Ecoagriculture: sustainable food production through ecosystem management

Jeffrey Milder, EcoAgriculture Partners & Cornell University
Sara J. Scherr, EcoAgriculture Partners

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National Academies Workshop:

Exploring Sustainable Solutions for Increasing Global Food Supplies

3 May 2011

Beyond food security: societal demands on rural landscapes

- Meet food demand for 9 billion people (~70% increase), in the context of climate change and growing resource scarcity
- Provide energy for local use and/or world markets
- Shift from a major source of greenhouse gases, to a net sink
- Contribute to and restore critical ecosystem services
- Protect agro- and wild biodiversity

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Single-objective land allocation and use

PNAS

Trading carbon for food: Global comparison of carbon stocks vs. crop yields on agricultural land

Paul C. West[a,b,1], Holly K. Gibbs[c], Chad Monfreda[d], John Wagner[e], Carol C. Barford[a], Stephen R. Carpenter[b], and Jonathan A. Foley[f]

[a]Center for Sustainability and the Global Environment (SAGE), University of Wisconsin, Madison, WI 53726; [b]Center for Limnology, University of Wisconsin, Madi
[d]Con
5370
Edite

Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales

Erik Nelson[1*], Guillermo Mendoza[1],
Kai MA Chan[5], Gretchen C Daily[6], J
Taylor H Ricketts[10], and M Rebecca

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Contents lists available at ScienceDirect

Agricultural Water Management

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Managing water in agriculture for food production and other ecosystem services

Line J. Gordon[a,b,*], C. Max Finlayson[c], Malin Falkenmark[a]

[a]Stockholm Resilience Centre, Stockholm University, Sweden

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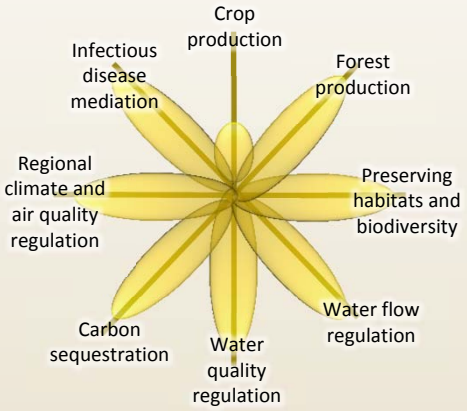
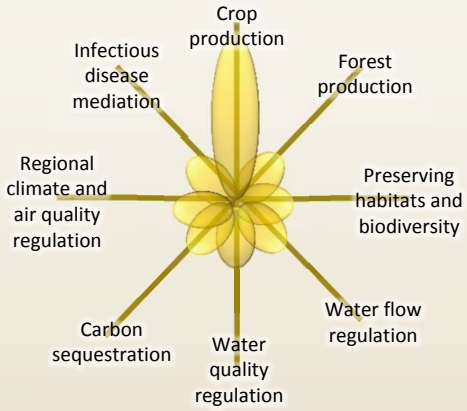
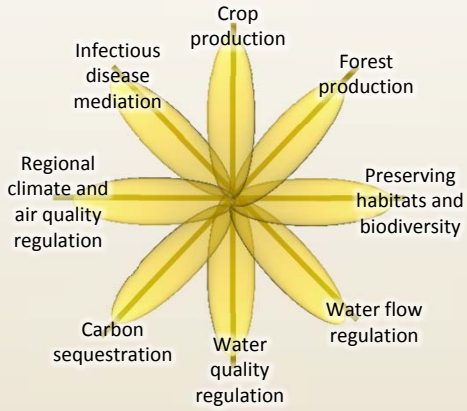
Multi-tasking the world's productive land base



Natural ecosystem



Intensive cropland



Cropland with restored ecosystem services

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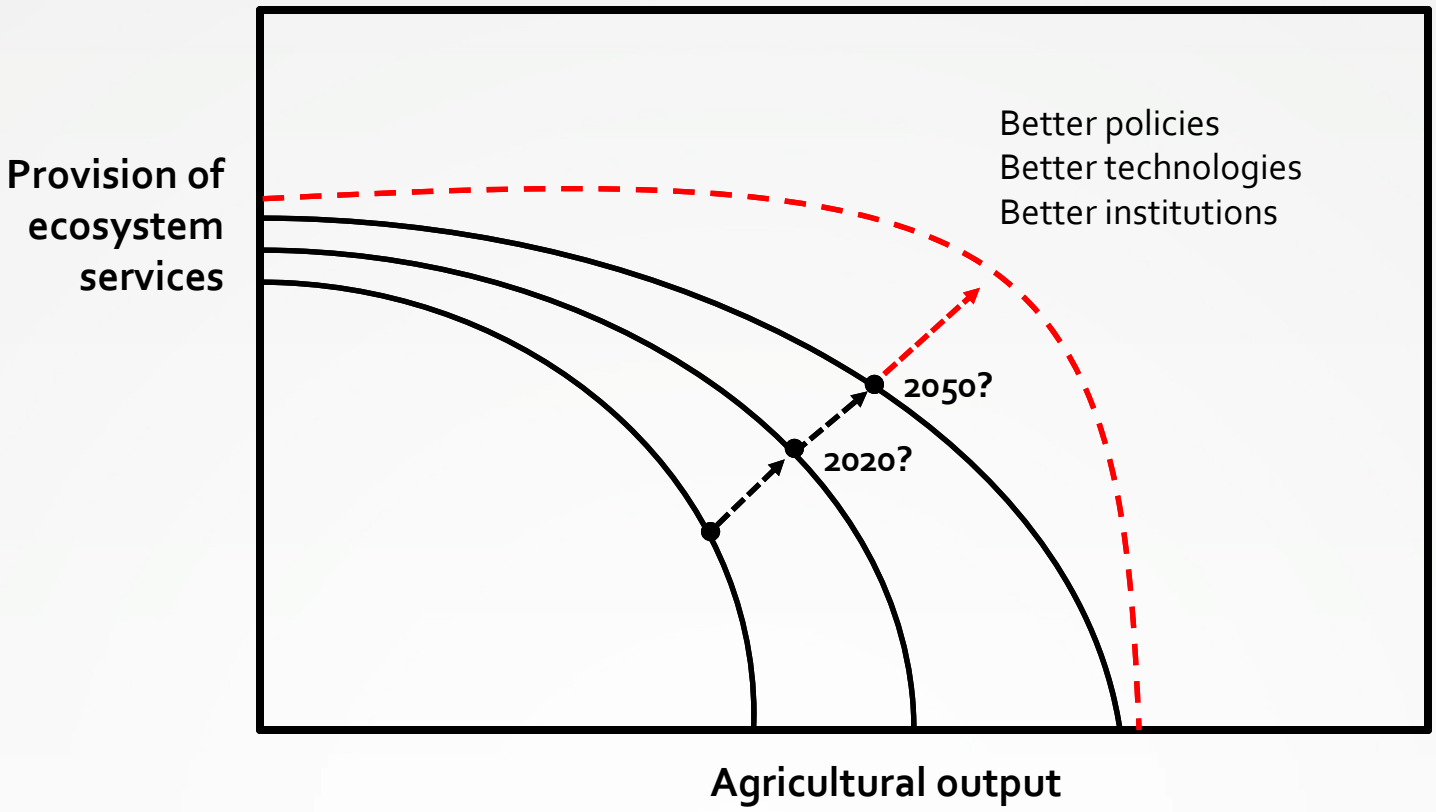
Re-drawn from Foley et al. 2005

How far can we push the tradeoff frontier?



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Ecosystem management: management to conserve ecological services and restore natural resources while meeting the needs of current and future generations

- a holistic approach that moves beyond management of individual parts (U.S. Forest Service)
- integrates scientific knowledge and socio/economic/political values (Grumbine 1994)

Landscape- & regional-scale factors can undermine farm- & community-scale gains

Landscape scale conflicts over watershed management in the Nile Basin

Severe erosion in the Nyando watershed, Kenya

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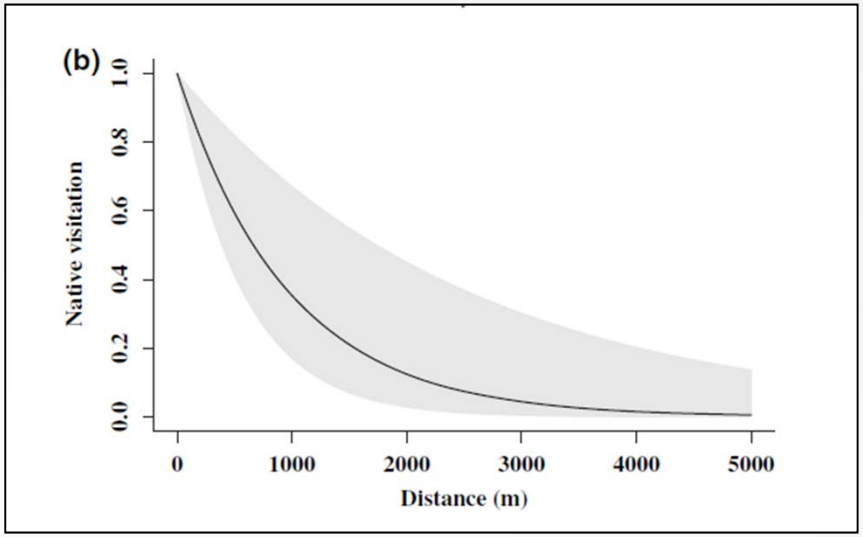
Key synergies benefitting agriculture are realized through landscape-level management



Biodiversity: nearby habitats increase pollination in tropical and temperate regions

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Source: Ricketts et al. 2008


Think globally, act locally
^ Plan regionally
Quotation attributed to Richard T.T. Forman

Ecosystem management, evolved

Landscape approaches to achieving food production, natural resource conservation, and the MDGs:

- Landscape scale
- Landscapes understood and managed as systems
- Multi-objective management
- Adaptive management
- Multi-stakeholder management supported by social learning

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Source: Milder et al. 2011 in *Integrating Ecology and Poverty Reduction* (Springer)

The 'landscape' of landscape approaches

Increasing adoption of landscape approaches, e.g.:

- IUCN landscapes & livelihoods program
- Int'l Model Forest Network
- Ecosystem approach within the Convention on Biological Diversity
- Sustainable Land Management (e.g., TerrAfrica)
- USAID sustainable landscapes program
- Territorial development in Latin America

Gradually expanding outward from 'conservation landscapes'

New drivers/motivators of landscape approaches

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Source: Milder et al. 2011 in *Integrating Ecology and Poverty Reduction* (Springer)

Moving towards 'ecoagriculture landscapes'

Agricultural landscapes managed to enhance **rural livelihoods** and **sustainable agricultural production** (of crops, livestock, fish and forest), while **conserving or restoring ecosystem services and biodiversity**.

Sources of synergy

- Substitute natural capital for financial capital
- Improve spatial organization of land use
- Manage biological interactions to increase ecosystem services *to* agriculture
- Increase ecosystem services *from* production units
- Diversify to improve resilience to env'l and economic stressors
- Realize economies of scale through collective action

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Positive impacts of ecoagriculture: examples

1. **Banikoara District, Benin** - livestock corridor
2. **Kericho, Kenya** – certified tea
3. **Luangwa Valley, Zambia** - wildlife-friendly farming
4. **Loess Plateau, China** – degraded land restoration
5. **Rajasthan, India** – landscape water harvesting
6. **Cebu, Philippines** – watershed restoration
7. **Kalinga, Philippines** – forest biodiversity & agro-biodiversity conservation with intensification
8. **Talamanca, Costa Rica** – farmer-led biodiversity conservation and eco-label marketing
9. **Matiguas, Nicaragua** – payment to farmers for ecosystem services on farmland

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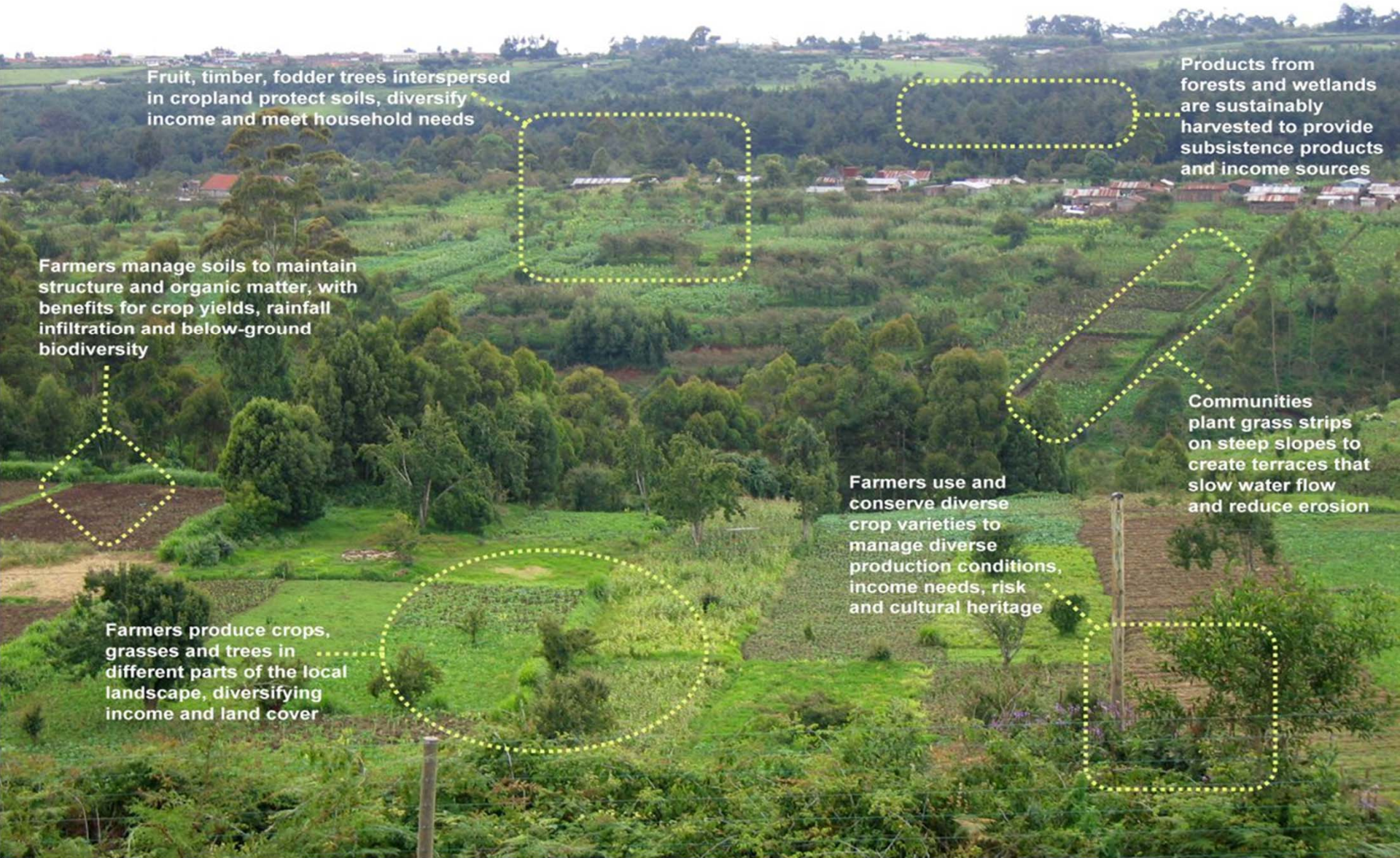
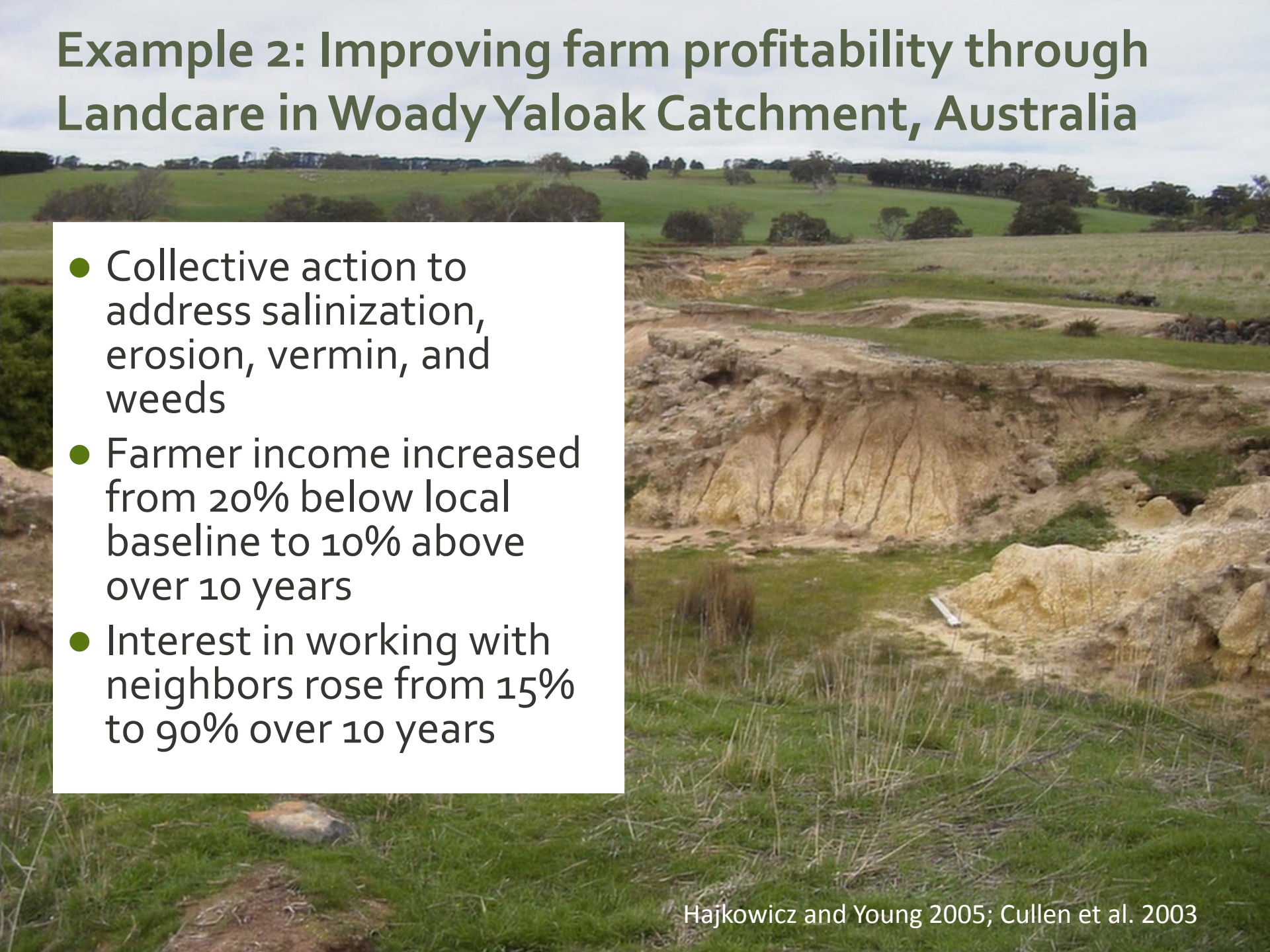
Example 1: Climate- and ecosystem-smart agricultural intensification in Lari, Kenya



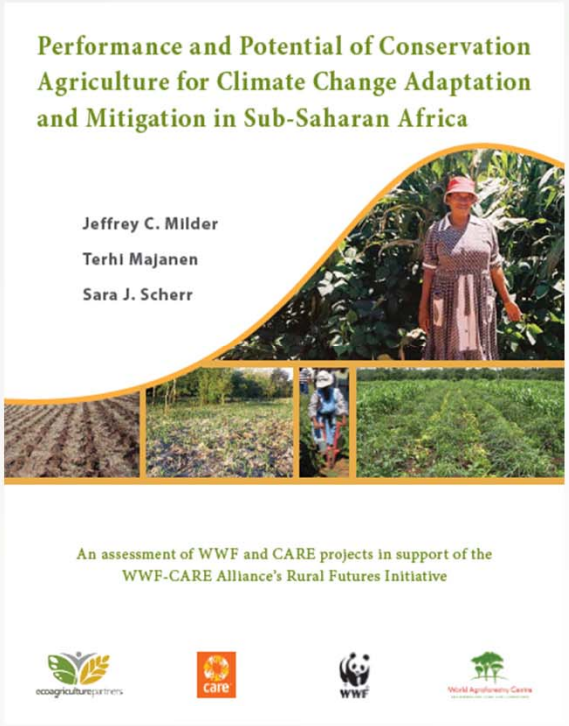
Example 2: Improving farm profitability through Landcare in Woady Yaloak Catchment, Australia

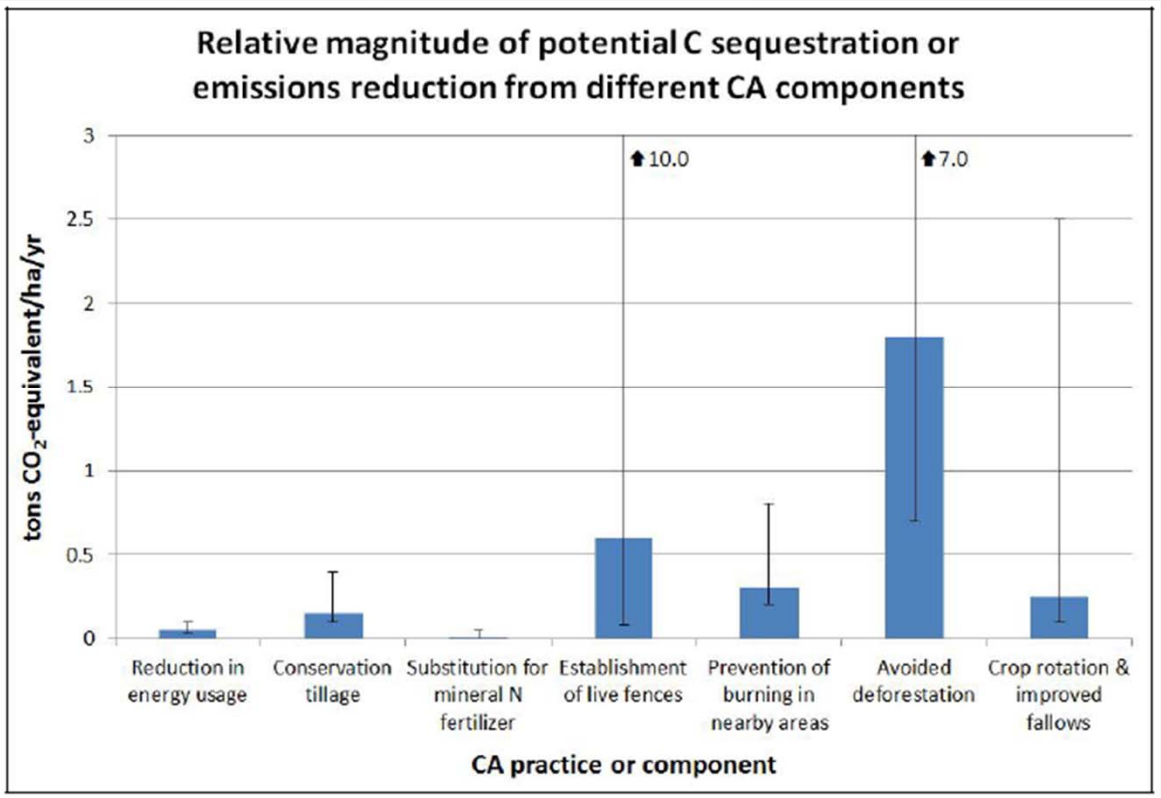


- Collective action to address salinization, erosion, vermin, and weeds
- Farmer income increased from 20% below local baseline to 10% above over 10 years
- Interest in working with neighbors rose from 15% to 90% over 10 years

Hajkowicz and Young 2005; Cullen et al. 2003

Example 3: Managing agricultural landscapes for climate change mitigation and adaptation





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Source: Milder et al., forthcoming 2011

Example 3: Managing agricultural landscapes for climate change mitigation and adaptation

Agricultural Carbon Projects in Africa (2010 assessment)

Mitigation activity	% of projects implementing activity
Off-farm land rehabilitation with benefits to farmers	55
On-farm practices: tree planting, agroforestry, agricultural soil mgmt	47
REDD with benefits to farmers	18
Other (biodigesters, green charcoal, reducing fertilizer N_2O emissions)	11

N=66; 27% of all cases implement more than one of the activities

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Source: Shames & Scherr 2010

Landscape approaches are complex: Is it worth it?

Demanded by biophysical realities:

- Agriculture coincides with existing protected areas, water towers, etc.
- Future expansion & intensification will exacerbate conflicts

Demanded by farmers:

- Resilient, risk-spreading approaches for smallholders
- Spatial planning & securing resources for commercial agriculture

Demanded by the marketplace:

- Eco-standards, public & private procurement rules
- Farm units targeted for ecosystem mgmt incentives

Driven by policies, programs, or public investments:

- Agriculture in NAMAs and NAPAs
- Donor-led programs, env'l and aid NGOs (incipient)

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Landscapes for People, Food and Nature

International Conference and Knowledge Exchange

Objectives:

1. share and assess experience with integrated landscape approaches
2. identify key factors that support production, conservation, and livelihood goals
3. showcase tools, methods, and innovations
4. define policy, action, and research agendas to support effective landscape approaches at a globally significant scale

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UNEP

United Nations University / Int'l Partnership for Satoyama

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Landscapes for People, Food and Nature

International Conference and Knowledge Exchange

Component 1: Global Review (2011-early 2012)

- Amass & communicate evidence base for integrated landscape initiatives and their costs and benefits – CONTRIBUTORS WELCOME

Component 2: Int'l Meeting (March 2012 in Nairobi, Kenya)

Component 3: Implementation (2012 on)

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Overcoming barriers to effective integrated landscape management

- Governance: align, coordinate, or integrate across sectors & ministries
- New institutions & mechanisms for integrating at landscape scale
- Improve shared "landscape literacy" among sets of stakeholders
- Building ecosystem services & env'l externalities into decision-making
- Paradigms & expectations: will rural landscapes will provide multiple products & services for private & public benefit?

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Thank you

For more information:

www.ecoagriculture.org

jmilder@ecoagriculture.org

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