From Integrated Pest Management to Adaptive Ecosystem Management

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Talk Overview

1. Context: Why the need to transform the food system? A global perspective

2. Agroecology, Organic/regenerative ag, IPM and Adaptive Ecosystem Management definitions

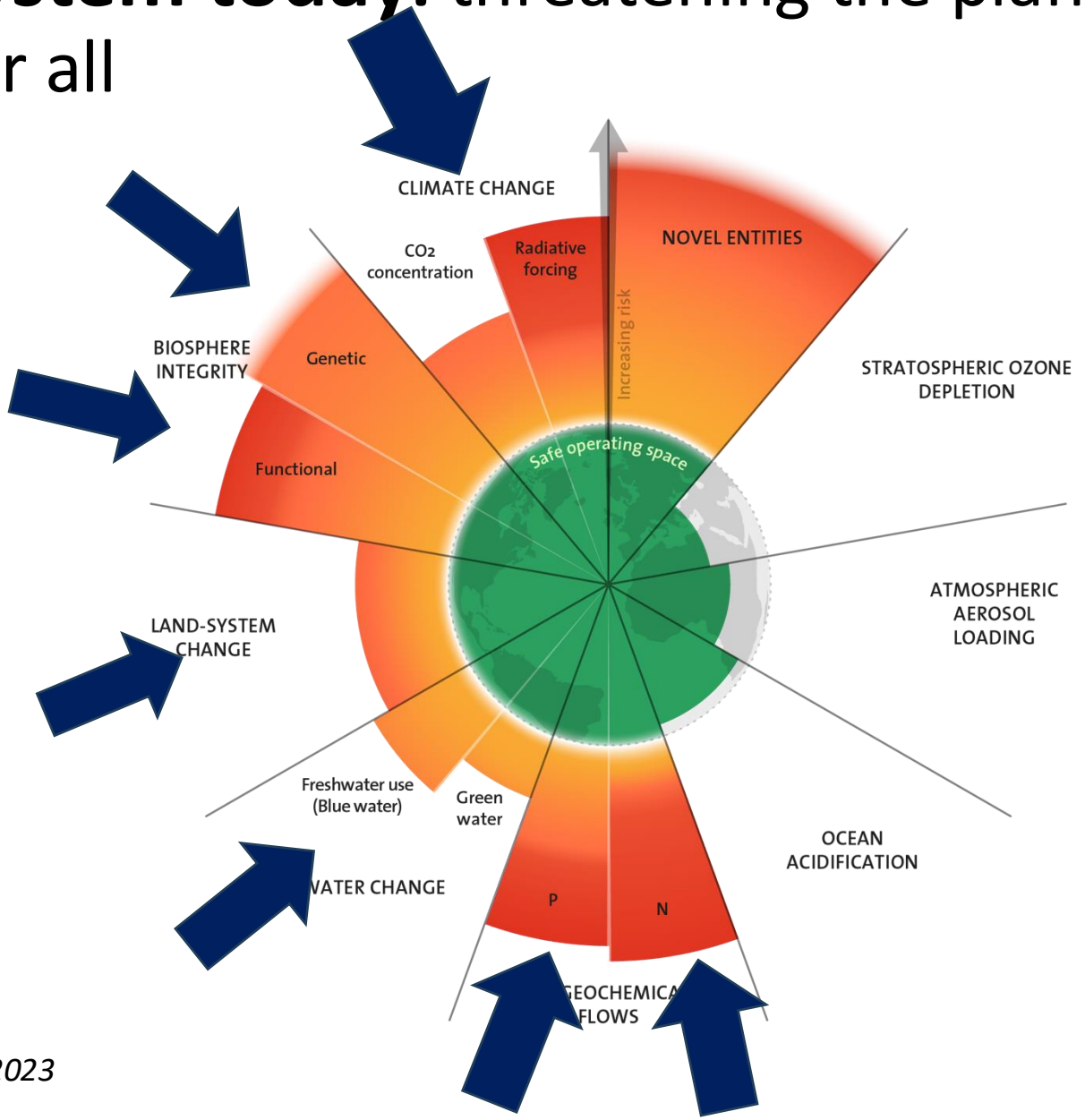
3. Background and evolution of IPM from a good idea backed up by needs to its co-option and dilution by the corporate ag input sector

4. What do we understand under "Adaptive ecosystem management for pest control”? What are the key considerations for why, how, when and who should be involved

5. How does adaptive ecosystem management fit agroecology's 13 principles and what will it take to transform the system to benefit farmers, consumers and the environment?

The food system today: Reductionism

The food system today: threatening the planet's capacity to provide for all



From Rockstrom et al 2023

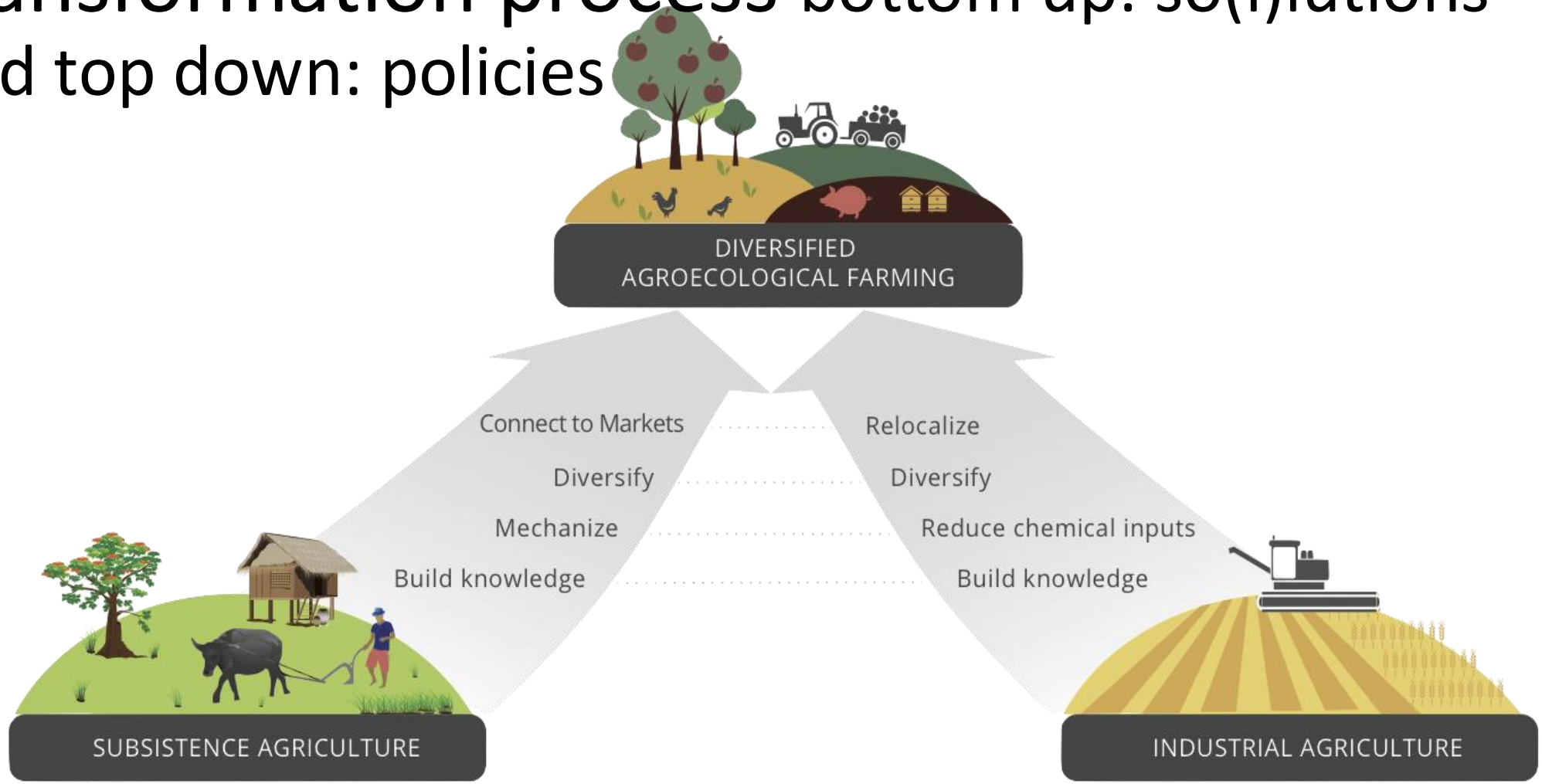
The food system today: Deficient

Broad recognition that the global food system is not functioning effectively

The food system today: we know what's wrong and how to fix it…….

Broad recognition that the global food system is not functioning effectively

The food system today: we know how to fix it with a transformation process bottom up: so(i)lutions and top down: policies



IPES-Food 2016

IPM

The concept, primarily driven by concerns about the environmental impact of widespread pesticide use (Rachel Carson), emerged from the work of several scientists and researchers in the 1950s and 1960s, from the University of California, including Ray F. Smith and Paul DeBach who pioneered the concept of "integrated control," which emphasized the combined use of biological and chemical control methods.

IPM gained wider recognition and was further developed in the late 1960s and early 1970s covering multiple control tactics. It emphasized a holistic approach that integrated various pest control methods, including:

- Biological control: Utilizing natural enemies of pests, like predators and parasites.

- Cultural control: Employing farming practices that discourage pest populations / prevention (e.g., crop rotation, proper sanitation/residue management, host plant resistance).

- Physical/mechanical control: Using barriers, traps, and other physical means to prevent or reduce pest damage.

- Chemical control: Using pesticides as a last resort and only when necessary and selecting the most specific and least harmful/toxic options.

IPM

Key Aspects of IPM:

- Economic Thresholds: IPM aims to control pests to levels that are economically justifiable, considering the costs of control measures and the potential damage caused by the pests.

- Monitoring and Evaluation: Regular monitoring of pest populations and the effectiveness of control measures is crucial for successful IPM implementation.

- IPM is a dynamic and evolving approach to pest management that seeks to minimize reliance on synthetic pesticides while achieving sustainable and effective pest control.

IPM Evolution

Key Changes in Focus:

* From Reactive to Proactive: Shifting from solely responding to pest outbreaks to preventing them from occurring in the first place.

* From Pesticide-Centric to Multi-faceted: Recognizing the value of a diverse range of control methods and minimizing reliance on pesticides.

* From Agricultural to Broader Applications: Expanding the scope of IPM to address pest challenges in various settings.

* From Economic Thresholds to Holistic Approach: Considering environmental, social, and human health factors alongside economic considerations.

In Summary:

IPM has evolved from a primarily agricultural, pesticide-focused approach to a more holistic and sustainable strategy that prioritizes prevention, minimizes environmental impact, and considers the broader implications of pest control

IPM Evolution 2

Modern IPM: Increased Sophistication with “advanced” technologies like:

- Biotechnology: Using genetic engineering to develop pest-resistant crops.
- Precision Agriculture: Utilizing GPS and other technologies to apply treatments precisely where needed.
- Modeling and Simulation: Using computer models to predict pest outbreaks and optimize management strategies.
- Emphasis on Sustainability with focus on long-term sustainability, considering environmental, economic, and social impacts.
- Addressing new challenges such as invasive species, climate change, and the development of pesticide resistance.

Overall, IPM has evolved from a reactive approach to pest control to a more proactive, ecologically-based system that aims to minimize environmental harm while ensuring agricultural productivity….but it has also been corrupted through co-option and intervention threshold manipulation

The Africa-wide Cassava Mealybug and Green Mite biocontrol program (classical)




The Africa-wide Cassava Mealybug and Green Mite biocontrol

The cassava mealybug: *Phenacoccus manihoti* and the cassava green mite *Mononychellus tanajoa*
New world species, new to science when discovered in Africa

Natural enemies discovered in the Americas:
Epidinocarsis (Apoanagyrus) lopezi

The Africa-wide Cassava Mealybug and Green Mite biocontrol

Return on investment 241:1 (discounted over 20 years)

Moving on to Adaptive Ecosystem management to overcome IPM shortcomings

What:

Adaptive ecosystem management acknowledges uncertainty and recognizes our incomplete understanding of the ecosystem

- Management actions are treated as experiments (learning by doing)
- Management plans are adjusted based on the results of monitoring and new information.
- Collaborative/inclusive process involving farmers, scientists and the public in the decision-making process

Moving on to Adaptive Ecosystem management to overcome IPM shortcomings

How:

- Assess: Define the problem, set clear objectives, and identify potential management actions
- Design: Develop a monitoring plan to track the effects of management actions
- Implement: Carry out the chosen management actions
- Monitor: Collect data on the ecological response to the management actions
- Evaluate: Analyze the data to determine if the management actions are achieving the desired objectives and to identify any unexpected outcomes
- Adjust: Modify management actions based on the evaluation results.

Moving on to Adaptive Ecosystem management to overcome IPM shortcomings

Why (benefits):

- Improved Decision Making: Leads to more informed and effective management decisions over time

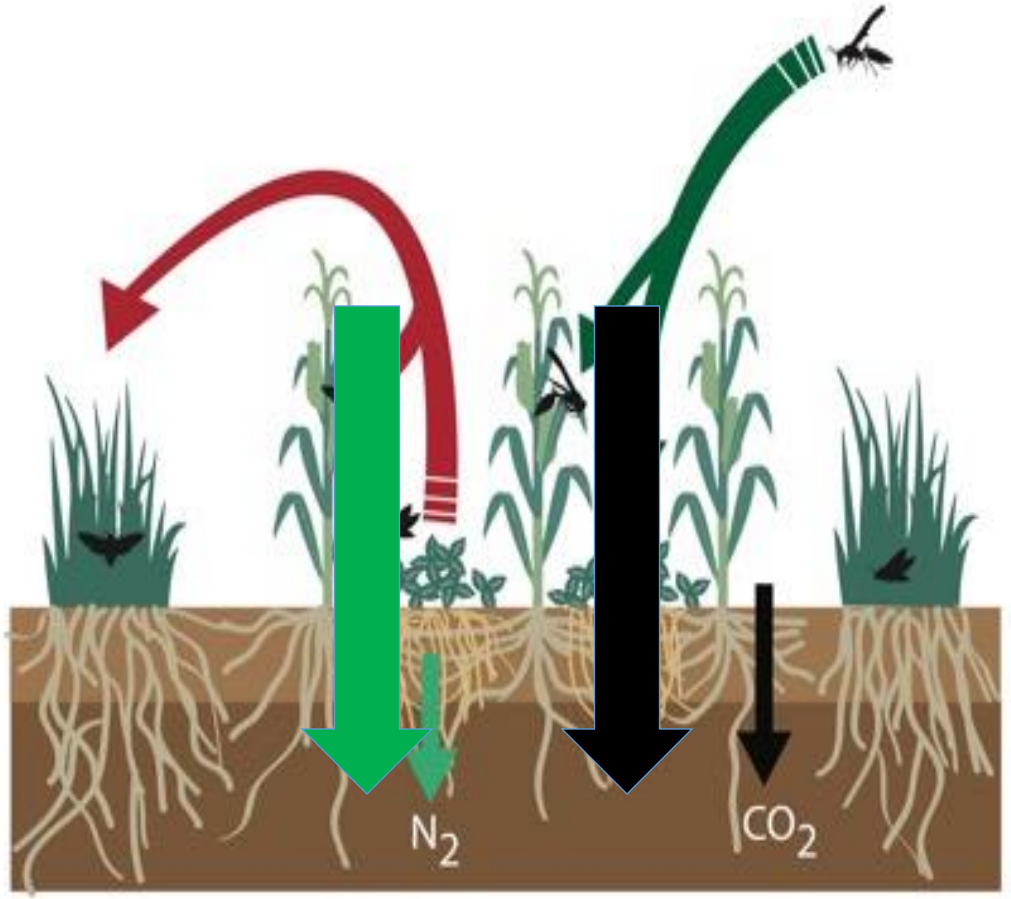
- Increased Resilience: Helps ecosystems better withstand disturbances and adapt to change

- Greater Public Trust: Involves stakeholders in the decision-making process, increasing transparency and accountability.

Adaptive management is about learning from experience and continually improving our understanding of how to manage ecosystems sustainably.

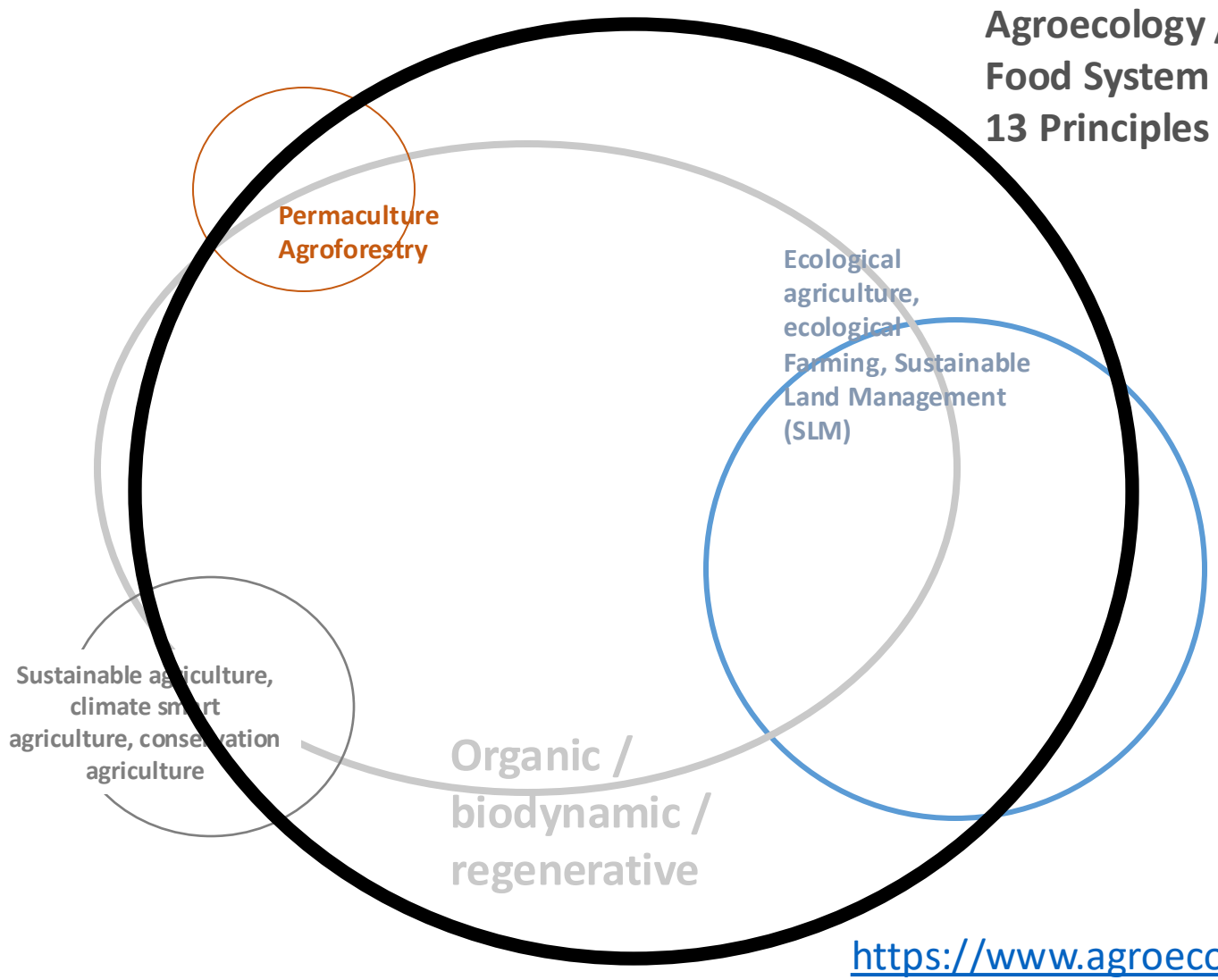
It is iterative process allows managers to learn from their actions and refine their approach over time, ultimately leading to better outcomes.

Push-Pull: an agroecology approach example



www.push-pull.net

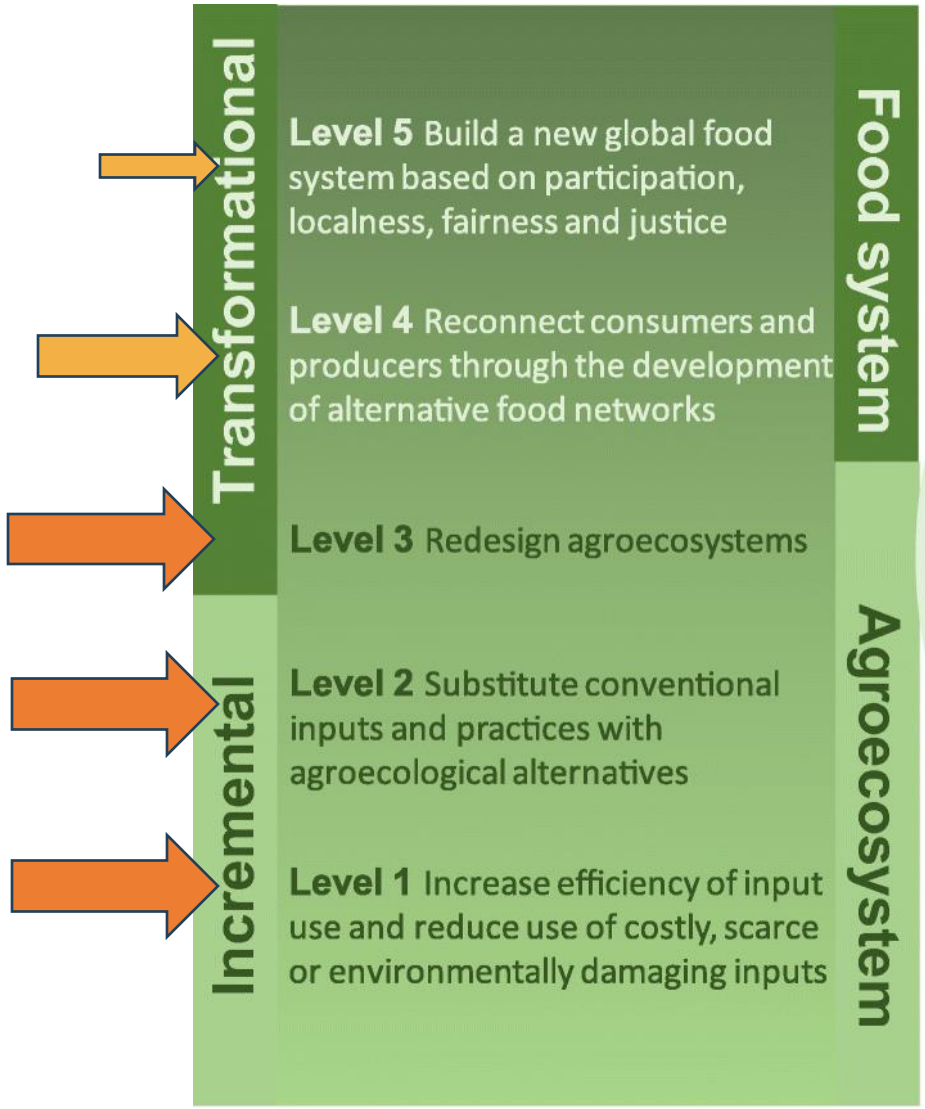
What fits where? Importance a clear definition

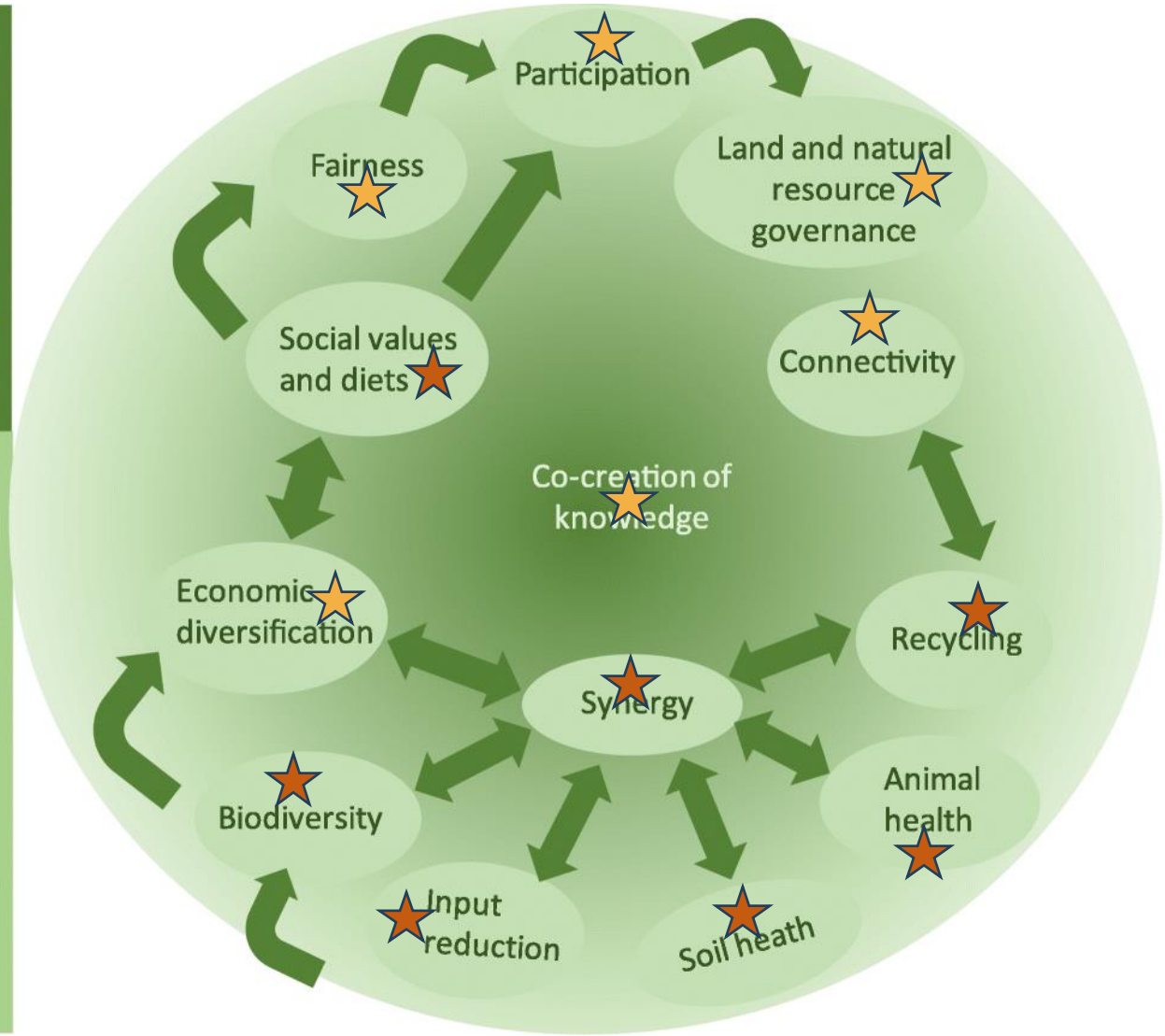


https://www.agroecology-pool.org/methodology/

Agroecology's levels and principles

..where does Adaptive Ecosystem Management for IPM fit in?





Gliessmann 2007; Wezel et al 2020; Altieri and Nicholls 2017; IAASTD 2008

Implementation steps for AEM practices in Agroecology

1. Define Clear Objectives and Goals:

Agroecological Focus: Soil health, biodiversity, water quality / use efficiency, climate resilience, support local food systems

Define desired ecological outcomes (e.g., increased soil organic matter, reduced erosion)

Set measurable, achievable, relevant, and time-bound (SMART) goals

Consider social and economic objectives alongside environmental ones

2. Develop a Comprehensive Understanding of the Agroecosystem

Characterize the System: soil, water, biodiversity, climate, and existing management practices assessment,
Identify ecological processes
(e.g., nutrient cycling, pollination, pest-predator interactions)

Incorporate Traditional Knowledge engaging with local farmers and communities

Implementation steps for AEM practices in Agroecology cont‘

3. Develop and Implement Management Actions: crop diversification (improve resilience), cover crops, crop rotation and intercropping , low/no till practices, IPM, increase agro-bioversity/beneficials habitats, water saving practices.

4. Monitor and Evaluate: Establish monitoring programs for ecological indicators (soil health, biodiversity, water quality),

5. Foster Collaboration and Knowledge Sharing: Build Strong Partnerships, share knowledge and lessons learned with other farmers, researchers, and stakeholders.

Always consider:

- Context Specificity: AEM approaches must be tailored to the specific ecological, social, and economic conditions of each agroecosystem.
- Long-Term Perspective: AEM is a long-term process that requires ongoing monitoring, evaluation, and adaptation.
- Social and Economic Sustainability: AEM practices must be economically viable and socially just for farmers and communities.

A step further…..Proactive Ecosystem Management

Focus on preventing / minimizing environmental problems before they occur

- Predictive: scientific understanding, monitoring, and modeling to anticipate potential threats (e.g., climate change impacts, invasive species)

- Preventative: avoiding ecological degradation in the first place through measures (habitat conservation)

- Sustainable land use planning: Minimizing human impacts.

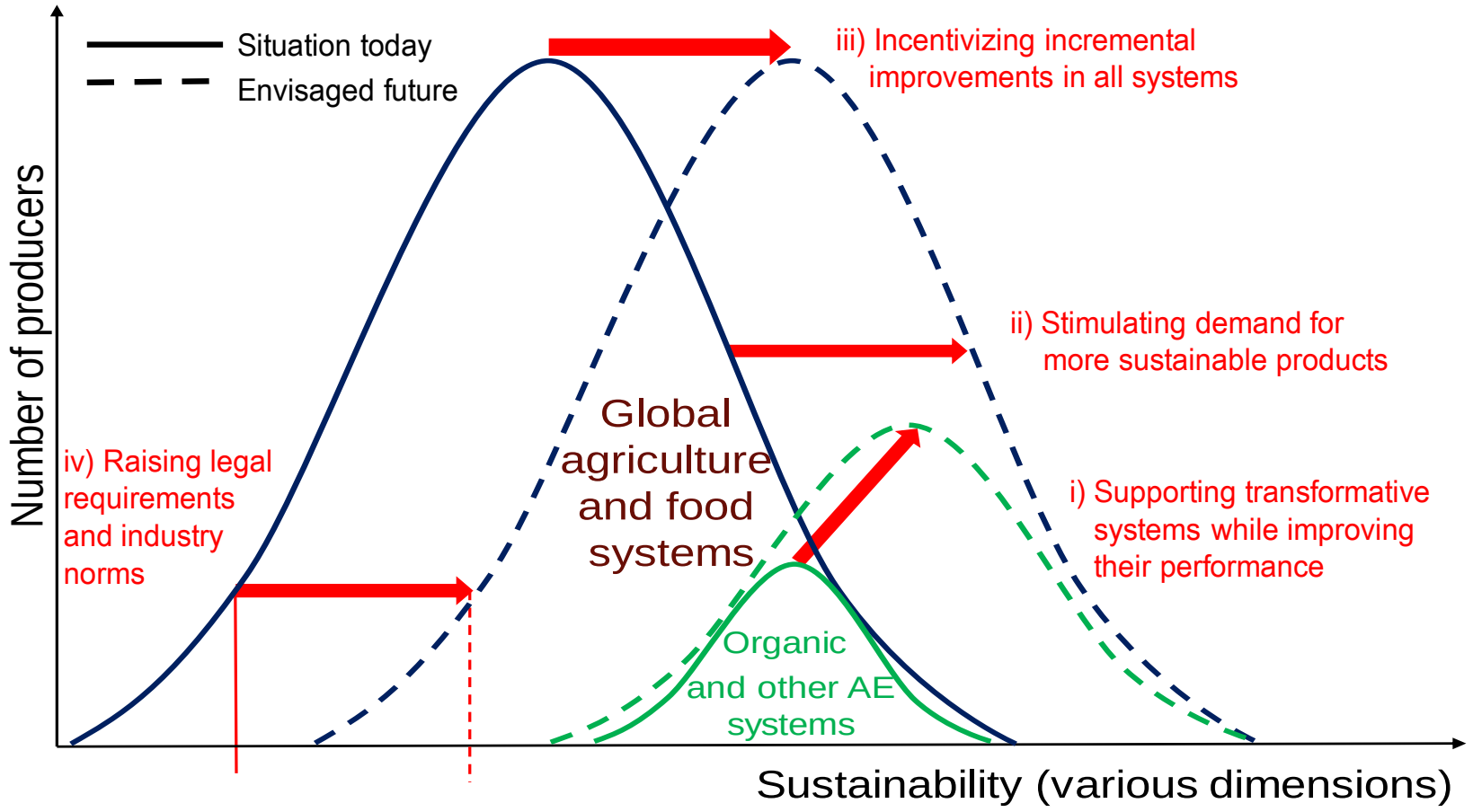
- Early detection and rapid response: Identifying and addressing emerging threats quickly.

- Adaptive: Continuously monitors, evaluates, and adjusts management strategies based on new information and changing conditions.

Proactive ecosystem management is about taking a long-term, forward-looking approach to environmental stewardship, prioritizing prevention and early action to ensure healthy and resilient ecosystems for future generations.

System interventions in support of the Agroecology transition

Four groups of policy interventions to transition our food system to a more sustainable one



Source: Eyhorn, F. et al. 2019

Policies for Agroecology

I. Research and Innovation

- Transdisciplinary, integrated and agroecological approach
- Co-creation of knowledge
- Invest in AE R&D (only)

II. Coherent policies that drive food system transformation

- Sharing of experience between policy makers on integrated agroecological policies

III. Contribution of agroecology to global/regional/national commitments

- Impact of policies on SDGs
- Climate Change and NDCs

You cannot solve the problem with the same kind of thinking that created the problem *Albert Einstein*

Thank you

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