Research Institute of Organic Agriculture FiBL
info.suisse@fibl.org, www.fibl.org

How agroecology contributes to climate change adaptation and mitigation

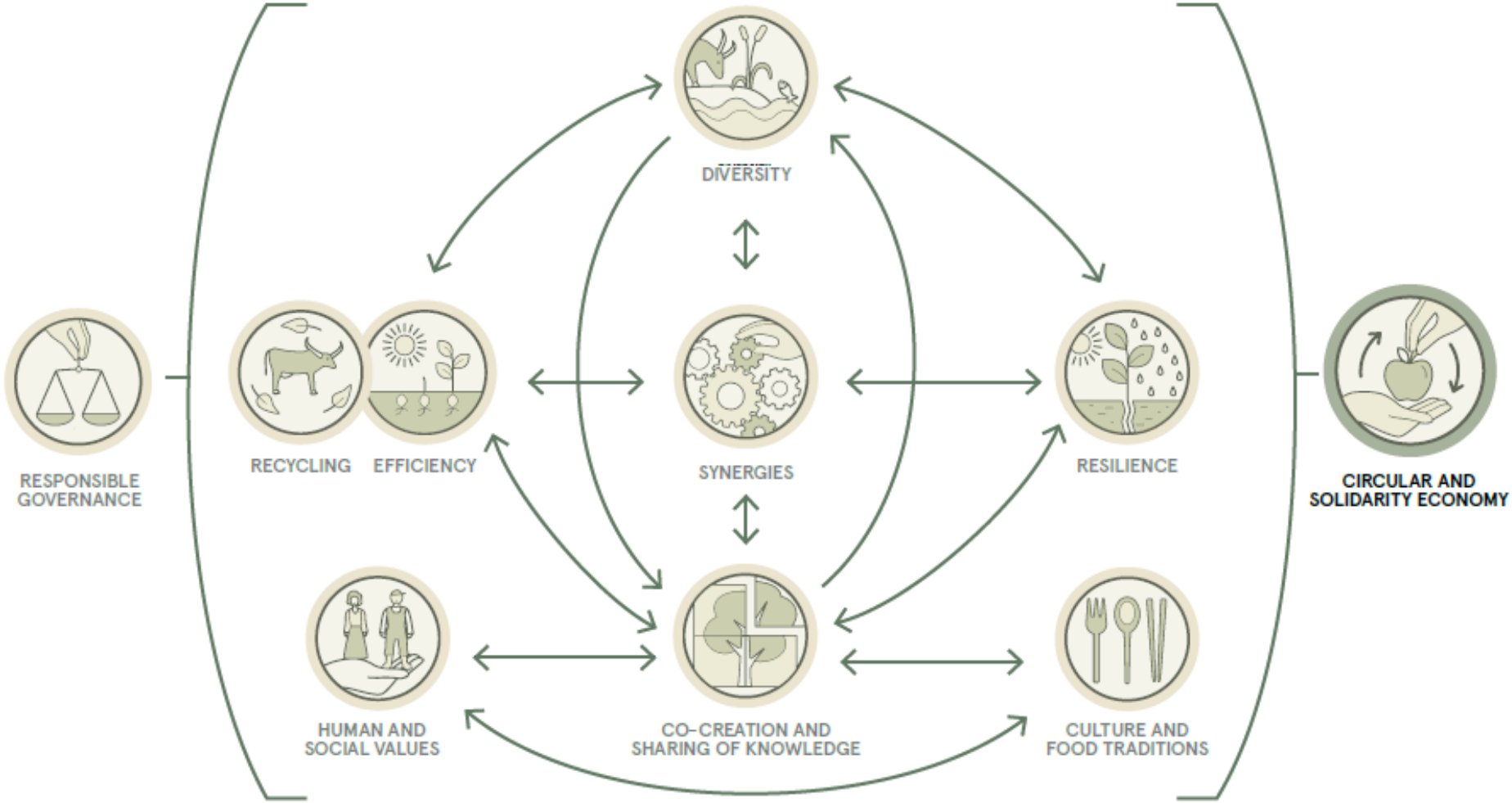
Adrian Muller adrian.mueller@fibl.org

Side-event: **How can Agroecology be a solution for adaptation and healthy soils?**
Organized by Caritas Internationalis, IATP, BioVision, Jeunes Volontaires pour l'Environnement (JVE)

SBSTA50, 18 June 2019

What is agroecology ?

The 10 elements of agroecology according to the FAO



The 10 Elements of Agroecology, FAO 2018

Examples of key practices in agroecology

- Organic fertilizers (manure, compost)
- Optimized crop rotations
- Cover crops
- Utilize ecosystem dynamics for plant protection
- Closed nutrient cycles

Compiling and synthesizing the empirical evidence for the potential of agroecology to hedge against climate change (Biovision-FiBL-FAO)

A review/meta-analysis of

- **peer-reviewed literature** (E,SP,F,I,P) that
- **compares** an agroecological with some baseline situation and
- provides (quantitative or qualitative) **empirical evidence** for the relative performance of the two systems
- with regard to **climate change adaptation** and co-benefits thereof,

- complemented by existing **meta-analyses** on the influence of single practices and system characteristics on performance

Preliminary Findings I: Biased Case Studies

ELSEVIER

Agriculture, Ecosystems and Environment 93 (2002) 87–105

Agriculture Ecosystems & Environment

www.elsevier.com/locate/agee

Measuring farmers' agroecological resistance after Hurricane Mitch in Nicaragua: a case study in participatory, sustainable land management impact monitoring

Eric Holt-Giménez*

Department of Environmental Studies, 321 Natural Sciences 2, University of California, Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA

Received 23 February 2001; received in revised form 15 October 2001; accepted 15 December 2001

Biased Case Studies

- few results on agroecology **in general**, but more results on **very good** agroecology compared to average conventional.

- use those results to learn on the factors of success – but **they may not all relate to agroecology** (but e.g. to good soil quality, good education, bigger capital endowments, etc.)

- use those insights when working with "**average**" agroecology to learn where particular challenges and opportunities may arise

Preliminary Findings II: Central Role of External Finance, Institutions, and Advisory Services

Food Sec. (2017) 9:561–576
DOI 10.1007/s12571-017-0669-z

ORIGINAL PAPER

Impact of a participatory agroecological development project on household wealth and food security in Malawi

Joseph Kangmennaang[1] · Rachel Bezner Kerr[2] · Esther Lupafya[3] · Laifolo Dakishoni[3] · Mangani Katundu[4] · Isaac Luginaah[5]

Received: 11 January 2016 / Accepted: 2 March 2017 / Published online: 26 April 2017

Abstract This paper presents the impacts of a participatory ($\beta = -3.21$, $p = 0.01$) compared to non-participants, after

Central Role of External Finance, Institutions, and Advisory Services

- many results do not refer to agroecology but to **external finance, institutions, and advisory services**

- use those results to learn on the factors of success regarding
  - **availability of finance**
  - optimal **institutional context**
  - the role of **research, knowledge transfer and advisory services**

Preliminary Findings III:
Metaanalyses on the performance of agroecological practices and on the relevance of system characteristics

LETTER

doi:10.1038/nature15374

Biodiversity increases the resistance of ecosystem productivity to climate extremes

Forest Isbell[1], Dylan Craven[2,3], John Connolly[4], Michel Loreau[5], Bernhard Schmid[6], Carl Beierkuhnlein[7], T. Martijn Bezemer[8], Catherine Bonin[9], Helge Bruelheide[2,10], Enrica de Luca[6], Anne Ebeling[11], John N. Griffin[12], Qinfeng Guo[13], Yann Hautier[14], Andy Hector[15], Anke Jentsch[16], Jürgen Kreyling[17], Vojtěch Lanta[18], Pete Manning[19], Sebastian T. Meyer[20], Akira S. Mori[21], Shahid Naeem[22], Pascal A. Niklaus[6], H. Wayne Polley[23], Peter B. Reich[24,25], Christiane Roscher[2,26], Eric W. Seabloom[1], Melinda D. Smith[27], Madhav P. Thakur[2,3], David Tilman[1,28], Benjamin F. Tracy[29], Wim H. van der Putten[8,30], Jasper van Ruijven[31], Alexandra Weigelt[2,3], Wolfgang W. Weisser[20], Brian Wilsey[32] & Nico Eisenhauer[2,3]

It remains unclear whether biodiversity buffers ecosystems against climate extremes, which are becoming increasingly frequent worldwide[1]. Early results suggested that the ecosystem productivity of diverse grassland plant communities was more resistant, changing less during drought, and more resilient, recovering more quickly after drought, than that of depauperate communities[2]. However, subsequent experimental tests produced mixed results[3–13]. Here we use data from 46 experiments that manipulated grassland plant diversity to test whether biodiversity provides resistance during and resilience after climate events. We show that biodiversity increased ecosystem resistance for a broad range of climate events

plant communities was more resistant and more resilient to a major drought than that of depauperate communities[2]. However, this study had not experimentally manipulated biodiversity, which confounded variation in biodiversity with variation in species composition and resource availability[25]. Hundreds of biodiversity experiments were subsequently conducted[26,27], but few of these studies revisited this important question, and those that did so found mixed results[3–13]. Further analysis of the original data also produced mixed results[28]. Thus, it remains unclear whether biodiversity buffers ecosystems against climate extremes, which are becoming increasing frequent worldwide[1].

Metaanalyses on the performance of agroecological practices and on the relevance of system characteristics

- Grassland biodiversity increases the resistance of productivity to climate extremes
- Higher biodiversity similarly strongly influences total biomass production in natural ecosystems as climate variables or nutrient availability

- Organic agriculture shows lower pathogen and animal pest and higher weed infestation
- Optimised crop rotations and organic fertilizers lead to higher soil organic carbon levels
- Organic agriculture shows good overall sustainability performance in temperate zones (Thünen report 65)
- Organic agriculture shows lower yields

Gattinger et al. 2012; Isbell et al. 2015; Duffy et al. 2017; Muneret et al. 2018; Seufert 2018; Sanders and Hess 2019

Metaanalyses on the performance of agroecological practices and on the relevance of system characteristics

- These analyses deliver robust results on **single practices** in agroecology and on **characteristics of agroecosystems** and how they correlate to key performance or resilience indicators
- In particular: We often see **high public good provision vs. lower yields** in agroecology

- but **these results may not directly reflect** the performance of **agroecology as a whole** but rather of central aspects thereof

Why do we look at this?

- There is a demand from policy for information on which agriculture to support for sustainable food systems and why!

- Therefore we need to go beyond anecdotic evidence and case studies

- Therefore we have to compile, provide and communicate the results in a form that can be used by policy making

Take Home Messages

- Learn from the performance of **good examples** of agroecology but be careful with **biased case studies**

- Agroecology tends to have lower yields and higher public good provision: a **food systems approach is needed**:
  - We need to address the level of **animal source food** and the level of **food loss and waste**

- We have considerable evidence from meta-analyses: positive influence of **agroecological practices** and **single agroecosystem characteristics** on performance

- Focus on the role and potential of institutions, advisory services/knowledge transfer, **research, and finance**
  - **More is needed, in particular of these latter two**

Taking action

- **We know enough to take action** by implementing agroecological core practices: farmers, companies, finance institutions, and policy can do this and support this

- This allows to learn more on the performance on these systems

- Which then helps to further build the evidence base for effective policy design

- Thereby, we need to fully **acknowledge the multifunctionality of agriculture as captured in agroecology**; we need to carefully analyse potential unintended side-effects of new policies and of climate change mitigation policies in particular