combination of trap cropping and cycle rupture, and the potential of several trap crops for managing the tomato fruitworm (and in a subsidiary way the cotton white fly and the TYLC-transmitted disease) on okra. Although processes studied primarily operate at the field level, results obtained stress the need to take into account larger scales, both spatial and temporal. This approach is developed in the Cirad Omega3 project which builds on tropical case studies, representing a broad range of PSD scales and deployment modalities according to a typology of pests and pathogens based on life-history traits the most amenable to manipulation by PSD. Further to results aiming at immediate impact, more generic results are expected, after formalizing the ecological processes studied, namely decision-making rules which will help set up models to predict the impact of PSD on pests and pathogens with similar life-history traits.

Biographical sketch

Dr. Ratnadass holds *Ingénieur agronome* (MSc, 1982) and *Docteur-Ingénieur* (PhD, 1987) degrees in Crop Protection from the National Institute of Agronomy, Paris, and a *Habilitation à diriger des recherches en Sciences* (DSc, 2007) of the National Institute of Applied Sciences/University of Lyons. Currently (since 2008), head of the Agroecology team of CIRAD's HortSys (Horticultural Systems) research unit, Coordinator of CIRAD's Omega3 ("Optimization of ecological mechanisms of pest and disease management for sustainable improvement of agrosystem productivity") project, and Principal Scientist in Integrated Pest Management (IPM) at the ICRISAT Sahelian Center (Niamey, Niger). Formerly (from 2001-2007). Head of CIRAD's SCRiD (Sustainable Rice Cropping Systems) Cooperative Research Unit in Madagascar. Extensive experience in IPM in Africa and the Indian Ocean (with 26 years of long-term assignments in Côte d'Ivoire, Central African Republic, Mali, Madagascar, Niger) on cereal, legume, root & tuber, and fruit & vegetable crops, with emphasis on post-harvest entomology, host plant resistance, soil biology, plant-derived pesticides and stimulo-deterrent diversionary approach.

Functional agrobiodiversity: a framework for enhancing on-farm ecosystem services

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Humans have transformed the vegetation cover of the Earth to such an extent during the past 50 years, that it is considered that the Earth has entered a new epoch, the 'Anthropocene' where humans constitute the dominant driver of change in the Earth System. The purpose of these transformations is primarily land clearing for crops and pastureland. There is a range in the degree of transformation, from intensively managed systems, with high productivity at one extreme, to extensively managed systems with a minimum of input at the other. Intensified systems are usually extremely simplified and natural systems, of high complexity. These extremes reflect the trade-off between maximizing food, fiber and timber production *vs*. the maintenance of complex life supporting functions. Silvopastoral systems are somewhere in-between these extremes, so how these ecosystems are shaped and managed, determines critically, the kind of functions that are maintained and the services they provide. Diverse silvopastoral systems have the potential to maintain critical functions across spatial scales.
Locally, trees can give rise to 'habitat cascades' by which they facilitate conditions for growth for other organisms and determine process rates. The characteristics of these cascades are linked to the attributes of the tree species. The attributes of the trees also affect the performance of the pasture. Pastures in silvopastoral systems can also be functionally diverse. In diverse pasturelands in Nicaragua, co-existing species with different strategies of resource use under high (rainy season) and low (dry season) resource supply appear to capture more fully differences in resource levels determined by rainfall seasonality, and this fact is related to continued production at the end of the rainy season.

At the landscape and regional scales, the configuration of silvopastoral elements is crucial in maintaining tropical forest elements and functions, and silvopastoral practices critically determine the elements of the landscape. Large number of the forest species, and birds can be maintained in the agricultural countryside.

Biographical Sketch

I am a plant ecologist, born in Buenos Aires, Argentina. My academic career started at the University of Buenos Aires with training as an agronomist with stress in of plant ecology and eco-physiology of agro-pastoral ecosytems. I hold a PhD in Plant Ecology from Uppsala University, Sweden and have research experience in a range of ecosytems in Europe, North America, South and Central America, and Africa. My research interests are in the understanding of the functions in natural and man managed systems and on the effects of land use practices on biodiversity and bio-geo-cycles. I am interested in documenting the role of biodiversity in maintaining important functions that support human society.

Agrobiodiversity and human nutrition

Fabrice A.J. DeClerck[1,3], Jessica Fanzo[2], Roseline Remans[3] and Cheryl Palm[3]

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Malnutrition continues to affect a disproportionately large number of people throughout the world, particularly Africa. Approaches to reducing malnutrition rarely focus on the role of ecology and agriculture in simultaneously improving human nutrition and environmental sustainability. Evidence suggests that interdisciplinary approaches that combine the knowledge bases of these disciplines can serve as a central strategy in alleviating hidden hunger. Here we explore the role that ecology can play in alleviating hidden hunger suggesting that human nutrition is a critical, but largely overlooked ecosystem service. We present an eco-nutritional framework and provide novel evidence from case studies from Western Kenya supporting the need for greater interdisciplinary collaboration in achieving multiple development targets including alleviating hidden hunger, increasing agricultural productivity, and improving environmental sustainability. Particularly we provide evidence that increased functional agrobiodiversity can alleviate anemia, and interventions that contribute to environmental sustainability can have both direct and indirect effects on human health and nutritional well-being. Integrated and interdisciplinary approaches are critical to reaching development goals. Ecologists must begin to consider how their field can contribution not only to the conservation of biodiversity, but on the relationship between conserved biodiversity and provisioning of ecosystem non-traditional ecosystem services such as human health. Likewise, nutritionists and agronomists must recognize that many of the solutions to increasing human well-being and health can best be achieved by focusing on a healthy environment and the conservation of ecosystem services.

Biographical sketch

The three authors met through the Earth Institute at Columbia University where DeClerck, Fanzo and Remans were postdoctoral scholars. Cheryl Palm is the lead scientist for the Millennium Village Project. Palm and Remans continue to work for the Tropical Agriculture Program of the Earth Institute at Columbia University. DeClerck continues to hold and adjunct position with the group but currently works for CATIE in Costa Rica. Fanzo is now employed with Bioversity International where she continues to work on the relationship between biodiversity and human nutrition. Publications by the group include:

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The influence of the structure of Cocoa-based Agroforestry Systems on Ecological Services in Talamanca, Costa Rica

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In the humid tropics, deforestation leaves forest patches that are increasingly isolated within an expanding agricultural matrix. In these landscapes, a significant area consists of complex agroforestry systems (AFS) with high structural and functional plant diversity. These AFS provide critical resources for biodiversity conservation, such as food and habitat and are gaining conservation value as deforestation progresses. Cocoa AFS provide habitats for forest dependent species and may play a largely undocumented role in global biodiversity conservation. This conservation value is greatly influenced by their botanical composition and structure. We characterized this structure in a sample of 36 contrasting cocoa agroforests and 3 forest fragments selected in the south east of Costa Rica to maximize contrasts in terms of 1) altitude, 2) landscape context, 3) topographical situation, 4) vegetation structure of the cocoa agroforest, 5) soil quality and 6) management intensity. Ecological services were assessed by i) Cocoa productivity and ii) Biodiversity of herpetofauna, soil and litter invertebrates, small mammals, cocoa pollinators and epiphytes. Results show that the cocoa field productivity is not affected by the structure complexity when cocoa yield per tree is strongly dependent on the level of complexity of the system. Structure complexity has an effect on Biodiversity but with a specific response for each taxum, suggesting in some case that a wider scale is needed to properly understand the differences observed. Functional diversity for soil invertebrates in cocoa agroforests was not different from nearby primary forest patches, suggesting that ecosystem functions are conserved in these systems. Cocoa agroforests could finally be presented as a gradient of structure illustrating tradeoffs between low to high functional biodiversity and low to high productivity.

Biographical sketch

Olivier Deheuvels is an agronomist specialized in cocoa cropping systems. He has been working in CIRAD since 1999 as a researcher, first in Ecuador where he contributed to conserve national cocoa varieties and their famous “Arriba” flavor. He then got involved into a research project in Ivory Coast where renovation and rehabilitation techniques for senescent cocoa fields were described and tested. From 2003 to 2006, he has been consulting in Ecuador, Ghana and Cameroun for cost/benefit studies in cocoa based agroforestry systems versus monospecific cocoa cropping system. Since 2007, he has been working as seconded staff in CATIE, in the Casa thematic group where he has been involved in the Centro American Cocoa Project (PCC) from its ex-ante studies to present. He now coordinates researches on tradeoffs between Productivity and Ecological services in the 6 countries of this regional project. Finally, he is achieving his PhD on the tradeoffs between cocoa productivity and Biodiversity within a gradient of agroforests based on cocoa cultivation.

Effects of on-farm and landscape botanical diversity on insect pests of coffee agroforestry systems

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Abstract

Coffee is grown extensively throughout the American Tropics, typically, within complex landscapes that include diverse land uses. In addition, coffee systems vary internally in their complexity, ranging from highly diversified organic agroforestry systems to conventional monocultures without shade trees. The biota in these systems is affected by on-farm and landscape scale conditions. We illustrate this by considering two groups of pest insects associated with coffee systems in the Turrialba region of Costa Rica. The propensity of leafcutter ants (*Atta cephalotes*) to attack and injure coffee varies greatly among coffee system typologies due to behavior of the ants. In addition, landscape context and on-farm diversity affect leafcutter ant colony densities, with implications for management of these ants as pests. Leafhopper species (Cicadellidae) are potential indirect pests of coffee because they can vector *Xyllela fastidiosa*, the bacterium responsible for the "crespera" disease. Leafhoppers differ in abundance in coffee plantations as compared with land uses such as forest and pasture. Their movements among these land uses differ, with implication for pathogen spread. These examples and others from the literature on coffee landscapes and coffee plantation diversity illustrate the importance of understanding botanical complexity at several scales as part of coffee agroecology.

Biographical sketch

Dr. Sanford Eigenbrode received a BS, MS and PhD from Cornell University. He is Professor of Entomology at the University of Idaho (UI). His research concerns the chemical ecology of insects, plant-insect interactions, chemical and structural plant attributes affecting plant-insect and tritrophic interactions, insect behavior, plant surface waxes. He has expertise in extraction and analysis of chemicals from plant tissues, scanning electron microscopy, host plant resistance, and integration of host plant resistance into pest management. His interests also include the effects of crop variety and management practice on arthropod communities in agroecosystems. Research in this area includes effects of management practices and the surrounding landscape on insect herbivores and predators in agroecosytems in Idaho and Costa Rica. Recent work addresses the ecology of insects that vector plant pathogens affecting crops. He is part of a training and research project funded by the US National Science Foundation's IGERT program. He is director of an interdisciplinary project on aphid-transmitted viruses affecting crops in Idaho and Washington and a project to establish a long-term project concerning agriculture and climate change in the Pacific Northwest. He coordinates the Joint Doctoral Program between UI and CATIE. Dr. Eigenbrode is engaged in additional research focused specifically on improving the process of collaborative science.

Biodiversity and low-external-input crop management in the North Central USA

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To test the hypothesis that yield, weed suppression, and profit characteristics of low-external-inputs (LEI) cropping systems can match or exceed those of conventional systems, a multiyear, 9-ha field experiment was established in 2002 at Iowa State University's Marsden Farm, located in Boone County, Iowa. The experiment includes three cropping systems: a conventional 2-year corn-soybean rotation, a 3-year corn-soybean-small grain/red clover rotation, and a 4-year corn-soybean-small grain/alfalfa-alfalfa rotation, arranged in a randomized complete block design with four replicates. The results of this experiment after 4 years indicated that synthetic N fertilizer use was 59 and 74% lower in the 3- and 4-yr systems and herbicide use was reduced 76 and 82% in the 3- and 4-year systems, compared to the 2-yr system, while corn and soybean yields were as high or higher in the LEI systems as in the conventional system. The 3-yr and 4-yr rotations used between 23 and 56% less fossil energy than did the 2-yr rotation. Net returns were highest for the 4-yr system, lowest for the 3-yr rotation, and intermediate for the 2-yr system, but the magnitude of differences between systems varied depending whether subsidies were considered or not in the calculations. Weed demography studies conducted in this long-term experiment found that between fall 2002 and spring 2006, the decline of an experimentally supplemented seed bank of giant foxtail (*Setaria faberi*) was greatest in the 2-yr rotation, least in the 3-yr rotation, and intermediate in the 4-yr system. Velvetleaf (*Abutilon theophrasti*) in a supplemented seed bank declined significantly in the 2-yr and 4-yr systems, but remained unchanged in the 3-yr system. Experiments focusing on post-dispersal seed predation of giant foxtail and velvetleaf in the three cropping systems demonstrated that a more diversified system provided the greatest opportunities for weed seed elimination by predators.

Biographical sketch

Matt Liebman is a Professor of Agronomy and the Henry A. Wallace Endowed Chair for Sustainable Agriculture at Iowa State University. He received a B.A. in biological sciences from Harvard University (1978) and a Ph.D. in botany from the University of California-Berkeley (1986). His research, teaching, and outreach activities focus on ways to use ecological processes to reduce dependence on agrichemicals and fossil fuels. Specific interests include diversified cropping systems, organic matter amendments to soils, weed ecology and management, and environmental impacts of using native perennial species for biofuel production. Matt teaches a graduate course on ecologically based pest management strategies, and was a co-author of the book *Ecological Management of Agricultural Weeds*, published in 2001 by Cambridge University Press. He held the Pioneer Agronomy Professorship at Iowa State University from 2001 through 2004 and was selected as a fellow of the American Society of Agronomy in 2009. More details about his interests, responsibilities, and activities are available at http://www.wallacechair.iastate.edu.

Robin Gómez is currently a PhD. Candidate in Sustainable Agriculture at Iowa State University. He received a B.A. in Agronomy and a MSc. in Crop Protection from the Universidad de Costa Rica (UCR). Robin worked for the UCR as an instructor in weed science and participated as an associate researcher in various studies of weed management in tropical crops. He is interested in developing weed management strategies that take into account multiple interactions between the different components of the agroecosystem, in order to increase crop yield and farm income while reducing negative environmental effects.

The functional role of agrobiodiversity at landscape scales

Teja Tscharntke[1]

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Agricultural systems have been subjected to a vast simplification of the surrounding landscape, which has been associated with the loss of habitat supporting functionally important biodiversity. Agricultural iintensification may occur on different spatial scales including enhanced local agrochemical input and reduced landscape heterogeneity. In this talk, I will focus on the role of shaded agroforestry and distance to forest remnants for functional biodiversity and provide case studies on plant-pollinator and predator-prey interactions. Losses in biodiversity and functions such as pollination and biological control will be related to the farmers' income, balancing human and ecological needs.

Biographical sketch

Teja Tscharntke is Professor of agroecology at the Department of Crop Science, Georg-August University of Göttingen, Germany. He studied sociology (MSc 1978) and biology (MSc 1981) at the universities in Marburg and Gießen and made his PhD 1986 in Biology, University of Hamburg. According to Labor Journal (2008, 10: 55-57) he is the most cited ecologist of Germany, Austria & Switzerland.
His key research expertise is:

- Biodiversity-ecosystem functioning relationships (predation, parasitism, pollination)
- Patterns and processes at different spatiotemporal scales (local vs. landscape scales; GIS and geostatistics), habitat fragmentation, spatial ecology
- Tropical ecology, comparison of tropical and temperate communities and trophic interactions (plants, herbivores, predators),
- Biodiversity of managed versus natural ecosystems, succession in plants and animals
- Pollination in wild and crop plants (including seed set and yield), plant population dynamics
- Quantified food web interactions, food web statistics, multitrophic interactions (direct and indirect effects, below- and aboveground interactions, interactions between plants, herbivores, pathogens, predators, parasitoids, pollinators).
- Ecosystem services, multidisciplinary studies linking socioeconomic and ecological approaches

Forests and trees in Mesoamerican agricultural landscapes: functional diversity, environmental services and the effects of global change

Bryan Finegan[1], Sandro Aquino Yaringaño[2], Fernando Casanoves[1], Albert Chan Dzul, Diego Delgado Rodríguez, Fernando Fernández Méndez[2], Eleni Marinidou[2], and Beatriz Salgado Negret[2].

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Forest patches and remnant trees are key biodiversity components of agricultural landscapes and play roles in ecological processes linked to agricultural production. Most characterizations of tree biodiversity use a taxonomic approach, but concepts and tools of functional ecology permit characterization of species, trees and communities in terms of the environmental services they offer. We analyze and contrast data from wet and dry Mesoamerican systems to show how: correlations among species functional trait values underlie the functional ecological characterization of tropical tree species in terms of ecological effects and responses; how species trait values combined with individual tree dimensions permit the functional characterization of tree communities in relation to particular environmental services; and how this approach can be applied to determining tree cover value for environmental service payments. We emphasize the impacts of major drivers of global change on tree community functional responses, effects and value for environmental services. We show that the type and degree of global change impacts on the functional characteristics of tree communities depend on the function and service considered and that they may differ considerably from impacts on taxonomic diversity. Further work is required to quantify the relationships between some functional traits, processes and environmental services, and the application of this approach to the hydrological cycle is challenging. A traits-based approach to the estimation of value for environmental services is, however, in some ways superior to approaches currently used.

Biographical sketches

The authors collaborate in research on the relationships between tropical forests, trees and people on the combination of production and conservation. Sandro Aquino Yaringaño was born in Jauja, Perú and was originally trained as an agronomist at the La Selva National Agricultural University. Fernando Casanoves, from Santa Fe, Argentina, also originally an agronomist, is a statistician trained at Córdoba University, experienced in research in integrated agriculture and natural resource management, and leads CATIE´s Biostatistics Unit. Albert Chan Dzul studied biology at the Conkal Technological Institute in Yucatán, Mexico. Diego Delgado Rodríguez, from La Suiza, Costa Rica and an agronomist trained at the University of Costa Rica, now works in tropical forest ecology and conservation at CATIE. Fernando Fernández is a forest engineer from Ibagué, Colombia and is currently professor of dendrology in the forestry department at the Tolima University there. Bryan Finegan was born in Huddersfield, England, and is a tropical forest ecologist at CATIE. Eleni Marinidou is from Kavala, Greece but now has dual Mexican-Greek nationality. She is an agroecologist trained at Chapingo Autonomous University, specializing in agroforestry. Beatriz Eugenia Salgado Negret, from Popayán, Colombia, was trained as a biologist and is currently studying for her PhD in forest ecology at the Catholic University in Chile. Sandro, Albert, Eleni and Beatriz are recent graduates of CATIE´s master´s program.

Reduction of Quarantine Pest Populations in Ornamental Farms: The Role of Secondary Forests and Functional Traits of Cover Crops

Tamara Benjamin[1,2], Cliff Sadof[1], Fernando Casanoves[3], Eduardo Hidalgo[2], Mildred Linkimer[2], Julia Prado[2], Adriana Villalobos[2], Gerardo Perez[2]

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As free trade agreements and globalization liberate restrictions on trade, there is a real danger for increasing unwanted pests entering through the export/import markets. Over the past 20 years, more than 7000 interceptions of quarantined pests have been recorded on the ornamental plant, *Dracaena*. A joint venture between USA and Costa Rican regulatory agencies, researchers, and growers was aimed to reduce pest interceptions and improve the quality and increase the allowable size of Dracaena plants imported into the USA. Researchers diagnosed ornamental pest problems and compared their population levels at landscape and farm levels to determine whether competing land uses had an impact on their populations. Plant functional traits of common cover crop plants found within the ornamental plantations were identified and associated with a cicadellid commonly found during the interception process. Selected cover crops were then planted and pest populations (including the most commonly intercepted pests: cicadellid eggs, scales, tetigonid eggs, and mollusks) were monitored to determine whether cover crop functional traits have an impact on their populations. A variety of plant functional traits such as narrow leaves (grasses) were shown to influence different quarantine pest populations. Pests and their natural enemies were also monitored between ornamental plots and secondary forests to determine the movement and use of additional habitat by these insect populations. We found that secondary forests are not used by the pest populations but are utilized by numerous insect species, possibly natural enemies. Other micro landscape measures, such as edge habitat, can also influence pest populations. Quarantine pest populations can be controlled by increasing plant diversity in and around an ornamental farm.

Biographical sketch

Dr. Benjamin has concentrated her research primarily on the biophysical, social, and economic implications of agroecosystem diversification, the impact of agroecosystems on ecological communities, and the management of agroforestry planning. Some of her interests are focused on finding ways to design agroforestry systems to meet the needs of local farmers or the agenda of national governments in Latin America. The design of sound agroforestry systems that have high adoption rates take into account a myriad of factors that include social, economic, physical, biological, ecological, and cultural aspects. She co-led the Clean Stock Program research team with Dr. Cliff Sadof of Purdue University where they focused on a systems approach to find new tools to reduce pest populations on exported ornamental crops to the United States. She currently is working in the areas of biochar as a form of carbon sequestration and soil improvement as well as plant functional traits in silvopastoral systems.

Landscape context and movement of coffee pests

Jacques Avelino[1], Fabrice DeClerck[2], Amada Olivas[2], Cipriano Rivera[2], Hector Cruz[3], and Ali Romero[3].

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Existence and severity of pest and disease attack are determined at plot level by interaction between host, noxious organism, environment and agricultural management. However, the immigration of noxious populations from outside the plot may also affect pest and disease incidence at plot level. We present the results from three studies in the Volcanica Central Talamanca Biological Corridor that explore landscape effects on the densities and movements of three coffee pests: (1) coffee rust (*Hemileia vastarix*), (2) coffee berry borer (*Hypothenemus hampei*) and the (3) root-knot nematodes (*Meloidogyne spp.*).

The first study explored the impact of landscape context on these diseases and revealed that the coffee borer responds to the proportion of coffee in the landscape at small scales (150 m), whereas the coffee rust responds to the proportion of pasture in the landscape at a slightly large scale (300 m). Nematodes did not respond to landscape context at any scale. The second study focused on the dispersal ability of the coffee borer through sugar cane, pasture and forests through a series of 140 m transects that crossed the edge between coffee and the aforementioned land uses. We found the majority of coffee borer individuals (96.5%) in coffee; however the remaining 4% exhibited significantly greater abundances in sugar cane and pasture compared to forests. The third study used a grid approach with traps placed every 50 m in a 500 x 500 m grid and also supported the notion that the borer is largely limited to coffee fields with limited local dispersal abilities in adjacent land uses. These relationships indicate that fragmenting coffee farms at small scales (i.e. interspersing alternate land uses or linear barriers such as riparian corridors) may help to significantly reduce coffee berry movement between plots.

Biographical sketch

I am a plant pathologist, with a PhD degree of the University of Orsay, Paris XI. I have been working for CIRAD since 1986 and have been based at CATIE since 2007. I have spent almost 25 years conducting research in four Mesoamerican countries: Mexico, Guatemala, Honduras and Costa Rica working primarily on coffee and cacao pests and diseases. I have also worked on coffee quality for 10 years.
The main focus of my research has been on the relationships between pest and disease epidemics, and their relationship with the environment and crop management. During the last 2 two years I have led different studies on the effect of plant biodiversity on coffee pests and diseases at the plot and landscape scales. This research has been conducted with the support of EU funded CAFNET project and the CIRAD funded Omega3 project. I have published more than 80 papers, books, book chapters, and congress communications.

Landscape scale diversity and hydrological functions

Heidi Asbjornsen[1]

[1] Department of Natural Resource Ecology & Management, Iowa State University, Ames, IA. U.S.A. *Moving to the *Department of Natural Resources and the Environment at the University of New Hampshire, Durham, in January of 2011.*

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Globally, problems water scarcity and declining water quality are becoming more urgent, especially in the face of increasing human population pressures and the growing threat of climate change. One of the major causes of deterioration of the world's water resources has been ecosystem conversion and accompanying land use intensification. Enhancing and conserving biodiversity is often put forth as a potential means for protecting water supply and improving water quality. However, measuring the impacts of these interventions on the desired benefits is challenging given the complex interactions between biodiversity and watershed functions as well as the different scales at which they operate, and therefore data documenting these relationships are scarce. This presentation focuses on answering the question: Does increasing landscape scale diversity enhance hydrologic services, and if so, how much biodiversity, what kind of biodiversity, and where should it be placed on the landscape to achieve maximum benefits? Two contrasting case studies are used to illustrate the findings: one from an agricultural landscape dominated by annual rowcrops in central Iowa, USA, and the other a montane cloud forest zone that has been mostly converted to pasture and pine reforestations in central Veracruz, Mexico. The conclusions of this analysis suggest that biodiversity and hydrologic functions are generally related, but the strength and nature of this relationship are dependent on many factors, including species composition, landscape position, soil properties, climatic and weather patterns, and the time scale involved. More holistic and integrated studies are needed to better understand the complex feedbacks between biodiversity and the water cycle, and thus provide a scientific basis for more informed management and policy decisions aimed at enhancing hydrologic services.

Biographical sketch

Heidi Asbjornsen is an associate professor of ecosystem ecology and restoration. Her research interests are centered on ecosystem ecology and restoration, with a focus on ecohydrology and plant ecophysiology. She received her B.S. from Carleton College (1989) and her M.S. and Ph.D. from the Yale School of Forestry and Environmental Studies (1993 and 1999, respectively). Her current research programs are focused on designing mixed annual-perennial agroecosystems in the Corn Belt region of the U.S. that enhance diverse ecosystem services, particularly water quality and hydrologic regulation, biodiversity, and carbon sequestration, and assessing the ecohydrological effects of land use change in montane cloud forest regions of southeastern Mexico as a basis for improving natural resource management and policies aimed at protecting water supplies and enhancing water quality. She has authored over 40 peer-reviewed publications, which span a wide range of topics. She has served as associate editor for the Journal of Forestry and chair of the Ecology Working group of the Society of American Foresters, and was a Fulbright Scholar in Mexico.

Session 4: Awareness and understanding of agrobiodiversity among stakeholders in Mesoamerica – public sector, civil society, community-based organizations, university education.

Session leaders: Elizabeth Goldberg and Glenn Galloway

Rapporteur: Per Rudebjer

Session objective:
To have a better understanding of the state of awareness and use of agrobiodiversity by multiple stakeholder groups and to identify bottlenecks, knowledge gaps and areas for further study and action, including policy advocacy and institutional arrangements

Key questions:

1. What is the status of development and implementation of agrobiodiversity related laws and policies in Mesoamerica?
2. What is the role of public sector plant genetic resources networks in Mesoamerica to ensure sustainable conservation and use of agrobiodiversity and how do they link with other stakeholders?
3. What are universities in Mesoamerica doing to train future generations of researchers and decision makers in agrobiodiversity conservation and use?
4. How do public sector, civil society and universities propose that agrobiodiversity be used to strengthen livelihoods of smallholder farmers? What are the bottlenecks?
5. How do public sector, civil society and universities link with farmer and community organizations to influence policy decisions on conservation and sustainable use of biodiversity?
6. Are institutional arrangements adequate to support effective implementation of policy decisions on Mesoamerican landscapes? If not, what needs to be done?

Expected outcomes:

1. Research and civil society stakeholders better informed about the status of treaties and other public sector strategies such as regional networks to favor ABD;
2. Greater understanding of the degree to which stakeholders are aware of the importance and status of agrobiodiversity;
3. Overview of status of ABD in selected university curricula;
4. Improved approach to ABD curriculum review;
5. Greater understanding of perspectives of civil society in defense of ABD;
6. Overview of linkages among diverse stakeholders in defense of ABD;
7. Identification of models of supportive institutional arrangements;
8. Identification of opportunities for capacity strengthening in ABD in different stakeholders.

Implementing biodiversity-related treaties in Mesoamerica

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The conservation and sustainable use of genetic resources are key to meeting the food and agriculture needs of present and future generations. As these needs continue to grow, new challenges arise, the most critical being population growth, urbanization, a growing demand for animal protein and climate change. While poor rural populations worldwide largely depend on traditional crop varieties, plant genetic resources have undergone a significant erosion over the past 50 years.

The exchange of genetic resources underlies the history of humankind. World agriculture is based on a flow of crops and varieties which makes all countries virtually depend on the plant genetic resources for food and agriculture from other countries. During the past few decades, the international community has striven to implement policies on genetic resources that help meet growing food needs. In an attempt to facilitate access to plant genetic resources for food and agriculture and share the benefits of their use, many countries have signed binding and non-binding agreements. During this presentation we will review how the implementation of these agreements is evolving in the framework of an emerging global system for the exchange and use of plant genetic resources.

Biographical sketch

Dr. Ramirez became the Regional Director for the Americas office of Bioversity International in late 2005. A major component of her current work includes guidance and support to the development and implementation of the elements of global systems for conservation and use of genetic resources. This is done through engagement in regional processes such as the development of the Hemispheric Conservation Strategy; by facilitating the participation of PGR networks and countries in the Global Crop Diversity Trust's regeneration initiative, providing support to the implementation of the International Treaty on Plant Genetic Resources, and backstopping FAO's regional consultations to update of the Global Plan of Action and the State of the World Report.

Engaging stakeholders in the implementation of international agreements in Mesoamerica

Silvana Masseli[1]

[1]Biology Department, Universidad del Valle, Guatemala

Important global and regional efforts have increased in the last decade to make agrobiodiversity and plant genetic resources available for food security and for future agriculture. The International Treaty on Plant Genetic Resources for Food and Agriculture, ITPGRFA, and its framework for action, the Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture, GPA, have become the instruments, for signing parties of the Food and Agriculture Organization of the United Nations, FAO, to affirm the adoption of pertinent actions to promote the conservation and sustainable use of these resources. Since the last State of the World´s Plant Genetic Resources for Food and Agriculture (SOW) in 1996, through the commitment and initiative of the national stakeholders: Agriculture Research Institutes, Universities, NGOs, national and private biodiversity conservation institutions, and small farmer associations; the conservation activities have increased. The financial support that led to the advance of these activities was covered, either by the institutions, the Science and Technology Committees, or by the International Cooperation. In this conference the type of institution, its number, type of activity and their contribution to the conservation of agrobiodiversity in Mesoamérica will be discussed. The engaging of the main stakeholders in the implementation of the international agreements related to the PGRFAA and the application of the 20 priority activities of the Global Plan of Action for the conservation and sustainable utilization of Plant genetic Resources for food and Agriculture will be also analyzed

Biographical sketch

Silvana holds a Ph.D. from Universidad Politécnica de Madrid on plant genetic resources and graduated as a biologist at Universidad del Valle de Guatemala. She is actually teaching genetic resources and doing research at the Biology Department-Universidad del Valle, and is actively participating at the National Plant Genetic Resources Committee (CONARFI). Her research work both in Spain and Guatemala has included: *ex situ* conservation and genetic diversity studies with forest and abrobiodiversity species, using molecular techniques. She was responsible for the installation and implementation of the gene bank at Instituto de Ciencia y Tecnología Agrícolas, ICTA. Silvana has been a Guatemalan delegate at the international meetings organized by FAO related to the International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Global Plan of Action for Conservation and Utilization of PGRFA (GPA). She has been a consultant for FAO in projects and meetings related to the implementation of the ITPGRFA and GPA in Guatemala and for IICA in projects related to the conservation of the agrobiodiversity in Mesoamerica. Has participated as lecturer in topics related to the plant genetic resources in Guatemala and Central America

A network for agrobiodiversity in Mesoamerica.

Ing. Nevio Bonilla[1]

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The American Network of Plant Genetic Resources (REMERFI) was initiated in 1990 and formalized in 1993. Since this time, it has enjoyed the participation of all Mesoamerican countries, through the national research institutes. Regional institutions such as IICA, CATIE and Bioversity (IPGRI) have supported the development of this network of experts. It is particularly Importantly to point out the valuable support, logistics, facilitation and advice offered by IICA and CATIE for since the time of REMERFI's inception. The network has experienced four major stages: 1994-1998 with the Biodiversity Conservation project and Sustainable Use of tree fruit originating from the neotropics (IPGRI / BID); 1998-2002 GTZ-funded project for strengthening the Network; 2002 -2004 transition period; 2004-2010 support of CATIE, IICA and SICTA with development of project proposals, coordination and monitoring activities. Currently the network set a goal of improving the conservation and sustainable use of plant genetic resources by strengthening the national systems and coordinating manipulation of the respective actions at national levels as well as regionally; 2004 to present, REMERFI has led a series of project development activities to be funded by different donors such as IDB, GEF, FONTAGRO, CYTED, and GLOBAL TRUST among others. The network has been active in obtaining financing for some of these projects. Recently the Central American Integration System for Agricultural Technology (SICTA) has created and supported a number of expert networks in the region and REMERFI has been considered for this purpose. It is therefore expected that in the medium term, REMERFRI will have a greater presence and funding on the issue of conserving plant genetic resources in Mesoamerica. An important example of this are some on-going projects such as the regeneration of maize and bean collections and the creation of a network of experts through a Virtual Community through which subject matter experts can interact in forums, discussions, virtual meetings and exchange of information and experiences.

Agrobiodiversity in higher education; presentation of pre-conference study by Pre-Conference Group.

Margarita Baena[1], Nelly Vasquez[2], and Glenn Galloway[3]

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Agricultural biodiversity (ABD) encompasses the variety and variability of animals, plants and microorganisms at the genetic, species and ecosystem levels necessary to sustain agricultural production. It has an essential role in sustainable development and for this reason is a subject of study, research, conservation and use. Activities related to the conservation and use of ABD as well as plant genetic resources (PGR) are diverse and require knowledge and skills in a number of topics. The training of professionals to work in these fields has gradually evolved from short, occasional courses offered by a few organizations to graduate and undergraduate courses and programs offered by universities in the framework of their careers on agriculture and biological sciences. The purpose of this presentation is to show the status and treatment of PGR and ABD topics by universities in Mesoamerica and other countries in Latin America, as well as the challenges and opportunities for universities in their training of professionals to work on these fields. The presentation summarizes surveys and consultations done by Bioversity and CATIE among university staff and examples of the orientation given to courses and programs on ABD and PGR.

Biographical sketches

Margarita is Colombian and holds a BA in Modern Languages from Universidad del Valle in Colombia, and a MA in Linguistics from Ohio University. She is a member of several communities, including the CGIAR Training Community, KM4DEV and SIWA and is the focal point for Communications and Capacity Development in the Americas. She is engaged in regional and institutional initiatives oriented towards managing and disseminating knowledge and information, delivering training, and promoting the inclusion of agricultural biodiversity topics in university curricula. She is the editor of “Bioversity in the Americas,” an electronic news update, and moderates an electronic forum on agricultural biodiversity. Margarita has promoted and coordinated the publication of key Bioversity publications, including handbooks for genebanks, learning modules and guidelines to regenerate germplasm.

Nelly is Costa Rica. She holds a BSc in biology, and MSc. in agricultural sciences and natural resources, and a PhD in Sustainable Tropical Agricultural Systems, all from the University of Costa Rica. She currently works in Phytogenetic Resources and Biotechnology Program at CATIE where she works on *in vitro* multiplication and cryoconservation. She is part of the CATIE collections committee where we oversee the management of CATIE’s germplasm collections. She also co-teaches a course on conservation of phytogenetic resources in agroecosystems.

Markets for Agrobiodiversity: lessons learned from Certification
Organized by Jessie Cuevas of Starbucks Coffee

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Starbucks has always worked to buy our coffee in a way that respects the people and places that produce it. It's simply what we believe to be right. Over the last decade, Conservation International has helped us develop buying guidelines that address our principles for ethical sourcing. Called Coffee and Farmer Equity (C.A.F.E.) Practices, these guidelines help our farmers grow coffee in a way that's better for both people and the planet. C.A.F.E. Practices is a comprehensive set of measurable standards focused on the following four areas:
Product Quality (requirement): All coffee must meet Starbucks standards of high quality.
Economic Accountability (requirement): Transparency is required. Suppliers must submit evidence of payments made throughout the coffee supply chain to demonstrate how much of the price Starbucks pays for green (unroasted) coffee gets to the farmer.
Social Responsibility (evaluated by third-party verifiers): Measures in place that concern safe, fair and humane working conditions. These include protecting the rights of workers and providing adequate living conditions. Compliance with the indicators for minimum-wage requirements and addressing child labor/forced labor and discrimination is mandatory.
Environmental Leadership (evaluated by third-party verifiers): Measures in place to manage waste, protect water quality, conserve water and energy, preserve biodiversity and reduce agrochemical use.

We aim to have 100% of our coffee certified or verified by an independent third party. Starbucks bought 367 million pounds of coffee in fiscal 2009. Eighty-one percent of that – 299 million pounds worth – from C.A.F.E. Practices approved suppliers. We paid an average of $1.47 per pound for green coffee in fiscal 2009.

Financing Biodiversity in production landscapes of Central America

Oscar Murga[1]

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This presentation will focus on the Cental American Markets for Biodiversity (CAMBio) project funded by the Global Environmental Facility (GEF) and the Central American Bank for Economic Integration (BCIE). CAMBio is a tri-partite initiative by the Central American Bank for Economic Integration (CABEI), the Global Environment Facility (GEF), and the United Nations Development Program (UNDP). The project's objective is enhancing biodiversity conservation and sustainable use within Micro, Small, and Medium-sized enterprise (MSME) development. This will occur by applying innovative financing mechanisms and by extending products offered by CABEI's Financial Intermediary (FI) Network. I will discuss the CAMBio project characteristics and goals towards biodiversity conservation, as well as the role that this global pilot project is playing in financing biodiversity conservation and sustainability. I will focus on the main stakeholders and key partners of the project as well. We will give a brief over-view of the regional results to date and will highlight the potentials and pitfalls for replicating project outcomes and experiences. I will end with recommendations and main lessons learned from our experience working on this project.

Biographical sketch

Dr. Murga graduated from the Universidad Pontificia de Salamanca with a PhD Sociology. He worked with the German Technical Cooperation, PROFONANPE in developing and presenting a postgraduate course on protected areas and wildlife management in Lima and Tumbes, Perú. He spent some time working with the Central American Institute for Enterprise Management/INCAE's Higher Management Program for NGOs. He has also help other varied posts including with the New York Zoological Society where he worked on neotropical wildlife management. With the UNESCO-Man and Biosphere Program in association with the Smithsonian Institute he developed a post graduate course on Protected Area Management and Biosphere Reserves design and management for Tikal, National Park in the Mayan Biosphere Reserve of Petén, Guatemala. He also holds a doctorate in Veterinary Medicine from the San Carlos University of Guatemala.
Dr. Murga is currently the Biodiversity Specialist for the GEF funded Central American Markets for Biodiversity (CAMBio) project managed by the Central American Bank for Economic Integration. He is also the National Coordinator of UNDP/ GEF Small Grants Program for Guatemala. He has served as the primary consultant for the development of environmental education framework for the KfW funded "ProSelva" project. Petén, Guatemala, and served as the Regional Director for Petén and Mayan Biosphere Manager on the National Council of Protected Areas (CONAP). Wit The Nature Conservancy (TNC), he is the Main consultant and trainer, for the design and development of the Parkguards Training Program and Handbook for Park guards of the National System of Protected Areas of Guatemala.

The importance of Information for Stakeholders

Randall Garcia[1]

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The botanical richness of Central America and its role as food is expressed not only through the great diversity of crops that have originated in the area, but also through edible plants that are grown throughout the region, using both traditional methods or harvested directly, in addition to the genetic wealth of wild relatives of cultivated plants that is still in the woods. The National Biodiversity Institute (INBio) in Costa Rica, with support from the Government of Norway and herbariums from all countries in the region, has been able to collect and systematize information both on edible plants and their wild relatives. About 800 species of the 18,000 found in the wild are consumed locally. It has been possible to identify distribution locations for 368 wild relative species using a digital database of 15 herbariums (http://www.inbio.ac.cr/web-ca/paginas/herbarios.htm). The way in which research and conservation agendas convey in the region has left these strategic resources unprotected in many cases, without clear definition of responsibilities related to their conservation and use, while they face serious threats not only for the loss of habitat but also due to climate change. Efforts to raise awareness on the value of these resources as local livelihoods and as components of an adaptation strategy in agriculture are urgent, taking the topic beyond the specialists, which implies new forms of communication.

Biographical sketch

Mr. Randall García is a Forestry Engineer and holds a Master Degree in Ecological Tourism. His professional expertise covers the areas of reforestation, agricultural business management and the planning and management of wildlife-protected areas. During many years he worked in the Planning Department of the Servicio de Parques Nacionales (National Parks Service of Costa Rica). He coordinated the project of the Ministry of Environment and Energy to support the land planning development designed for conservation purposes of the biodiversity, denominated as GRUAS. He also worked as a consultant in the design of the project Corredor Biológico Mesoamericano.

Since 1996 Mr. García has been working for the National Biodiversity Institute (INBio) where he currently holds the position of Director of Conservation. Since 2004 has been encharged of INBio´s international projects, including: Building Capacity and Sharing Technology for Biodiversity Conservation in Centroamerica, and Sur Cooperation Program between Benín, Bhutan and Costa Rica.

Sessions 5 and 6: Factors affecting agrobiodiversity over the next 10-50 years – climate change, urbanization, global commodity trends, niche markets, biotechnology, declining farm population, ecotourism, ecosystem services

Session leaders: Jeff Milder and Bruno Rapidel

Session objectives

The overall aim of the conference is to strengthen the use and management of agrobiodiversity in Mesoamerica by bringing together international research and public sector organizations, universities and civil society to study, analyze and take action to promote sustainable land management, in recognition of the International Year of Biodiversity in 2010.

Session 5 provides a space for a Panel of Rapporteurs to recap the main points of Sessions 1-5. The final session, Session 6, Visions and Pathways, aims to bring together and synthesize an action plan for how CATIE and its partners address the threats and take advantage of opportunities for conservation and use. The Session briefs will help to provide coherence across the sessions and ensure that the key issues and opportunities are captured and brought forward into the Visions and Pathways for future action.

The Wallace conference is to reflect on the status, role, and future of agrobiodiversity in the Mesoamerican region. Rather than producing conference proceedings, the conference organizers invite the conference participants to join us in producing a policy brief synthesizing the discussions and ideas generated by the conference. The breakout groups of session 5 are designed to create a specific space where conference participants can brainstorm, discuss and present their perspectives on five key themes:

1. What actions are needed to enhance conservation genetic diversity of native agrobiodiversity?
2. Functional agrobiodiversity: how do we put biodiversity to work and raise awareness about the contribution that this diversity makes to human well-being?
3. How do we insert awareness, use and conservation of agrobiodiversity into university curricula in the region (Education for conservation and use of agrobiodiversity)?
4. What policy actions and institutional arrangements are needed to ensure the long-term conservation and sustainable use of agrobiodiversity?
5. What is the role of markets and the private sector in conservation and use of agrobiodiversity?

Facilitators of these breakout sessions will focus the discussion on the key questions outlined in the previous sections of these briefing notes. They should make reference to the results presented regarding the current status of agrobiodiversity in its different forms, but should particularly focus on research, action, institutional arrangements and policy gaps in ensuring the conservation and use of agrobiodiversity. We will use a wiki type tool that would permit all conference participants to contribute to the policy brief that will be ready before the end of 2010, the International Year of Biodiversity.

The Prospects for Agrobiodiversity in 2050: Key Economic and Policy Factors

Sara J. Scherr[1] and Jeffrey Milder[1]

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The research presented in this Conference illustrates the enormous potential for more agrobiodiverse farming systems and landscapes to contribute to global and local food security, rural livelihoods and economic growth, biodiversity and ecosystem services. We are seeing breakthroughs in addressing many of the technical constraints for agrobiodiversity conservation; sustainable use, genetic improvement, and agroecosystem design are being addressed. While these are critical, equally important in determining the scale and scope of agrobiodiversity over the coming decades will be trends and interventions in key economic and policy factors. Population growth, markets, climate policies and knowledge systems could all potentially move in directions that further reduce agrobiodiversity. However, these trends could also be shaped to encourage agrobiodiversity, in particular through patterns of population growth and urbanization that increase demand for diverse products; the development of food marketing systems, finance and infrastructure that can efficiently handle greater product diversity; the development of new market instruments like eco-certification and payments for ecosystem services that explicitly incorporate agrobiodiversity; policies that address climate change adaptation by using agrobiodiversity to enhance resilience and mitigation through large-scale sequestration in diversified landscapes; and strengthened institutions for transmission of rural knowledge about agrobiodiversity. Thus strategic policy action is needed, together with continued technical research and investment, to ensure that agrobiodiversity in 2050 is much richer and more robust than today.

Sara J. Scherr, an agricultural and natural resource economist, is President of EcoAgriculture Partners, an NGO that supports agricultural communities and their conservation partners to manage landscapes both to increase production and incomes, and to enhance wild biodiversity and ecosystem services. She is a member of the UN Environment Program Advisory Panel on Food Security, the Policy Advisory Group of the Alliance for a Green Revolution in Africa, and the Katoomba Group Board of Directors. She recently served on the World Agroforestry Centre Board of Directors and the United Nations Millennium Project Task Force on Hunger. Dr. Scherr's earlier positions include: Director of Ecosystem Services, Forest Trends; Adjunct Professor, University of Maryland; Co-Leader, CGIAR Gender Program; Senior Research Fellow, International Food Policy Research Institute; and Principal Researcher, World Agroforestry Centre. www.ecoagriculture.org

Jeffrey Milder is an ecologist and land-use planner whose work focuses on integration of ecosystem conservation, agriculture, and economic development in rural landscapes. Since 2005, he has worked with EcoAgriculture Partners, first as a Research Fellow and currently as Director of Strategic Planning and Research. During this time, he co-developed EcoAgriculture Partners' Landscape Measures Initiative for supporting the monitoring and adaptive management of rural landscapes. Dr. Milder's recent research, in conjunction with CATIE, has focused on landscape-scale relations between agricultural management and

biodiversity conservation in pasture-dominated landscapes of Central America. He has also conducted research and evaluation related to payment for ecosystem services, eco-certification, conservation farming, and other approaches to supporting sustainable agriculture and rural livelihoods. Prior to joining EcoAgriculture Partners, Dr. Milder founded and managed the community planning practice at Daylor Consulting Group, a U.S. design firm. Dr. Milder holds M.Sc. and Ph.D. degrees in Natural Resources from Cornell University and a B.A. in Earth Sciences from Harvard University.

Plant Genetic Resources and Climate Change: Opportunities and Challenges

Xavier Scheldeman[1], Maarten Van Zonneveld[2], Nora Castañeda[3] and Andy Jarvis[4]

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The growing evidence of a changing climate is leading to an increased number of studies, often model-based, on the effects of the changing growing conditions on agricultural production. Outputs of the impact studies often suffer from low confidence intervals, as the input of many models, the future climate projections, is still subject to a lot of uncertainty, starting with the projected emission scenarios in the decades to come. Without much doubt however, is the conclusion that plant genetic resources, and their variable response to changes in climate, will play a key role in the formulation of adaptation strategies to the new environmental reality, while they can also contribute in the implementation of effective mitigation actions. In order to be prepared for future changes, short-term priority activities should focus on the following activities:

- targeted collection of germplasm (especially in areas that are subject to extreme climate conditions where there is a higher likelihood to find adapted materials), with a special focus on wild relatives (as these often hold resistance/tolerance genes while they are not well represented in genebanks)
- increased multisite characterization (including development of markers for adaptive traits) and evaluation activities, in order to better understand the responses of selected accessions to different climatic conditions key be able to identify material with adaptation potential
- formulation of strategies and promotion of actions that facilitate exchange of material both at local (focusing on local seed systems), national and international level (focusing on access and benefit sharing)

Special Thanks

The conference organizers would like to take minute to recognize the financial and logistical support provided by several organizations and projects. Without their help, this conference would not have been possible.

Thanks to CATIE ***Mesoamerican Environmental Program (MAP)*** for generous financial support. The MAP of CATIE is an ambitious intersectorial platform designed to achieve sustainable land use that improves human wellbeing in rural areas of Mesoamerica. With the support of the Norwegian, Swedish and Finnish governments, MAP works with partners to develop knowledge and innovation, using a livelihoods approach that will multiply ecologically healthy, economically competitive and socially equitable use of natural resources to achieve its objectives. MAP is led by Drs John Beer (jbeer@catie.ac.cr), and Isabel Gutierrez (igutie@catie.ac.cr).

Thanks also to the financial support provided by ***CIRAD's PCP*** (French acronym for Scientific Partnership Platform) led by Dr. Bruno Rapidel. The PCP is a platform launched to bring together scientists from CIRAD, CATIE, INCAE, CABI, PROMECAFE, and Bioversity International to interdisciplinary challenges associated with agroforestry systems with perennial crops. The goal is to form a strong multidisciplinary group to achieve significant research and developmental results.

Generous financial support was also provided by the ***Wallace Genetic Foundation*** (www.wallacegenetic.org). The Wallace Genetic Foundation supports interests including agricultural research, preservation of farmland, ecology, plant genetic research, conservation and sustainable development.

Bioversity International (www.bioversity.org) provided tremendous logistic, intellectual and organization support that was indispensible in preparing and executing the conference. Particular thanks to Charles Staver, Elizabeth Goldberg, Xavier Scheldeman and Marleni Ramírez who have provided tremendous support to the ideas, design and presentation of the conference since its inception.

Bioversity International is the world's leading organization dedicated to researching agricultural biodiversity to improve people's lives. Their research is carried out with partners around the world and seeks sustainable solutions to meet three important challenges: (1) malnutrition and hidden hunger of missing micronutrients, (2) sustainability and resilience in food supplies and farming systems and (3) conservation and use, ensuring that agricultural biodiversity remains accessible to all. Bioversity also provides policy information and analysis to improve the legal framework - global, regional and national - needed to ensure that agricultural biodiversity can be put to work to deliver sustainable solutions for economic development.

Thanks to ***Ecoagriculture Partners*** (www.ecoagriculture.org) for their participation and contributions to the content of the conference. EcoAgriculture Partners strives for a world where agricultural communities manage their landscapes as ecoagriculture to enable them simultaneously to enhance rural livelihoods, conserve biodiversity and ecosystem services,

and sustainably produce crops, livestock, fish, and fiber.

Thanks to all the ***conference presenters, and participants*** who took time out of their busy schedules to join us, on what we hope has been a lively, and engaging week of discussions on how to best protect Mesoamerica's unique agrobiodiversity.

We would also like to thank all of CATIE staff, especially to the ***transportation unit***, ***security***, ***housing*** and ***maintenance*** for helping to make everyone feel welcome and comfortable while staying at CATIE. Thanks to ***Alex*** for preparing such wonderful and inspiring floral displays.

Finally, we would like to give special thanks to those that gave of their time to put the conference together. Thanks to ***Alejandra Martínez-Salinas*** and ***Johana Gamboa*** of the Livestock and Environmental Management Program for their tremendous help in managing the program logistics and details of the conference. Thanks to ***Cris Soto*** and ***Vicza Salazar*** in the CATIE Communications Office for their attention to detail and assistance in communicating the conference both internally and externally. And finally to ***Rocío Jiménez***, whose artwork we hope you have enjoyed.

Poster Abstracts

6th Wallace Conference
20-24 September, 2010
Turrialba, Costa Rica

1. Diversifying Monoculture Crops by Incorporating Prairie Buffer Strips

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Planting vegetative buffer strips in crop fields can dually act to conserve native plant species and to provide other ecological benefits to the agricultural system, including soil and water conservation and nutrient retention. We are conducting a watershed-level experiment that incorporates buffers composed of native, perennial prairie species into cropland. We divided 12 watersheds into four treatments, three treatments with buffers (modifying buffer size and position) and one all-crop treatment (corn and soybean, in alternate years). We surveyed vegetation in the buffers and analyzed the effect of buffer design on plant species richness (number of species) and plant cover. Additionally, we surveyed vegetation in the crop portion of the watersheds and analyzed differences in weed cover between watersheds with buffers and all-crop watersheds. In 2009, we identified 104 plant taxa within the buffers, of which 72 were native and 32 were non-native species. On average, there were 46 species in watersheds containing buffers, but only 12 species in all-crop watersheds. Within buffers, mean plant cover was 74%, with native perennial species providing an average of 20% cover. There were no statistical differences in mean plant cover or total number of species among the three buffer designs. There were also no statistical differences in mean weed cover within the soybean crop between watersheds containing buffers and all-crop watersheds. These findings suggest converting at least 10% of a monoculture crop watershed into buffers will increase biodiversity, consequently increasing ecological benefits resulting from perennial and native species, without increasing weeds within adjacent crops.

2. FDiversity: integrated software for the analysis of functional diversity

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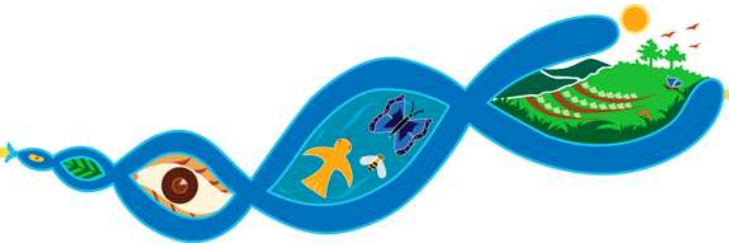
Functional diversity (FD) defined as the value, range, and abundance of functional traits in a given community or ecosystem is increasingly accepted as a synthetic ecological concept



that sheds light on ecosystem functioning. Several synthetic indices have been proposed to describe the FD of a community, or some of its components. The comparative assessment of FD in different ecosystems and for different ecosystem processes would be an invaluable tool for a better and more general understanding of what are the functional roles of biodiversity in the provision of ecosystem services.

We have developed a free-access software package, F-DIVERSITY, which implements a user-friendly interface to open source routines for the estimation and analysis of FD indices. The open source platform is R with an interface written in Delphi®. The software is free and can be downloaded at ***www.fdiversity.nucleodiversus. org*.**

The software can handle its own data sets and read files from different sources. The data handling also allows merging and concatenating different data files into synthetic matrices and tables. The software calculates all the major FD indices. It is also possible to obtain summary statistics, fit sophisticated linear models and make comparisons among communities using different a-posteriori tests. F-Diversity has therefore the potential to become a major tool assisting research on the links between biodiversity, functional traits and ecosystem processes and services. We present and illustrate its main features, as well as discuss some of the properties of common and new FD indices.

Keywords: *functional diversity indices, species abundance, community weighted mean, biodiversity assessments, linear models*

3. Qeco – Quantitative ecology software. A collaborative approach

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Fernando Casanoves, CATIE, Costa Rica[2]
Laura Pla, UNEFM, Venezuela
Sergio Vilchez, CATIE, Costa Rica
Mauricio J. Di Rienzo, Argentina

Qeco is a free statistical software for analysis of ecological data. It has a simple and user-friendly interface that makes the difference in the experience of data analysis. It implements state-of-the-art statistical and quantitative ecological methods. The main characteristic that makes it different is that it does not only merges the best of the ease-to-use menu-driven software with the power of R, but that it allows growing according to the needs and knowledge of the users. This is possible because Qeco creates an interface that invites the

[1] *Acknowledgement: To Conservation International Foundation for grant the launch of Qeco.*

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users to add new menus according to her/his needs. The purpose of Qeco is to give a standardized container of R applications that will be the core of an ease to use and productive statistical application.

The software can handle its own data tables and read and write from/to different standard file formats (*.xls, *.txt, *.r, and others). Several tools allow the users to edit, sort, rearrange rows and columns of the data table, select cases using several criteria and perform basic descriptive analysis. It also has several advanced tools for data handling including transformations, formulas, merging of tables and creating categorical variables from quantitative variables among others. The extended and flexible graphic tool makes the exploratory analysis easier than in other software. Qeco implements a new model of making software applications. Its strength is based on the collaborative environment it creates and the merging of the better of two apparently opposite paradigms: the menu-driven applications, and the flexibility of the command-based software.

Key-words: *free software, R, quantitative ecology, collaborative software development*

4. Cambios agroecológicos y de paisaje en los territorios indígenas Brunka / Landscape and agroecological changes in the Brunka indigenous territories

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Esta presentación describe y analiza los cambios de agrodiversidad y paisaje en los territorios indígenas brunkas de la región Pacífico sur de Costa Rica. Considero los factores socio-políticos que han impulsado cambios drásticos de las prácticas agrarias, la agrodiversidad, y la cobertura de tierra en los últimos cincuenta años, después de la apertura de la Carretera Interamericana en la región. La carretera facilitó acceso a la región sur del país, y el ITCO (Instituto de Tierras y Colonización) empezó a impulsar la colonización agraria en esta zona. En los años sesenta, la política nacional aún consideraba que los bosques representaban la falta de productividad, mientras que se priorizaban las tierras agrícolas. Este sistema de valores a nivel nacional era contradictorio a las prácticas y perspectivas indígenas, las cuales concebían a los bosques como parte fundamental del sistema productivo. Como consecuencia de estos factores, la cobertura boscosa en los territorios brunkas se redujo de aproximadamente 60% en el año 1964 a 26% en el año 2000, mientras que la tenencia de tierra indígena fue reducida a 35% del territorio. Las prácticas agrícolas han cambiado de manera significativa. Antes se practicaba la rotación de cultivos, y se dejaba la tierra en descanso. Ahora se utilizan más agroquímicos, hay más producción de monocultivo, y se aprovecha menos las comidas silvestres. Se compra más comida, y la seguridad alimentaria se ha reducido.

5. Micro-landscape context effects on the dispersal of coffee berry borer (*Hypothenemus hampei)* in Costa Rica

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Coffee berry borer (CBB) *Hypothenemus hampei* (Ferr.) is a recent pest of the Costa Rican landscape. Females have the ability to fly, and particularly do so when seeking new coffee berries to colonize after harvest. CBB dispersal is believed to be facilitated by the connectivity between coffee plantations, but may be hampered by fragmented landscapes when alternate land uses are found between coffee patches.

To assess the effects of land use on intermediate CBB dispersal distances (<150 m) we established a six-month study in six locations of the Turrialba region of Costa Rica that measured CBB movement in transects spanning isolated coffee plantations into three adjacent land uses: forest, sugar cane and pasture. At each location, we placed six transects starting 30 m within the coffee plantation, continuing 140 m into each of the adjacent land uses. Within these transects we placed one CBB trap (Brocap®) each 10 m. We baited each trap with a mixture of ethanol and methanol.

We captured 96.5% of the individuals within the coffee plots and only 3.5% outside. The majority of the individuals captured outside (30.2%) were found directly adjacent to the coffee on the edge between the two uses. However, some individuals (2.9%) were found 140 m from the edge in the furthest trap. Despite these low dispersal distances, we did find differences between the three adjacent land uses. The number of CBB captured in forests was only 12 % and 19 % the number of CBB captured in sugar cane and pasture respectively.

Our results show that CBB does not regularly disperse outside of coffee although occasional individuals were captured 140 m from coffee edges. This finding suggests that breaking connectivity between coffee plantations may help to reduce CBB dispersal particularly when low permeability land uses such as forests are placed between coffee plots.

6. Relationships between landscape context and coffee rust (*Hemileia vastatrix)*, coffee berry borer (*Hypothenemus hampei)* and the root-knot nematodes *Meloidogyne spp.* En Costa Rica

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We conducted a one-year survey on 50 coffee plots to study the effects of landscape structure on coffee pests and diseases. In each plot we monitored the density of three organisms with different dispersal abilities: (1) coffee rust (*Hemileia vastarix*), (2) coffee berry borer (*Hypothenemus hampei*) and the (3) root-knot nematodes (*Meloidogyne spp.*).We classified the landscape within a 1500 m radius around each plot into four land uses (coffee, sugar cane, pasture, and forest) using aerial imagery and verifying this classification on the ground. We further subdivided this 1500 m radius plot into 12 nested circular plots (0, 50, 100, 150, 250, 300, 350, 400, 450, 500, 1000, 1500 m) and calculated the proportion of each land use. Finally, we examined the correlations between plot level pest and disease densities and landscape context at each scale mentioned above.

We found diverse responses to landscape structure for each of the study organisms. There were no correlations between landscape structure and population densities of *Meloidogyne spp*. We found multiple significant positive correlations between *H. hampei* infestation and the proportion of the landscape in coffee. The significance of this relationship peaked at the 150 m radius ($r=0.28$, $P<0.05$). Similarly we found multiple significant relationships between maximum annual coffee rust incidence and the proportion of the landscape in pasture. The significance of this relationship peaked at the 300 m radius ($r=0.35$, $P<0.05$).

These relationships indicate that fragmenting coffee farms at small scales may help to significantly reduce coffee berry borer movement between plots. This is probably because *H. hampei* has low dispersal ability. In contrast, fragmentation of coffee landscape, particularly by pasture, may increase coffee rust dispersal. This is probably because *H. vastatrix* is an airborne pathogen whose dispersal is favoured by open spaces. Finally, nematodes, which are nearly immobile, are not influenced by landscape context.

7. Detección de aves de bosque en tres agropaisajes de las tierras altas de Nicaragua

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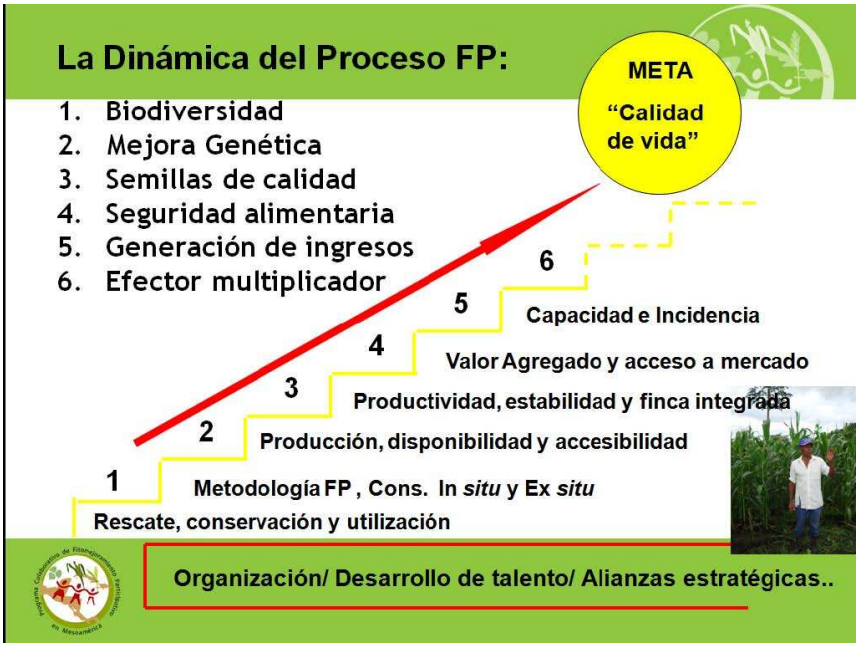
Con el fin de conocer el estado actual de la diversidad en las tierras altas de Nicaragua, se detectaron aves en tres paisajes diferentes: una finca orgánica (El Jaguar), en una finca bajo intenso uso de químico (Finca Santa Maura) y en un área rural de bajo presupuesto (Reserva Nacional Datanlí-El Diablo, Comunidad El Gobiado), realizándose 114 puntos de conteo visitados cinco veces en cinco hábitat: Bosque, bosques de riberas, tacotal, café, y área abierta. Se observaron 187 especies en total y 4843 individuos; 156 especies son residentes y 31 son migratorias. La riqueza de especies fue mayor en Cafetal (7.77 ± 3.1), y en la finca el Jaguar (7.56 ± 3). Las detecciones fueron mayores en cafetal también (10.53 ± 5.14), y el jaguar (9.7 ± 4.35). Las detecciones en cafetales con uso de químicos muestran variaciones temporales a diferencias de los otros hábitats. Puntos de conteo cercanos al borde o parcelas de café bordeadas de bosque obtuvieron valores de diversidad más alto, al mismo tiempo que presentan mayor presencia de especies de bosque. El efecto de remanentes de bosque principalmente aquellos que bordean las parcelas tiene un impacto el la diversidad positivo, por lo que se recomienda se use como estrategia de conservación y protección de la biodiversidad en agropaisajes.

8. Principales Logros del Programa Colaborativo de Fitomejoramiento Participativo en Mesoamérica

Rosas Juan Carlos Ph.D.
Araya Rodolfo, M.Sc.
Fuentes Mario, M.Sc.
Alonzo Sergio, Ing. Agr.

El Programa Colaborativo de Fitomejoramiento Participativo en Mesoamérica (FPMA) es uno de los programas pioneros en la región (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica y Cuba) en relación a la participación de los agricultores en la toma de decisiones y acceso a conocimientos para el mejoramiento de variedades de maíz, frijol y sorgo; además del establecimiento de alianzas entre instituciones de gobierno, organismos no gubernamentales y centros de investigación nacionales e internacionales.



Dentro de los principales logros del programa podemos mencionar los siguiente: Más de 5,000 agricultor@s involucrados en proceso FP, vinculados a Cooperativas, Asociaciones y ASOCIALes; Red de colaboración funcionando; Formación de recurso humano local y profesional; Alianzas estratégicas con Gobiernos locales y nacionales; 6 bancos de semillas establecidos a nivel comunitario y 4 a nivel institucional para impulsar la conservación in situ; liberación de 26 variedades de Maíz, 11 de Frijol y 8 de sorgo, aumentando hasta en un 50% la producción; producción de semilla de calidad; disponibilidad de alimentos en regiones con condiciones adversas y formación de recurso humano local que impulsa la mejora genética y la conservación *insitu*.

9. Use of Participatory Plant Breeding and Declared Seed Increase Maize Production for Small and Medium scale Farmers in Oaxaca, Mexico.

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To help increase maize production in the state of Oaxaca, Mexico, where average grain yields are low at around 2 tons/ha, a collaborative project of participatory plant breeding (PPB) of maize is conducted by CIMMYT maize germplasm bank and Research Extension Services of Autonomous University of Chapingo (UACH), Oaxaca, Mexico. CIMMYT maize germplasm bank has developed tropical maize gene pools and pool hybrids between heterotic pools. UACH has developed a movable seed conditioning and processing equipment to clean, sieve, classify, and treat seeds for production of "declared seeds". From six on farm variety trials conducted in 2009-2010 in the tropical wet region of Papaloapan, Oaxaca, CIMMYT late gene pools (variety) and pool hybrids (inter-variety hybrid) yielded 5.15 tons per hector on the average which was 1.9 ton (58%) more than the average yield of farmers' landraces which was 3.25 tons. On the other hand, the same trial conducted at four environments in CIMMYT stations during the same period showed late maturity gene pools and pool hybrids yielded 6.85 tons and the landraces yielded 3.1 tons per hector. Early and intermediate maturity CIMMYT gene pools and pool hybrids were not well adapted at high rain fall tropical regions of Papaloapan. CIMMYT late gene pools of yellow grain types yielding as much as white are new to most of the farmers for production of forage maize. The production of declared seeds in parallel with on farm variety trials and demonstrations has enabled farmers to plant selected varieties and hybrids in the following cycle. Based on the results of PPB activities conducted in 10 maize regions of Oaxaca, short statute, relatively early maturity and high yielding white and yellow CIMMYT pools and pool hybrids are expected to contribute to the on-farm maize diversity and productivity in the state of Oaxaca, Mexico.

Key words: Participatory plant breeding, on farm maize diversity, Tropical maize gene pools

10. OMEGA3: AN ECOLOGICALLY INTENSIVE APPROACH FOR THE DESIGN OF SUSTAINABLE CROPPING SYSTEMS IN THE TROPICS

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Farmers in the tropics are faced with plant protection issues resulting in: (i) food insecurity and low-income in low-input traditional agrosystems; (ii) pesticide-induced adverse impacts on human health and the environment in intensive systems; (iii) export restrictions due to strict regulations imposed by importing countries. To sustainably provide more and better food to populations of both southern and northern hemispheres, one should therefore

shift from Agrochemistry to “Ecological intensification”, a paradigm based on the optimization of biological interactions and regulations in agroecosystems, particularly via the planned introduction and management of plant species diversity (PSD), resulting, alongside other positive impacts, in pest and pathogen regulation, through various pathways. The CIRAD Omega3 project addresses such issues, building on a broad range of tropical case studies representing various PSD deployment scales (soil, field, landscape), according to a typology of pests and diseases based on their life-history traits (specificity, dispersal ability): (1) sanitizing effects of rotation with service plants versus bacterial wilt on tomato in Martinique; (2) allelopathic effects of cover crops versus white grubs and Striga on upland rice in direct seeding mulch-based cropping systems in Madagascar; (3) diversionary effects of trap plants, combined with conservation biological control versus tomato fruit worms on tomato and okra in Martinique and Niger; (4) same effects "assisted" by application of a food attractant/biological insecticide combination versus fruit flies on cucurbits in Réunion; (5) effects of combining trees and shrubs on plant bug dynamics and black pod rot epidemics on cocoa in agroforestry systems in Cameroon; (6) landscape fragmentation effects on coffee leaf rust epidemics and coffee berry borer dynamics in agroforestry systems in Costa Rica. Beyond obtained immediate impact-oriented results, main expected outputs are tools for evaluating, developing and monitoring agroecosystems based on enhanced ecological processes of pest and disease control by optimized vegetational diversification.

11. USE OF RESIDUAL BODY CONDITION TO DETERMINE HABITAT SUITABILITY AND USE OF CLOUD FOREST AND SHADE COFFEE BY RESIDENT AND MIGRATORY BIRDS IN NICARAGUA

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Birds are prime bioindicators of habitat quality and ecosystem health. Avian body condition is a convenient measure of habitat quality. To evaluate the suitability of cloud forest and shade coffee as prime habitat for migratory and resident birds, I used principal components analysis to generate one optimal size variable (PC1) from eight longitudinal measurements (standardized structural differences). I used residuals from linear regression between the linear size variable (PC1) and body mass to obtain a body condition index. Birds relatively heavy for their size (positive residuals) were considered to be in good condition and vice versa. The data set constitutes 1,403 captures (3 migratory and 7 resident species) inhabiting cloud forest (n = 595) and coffee (808). Nine age class (adult, juvenile) and gender comparisons resulted in differential capture rates ($\alpha = 0.05$) within and between habitats. Whereas adult females were captured about equally in box habitats, 66% adult

males, 73% juv. males, and 60% juv. females were captured in coffee. I assessed body condition of 845 captures (min. = 35; max.133, avg. 85 per species). All three migrants (*Catharus ustulatus*, *Hylocichla mustelina*, *Seiurus aurocapilla*) and two residents (*Lampornis sybillae*, *Mionectes oleaginous*) were fitter in forest, three in coffee (*Campylopterus hemileucurus*, *Chlorospingus ophthalmicus*, *Chiroxiphia linearis*), and two comparable (*Eupherusa eximia*, *Phaethornis longirostris*). Forest and shade coffee are prime habitat. Demographics must be emphasized when using habitat-specific measures of abundance, performance or condition of birds to measure and evaluate habitat quality. Managers are encouraged to maintain comparable preserved and production acreage.

12. Bird dynamics and use of coffee and cacao agroforests, silvopastoral systems, sugar cane and forest landuses in the Central Volcanic Talamanca Biological

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Most studies of biodiversity in agroforests collect snapshots of information collected over very short periods of time. In contrast, CATIE's Bird Monitoring Program (BMP) has completed year and a half of continuous monitoring of avian biodiversity in the six landuses that dominate the Volcan Central Talamanca Biological Corridor, including four agroforestry systems. We capture, identify, measure and mark birds caught by mistnets in two coffee agroforests, a cacao agroforest, live fences in a pasture system, sugar cane fields and secondary forest. The focus of our efforts is to understand how land management, landuse change and climate change impact bird populations, including the capacity of forest dependant species to use agroforestry systems as corridors, and habitat. Since we began our research efforts in January of 2008, the BMP has gathered information on body condition, habitat preference and movement of more than 115 species, and 2000 individuals. More than 65% of these species and 45% of the individuals were found in coffee agroforests. These number increase for migratory species, where 69% of the individuals have been observed in coffee agroforests. In addition, we recaptured migratory species returning to agroforests following the summer migration, indicating that agroforests serve as important habitat for migratory species. Long-term dataset are critical for management recommendations that consider impacts of habitat conversion in the corridor, particularly coffee agroforests are rapidly being replaced with sugar cane plantations with low conservation value. We demonstrate how critical long-term data is for developing evidence based conservation strategies for biodiversity conservation such as increasing the

complexity and connectivity of live fences in pastures and timing the pruning agroforests to avoid nesting periods of resident species, among others.

13. Agrobiodiversity for livelihood security: A case study of coffee based agroforestry systems in Mexico

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The present article examines the livelihood benefits associated with agrobiodiversity in the state of Veracruz, Mexico. Coffee-based agriculture is the principal economic activity in the agricultural sector in the Huatusco region of the state of Veracruz. It is practiced in mono-crop plantations by the majority of farmers, who are rendered vulnerable to price depreciation resulting from simultaneous harvest and over-supply of a single commodity. Some farmers have associated multiple crops in coffee farms (agroforestry techniques) as a strategy to improve their livelihoods. Farmers who increased agrobiodiversity in their farms have significantly improved their livelihoods compared to mono-crop plantation owners. The associated benefits can be classified in three ways which correspond to the tripartite goal of sustainable development: (i) ecological sustainability (through increased ecosystem resilience), (ii) economic stability (through diversified, less risk-prone sources of income), and (iii) social well-being (through lower unemployment and increased reliance on indigenous knowledge). The research shows that increased agro-biodiversity can be a strategy to improve the livelihoods of coffee producers in the state of Veracruz. However further research is required to recommend appropriate plant-crop combinations suitable for different biophysical conditions and economically feasible by different farmers.

14. Factors shaping agro-biodiversity in Ethiopia: the case of sorghum in the centre of diversity.

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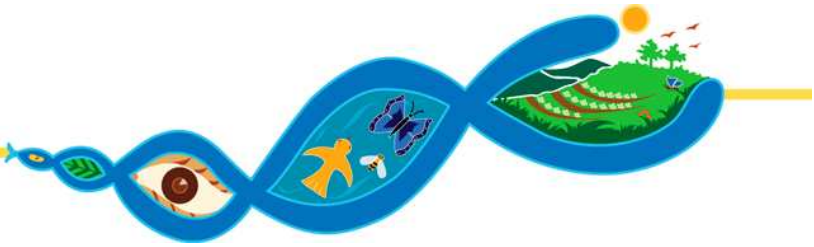

Ethiopia is cited as one of the centers' of sorghum diversity. In order to assess the on farm genetic resources management of sorghum various research methodologies were employed. These were focus group interviews with 360 farmers, key informant interviews with 60 farmers and development agents and semi-structured interviews with 250 farmers. Besides, a diversity fair was done with over 1200 farmers. For quantifying on farm diversity, direct on farm monitoring and participation with 120 farmers were made. Quantification of varietal diversity per farm was counted by a participatory zigzag sampling in the diagonal direction of the plot with the farmer and all encountered varieties were counted. Soil samples were taken from 120 farms and were subjected to analyses of soil pH, P, available nitrogen, organic matter, and exchangeable potassium. Altitude and other related climatic data were collected. The number of varieties conserved by farmers ranged from one to twenty per farm and this is affected by socio-economic and biophysical factors. The mean number of 8.3 and 6.3 varieties were grown by *Oromo* and *Amhara* farmers, respectively. The minimum and maximum range did not vary for both ethnic groups. There was no significant difference in the number of varieties held by various wealth groups. With respect to farm size as explained by the quadratic model, it significantly accounted and predicted for the variation in the number of varieties. The role of soil pH, P, available nitrogen, organic matter, and exchangeable potassium on farm genetic diversity is described. P was a positive limiting factor for varietal diversity. As to the effect of crop ecology, there were more number of varieties in the intermediate altitudes than in the lowland and highland. Both the quadratic and linear equation expressed that distance from the house and town showed non-significant relationship to the number of varieties planted per farm. Varietal mixture is one of the strategies used by the farmers for improved on farm genetic diversity management. Farmers' underlying principles for conserving genetic diversity is described. Three models developed, namely; Bioecogeographic genetic diversity model, Farmer induced genetic diversity model and Farmer-cum-bioecogeographic genetic diversity model are explaining the processes shaping on farm genetic diversity of sorghum in Ethiopia.

Key Words: *biophysical factors, centre of diversity, Ethiopia, farmer varieties, germplasm, genetic diversity, genetic diversity model, socio-economic factors, on farm*