Trends and Gaps in Ecoagriculture-Related Research

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What is Ecoagriculture?

- A vision for land use systems that are deliberately managed to produce both human food and ecosystem service, particularly habitat for wild biodiversity

- Strategies include
  - Making space for wildlife in agricultural landscapes
  - Enhancing the habitat value of productive farmlands

Reference: McNeely, Jeffrey A. and Sara J. Scherr. 2003. *Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity*. Island Press.

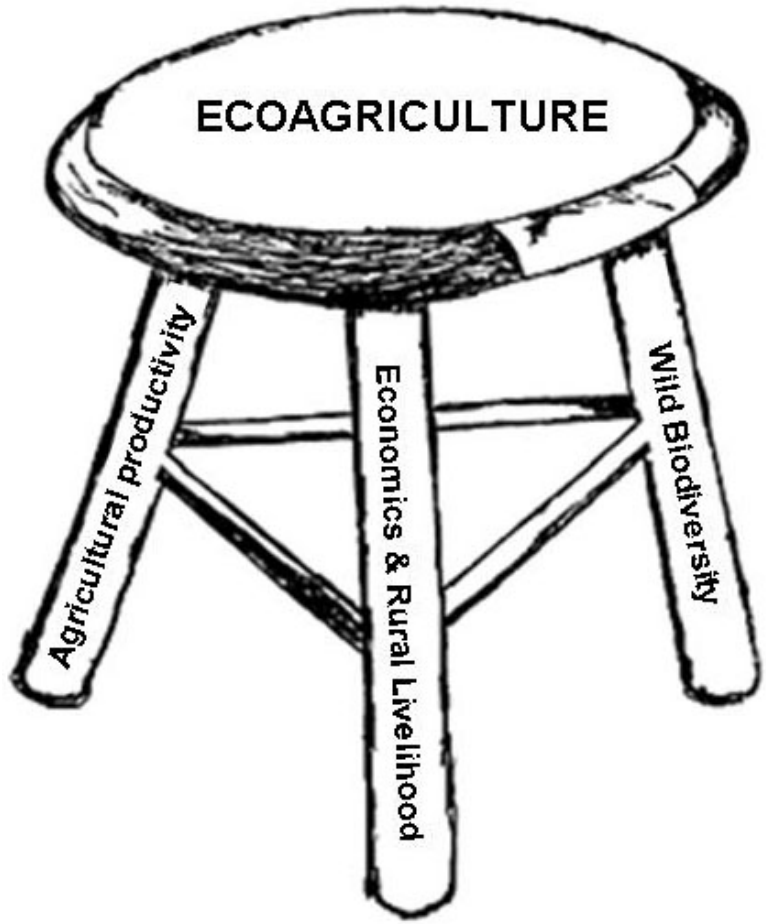
Why an Ecoagriculture Assessment?

- To explore the scientific research base for ecoagriculture to define our state of knowledge on:
  - Agricultural land use systems that increase biodiversity
  - The ability of researchers to influence biodiversity conservation in agricultural ecosystems
- To highlight related research efforts that combine, interpret, and communicate knowledge from different disciplines.
- To provide a basis for discussing research priorities in ecoagriculture.

Our Conception of Ecoagriculture

- Three interdependent legs of a stool

- An effective ecoagriculture system needs to satisfy all three objectives in space and time



Considerations: Agricultural Productivity

- What are the roles of biodiversity in:
  - Agricultural productivity
  - Agroecosystem function

- This unit discusses concepts of intensive vs. extensively managed systems and how they are compared in terms of productivity and ecosystem function, particularly biodiversity conservation.

Opportunities for achieving "positive sum" agricultural dynamics ?

This question is examined by reviewing literature on:

- Agrobiodiversity conservation and utilization
- Agroforestry
- Conservation agriculture/conservation tillage
- Organic agricultural production systems
- Systems approaches to pest management
- Integrated nutrient management
- Soil health
- Contributions of below ground biodiversity to SA
- Management of the hydrological cycle
- The system of rice intensification

Considerations: Biodiversity Conservation

- What are opportunities in agriculture for biodiversity conservation (bio-ecologically speaking)?
  - Within agricultural landscapes?
  - Within farm-based cropping and livestock systems?
- The emphasis is on conservation of regionally or globally rare species, rather than diversity of common species.

Systematic Literature Survey (sample)

Variable(s)	**Strategy Claimed to Conserve Biodiversity**			
Measured	**Shaded Tropical Ag.**	**Reduced Chemicals (agro-ecology)**	**Organic**	**Nearby Forest, fragment, hedgerow, etc.**
mammals				Tattersall et al 2002, Daily et al 2003; *but NO:* Burel et al 1998
birds	Wunderle & Latta 1998, Wunderle 1999, Greenberg et al 2000, Reitsma et al 2001, Perfecto et al 2003	Tourenq et al 2003	Beecher et al 2002, Freemark & Kirk 2000	Harvey 1999, Dechenes et al 2003, Luck 2003; Burel et al 1998, Ratcliffe and Crowe 2001
other vert.s				Glor et al 2001
ants	Perfecto & Snelling 1995, Perfecto & Vandermeer 2002, Ambrecht & Perfecto 2003, Perfecto et al 2003		Perfecto & Vandermeer 2002	Dunn 2000, Ambrecht & Perfecto 2003
soil invert.s		Neher 1999		
other invert.s	Rojas et al 1999, Perfecto et al 2003			Dunn 2000, Tscharntke et al 2002, Burel et al 1998, Abensperg-Traun and Smith 2001
soil microbes		Neher 1999		
			Mader et al 2002	

Considerations: Livelihoods and Rural Vitality

- How can land use systems that integrate biodiversity conservation and agricultural productivity support and improve rural livelihoods?

- How can benefits to producers, and to society, of integrating biodiversity conservation objectives into agricultural production systems be optimized?

Considerations: Livelihoods and Rural Vitality

- This unit is approached by discussing:
  - When synergies, rather than trade-offs, will emerge that simultaneously achieve diverse social objectives consistent with ecoagriculture strategies
  - Characteristics of existing and emergent models that would enhance an ecoagriculture analytic framework

Integrating the three ecoagriculture objectives in practice

- How can planning, monitoring and evaluation help translate concepts and principles of ecoagriculture land use into practice?

- How can scientific knowledge needed to support the design and development of ecoagriculture practices be integrated into landscape planning and management frameworks?

Integrating Ecoagriculture Objectives in Practice

- This unit is approached by discussing:
  - Known and emergent frameworks for integrating planning, science and management for economically and ecologically sustainable land use
  - Methods, tools and techniques for fostering collaboration and learning in multi-objective land use planning and management.

Key Issues in Ecoagriculture Related Research

- Definitions
  - Biodiversity
  - Intensification
- Scale
  - Spatial scale
  - Aggregation and scaling up
  - Measurement scales

Key Issues in Ecoagriculture Related Research

- Chasm between conservation biology and agricultural science communities
- Relationship of biodiversity to other environmental elements and ecological services not well specified or understood
- Real drivers of land use change -- human needs or profit incentive?

Key Findings in Ecoagriculture Related Research

- Biological dynamics give ecoagriculture a chance, even with low inputs, to achieve high levels of productivity and be economically profitable.

- What is not known, given limited experience with ecoagriculture practices and even less with evaluation research, is how far they can be developed as an alternative to conventional agriculture and in what and how many places.

Key Findings in Ecoagriculture Related Research

- There is a tremendous amount of literature, projects, websites and knowledgeable people who can contribute to the understanding needed to effect ecoagriculture land use.

- But, the entire field is fractionated and needs better organization and coordination for ease of access.

Ecoagriculture Knowledge Gaps and Research Needs

- Documented examples of how wild biodiversity specifically aids crop production
- Quantified cost savings to agriculture due to the presence of wild biodiversity
- Indicators and measures of wild biodiversity that can be easily incorporated into modeling approaches and used for research and policy analysis
- Rules of farm management that are almost always correlated with increased biodiversity
- Relationship between below ground biodiversity and above ground biodiversity
- How to measure and assess biodiversity efficiently and accurately in the field

Ecoagriculture Knowledge Gaps and Research Needs

- Corridors through agricultural landscapes – do they work – how, when, where, why and under what management conditions?
- Which agricultural practices actually help to select for extremely important species in terms of ecosystem services, or ones that are rare regionally or globally or are considered good indicator species for other groups of species?
- Which factors inform household decision-making across multiple objectives and what are their implications for ecoagriculture? How does decision-maker knowledge change with spatial aggregation, or dispersion, of habitat?
- How to better represent the role of social capital in shaping decision making, mitigating risks and ensuring the necessary conditions at the landscape level?