

# Co-creation of knowledge and transformations in agri- food systems

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# Structure

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- Today's food system and its converging challenges
- Decolonization and democratization approaches
- Examples from agroecology
- Transdisciplinary research
- Old and new knowledge
- Critical science approach
- Different approaches, different results
- Participatory action research with examples from Brazil and Bolivia
- Conclusions

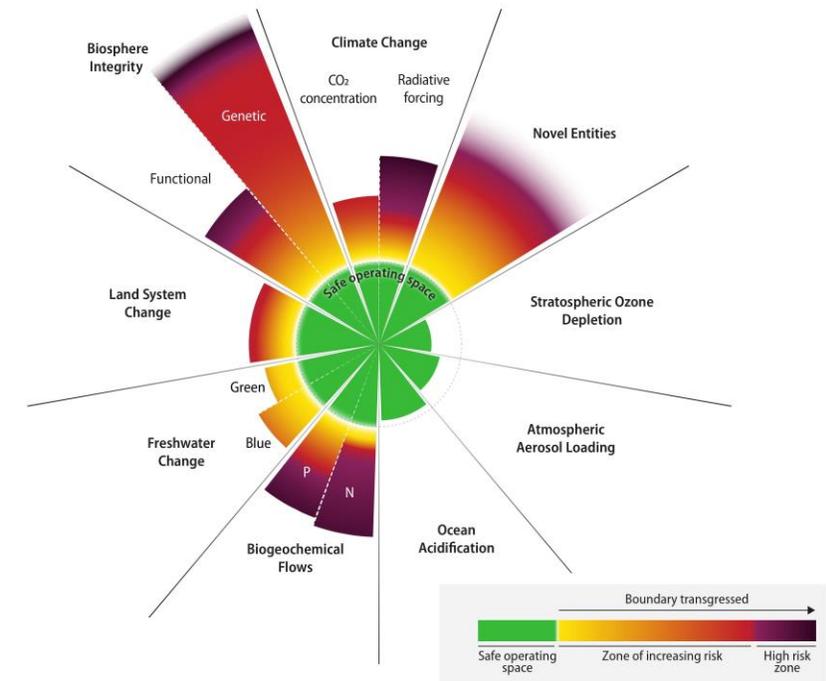
# Converging ecological and social crisis

1) Ecological **breakdown** of biodiversity and the climate: industrial agriculture incl. meat industry as a main driver

2) Growing **inequalities** (e.g. hunger, FAO 2023)

→ We are moving **backwards** on (many of) the SDGs

→ **Green growth logic** and forest carbon **offsetting** disproven (Haberl et al. 2020, West et al. 2023)



Source: Richardson et al., 2023



Source: Reuters (in: Harris et al 2019, The Political economy of food)

Sources:

FAO, IFAD, UNICEF, WFP and WHO. 2023. The State of Food Security and Nutrition in the World 2023. Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum. Rome, FAO.

Haberl, H., Wiedenhofer, D., Virág, D., Kalt, G., Plank, B., Brockway, P., ... & Creutzig, F. (2020). A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights. *Environmental research letters*, 15(6), 065003.

Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S. E., Donges, J. F., ... & Rockström, J. (2023). Earth beyond six of nine planetary boundaries. *Science Advances*, 9(37), eadh2458.

West, T. A., Wunder, S., Sills, E. O., Börner, J., Rifai, S. W., Neidermeier, A. N., & Kontoleon, A. (2023). Action needed to make carbon offsets from tropical forest conservation work for climate change mitigation. *arXiv preprint arXiv:2301.03354*.

# The global food system is responsible of one third of global Greenhouse gas emissions

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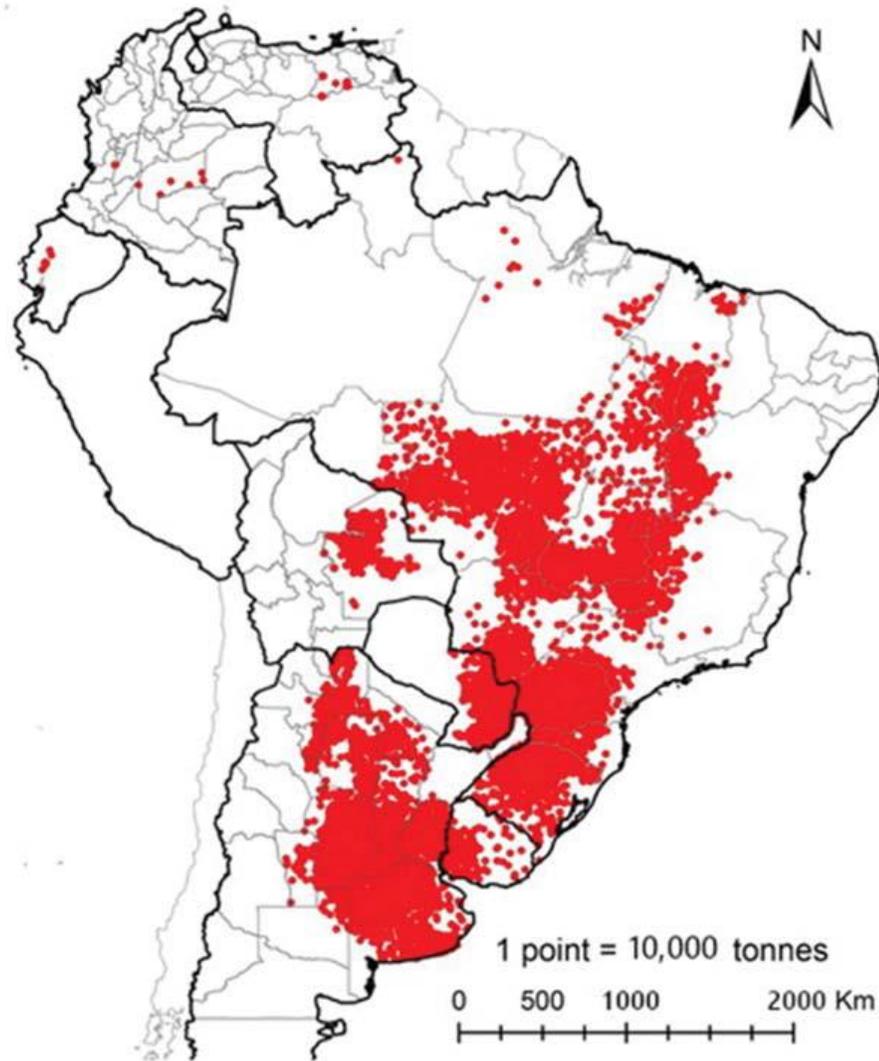
Article | Published: 08 March 2021

### Food systems are responsible for a third of global anthropogenic GHG emissions

[M. Crippa](#) ✉, [E. Solazzo](#), [D. Guizzardi](#), [F. Monforti-Ferrario](#), [F. N. Tubiello](#) & [A. Leip](#) ✉



# Soybean in South America and its global links



Soybean production in South America (Oliveira and Hecht, 2016)



Uma em cada dez  
pessoas no mundo é  
alimentada pelo Brasil.

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um  
país  
chamado  
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# Starting point: Sustainable Development Goals

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## Celebrating the SDGs

→ for the first time, a global framework, supported by all governments, includes action in the Global North

But...

- Still many colonial perspectives, rooted in economic growth paradigm

- big problem: link between science and policies very weak

→ Only parts are taken up, no transformative change; loss of control over our knowledge

→ What went wrong?



# Sustainable development: what worldview and view on humans?

Shortfall on the majority of the 17 SDGs, especially:

- eliminating hunger
- Ensuring healthy lives for all
- Protecting and sustainably using ocean resources

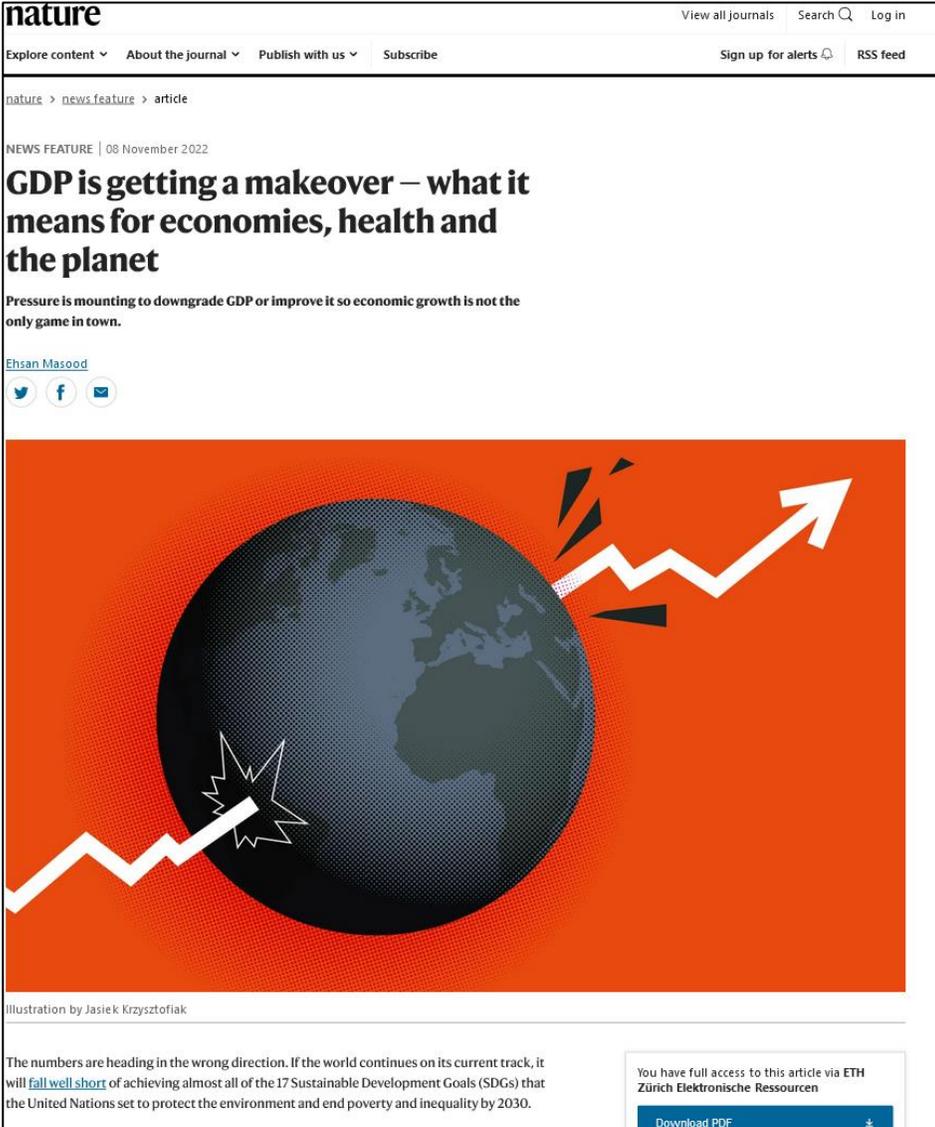
**Human Development Index** has fallen since 2019

UN Director General Guterres calls for dropping the GDP as success measure:

*“Absurdly, GDP rises when there is overfishing, cutting of forests or burning of fossil fuels. We are destroying nature, but we count it as an increase in wealth.”*

Inherent problems in “sustainability” indicators:

- Economic growth paradigm
- Materialism



The screenshot shows the top portion of a Nature journal article. The header includes the 'nature' logo, navigation links for 'View all journals', 'Search', and 'Log in', and a secondary row with 'Explore content', 'About the journal', 'Publish with us', 'Subscribe', 'Sign up for alerts', and 'RSS feed'. The article breadcrumb is 'nature > news.feature > article'. The main title is 'GDP is getting a makeover – what it means for economies, health and the planet', dated '08 November 2022'. A sub-headline reads: 'Pressure is mounting to downgrade GDP or improve it so economic growth is not the only game in town.' The author is 'Ehsan Masood', with social media icons for Twitter, Facebook, and Email. The main image is a stylized illustration of a globe with a white jagged line graph overlaid, showing a sharp upward trend on the right side. The background is a solid orange color. Below the image, it says 'Illustration by Jasiek Krzysztofciak'. At the bottom, there is a text block: 'The numbers are heading in the wrong direction. If the world continues on its current track, it will [fall well short](#) of achieving almost all of the 17 Sustainable Development Goals (SDGs) that the United Nations set to protect the environment and end poverty and inequality by 2030.' To the right of this text is a blue button that says 'Download PDF' with a download icon.

# Seven basic issues with the economic growth paradigm (Schmelzer et al., 2022)

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- 1) **Ecological critique:** Destroying the ecological foundations it relies on
  - 2) **Socio-economic critique:** GDP as the main measure mismeasures life and stands in the way of well-being and equality
  - 3) **Cultural critique:** Super-economized everyday lives alienated from work («bullshit jobs», David Graeber) and relating to each other and nature
  - 4) **Feminist critique:** Growth is based on gendered over-exploitation and devalues reproduction of life & the necessary conditions
- 
- 1) **Industrialism critique:** Undemocratic productive forces and technologies impact society
  - 2) **Capitalism critique:** Depending on exploitation and accumulation by dispossession (David Harvey)
  - 3) **South-North critique:** Based on domination, extraction and exploitation of the global South (resources and labor, «Westernization» of the world, unequal exchange, Jason Hickle)

# The role of emotions in sustainability learning (Grund et al., 2023)

**Fig. 3** Overview of specific emotions relevant to the phases of transformative learning. Black words inside the circle point to the phases of transformative learning, while gray words refer to descriptions of emotions from the 20 in-depth reviewed articles



# The problem with growing corporate concentration and power in the global food system (Clapp 2021, Nature Food):

## Mega-mergers:

2015: Dow + DuPont → Corteva

2016: Chem China purchased Syngenta

2018: Bayer purchased Monsanto

BASF bought assets from the others

Together, «the big four» control >70% of the global pesticide market and >60% of the seed market, e.g. 97% of maize seeds in Brazil

## Concentrated power in the food system:

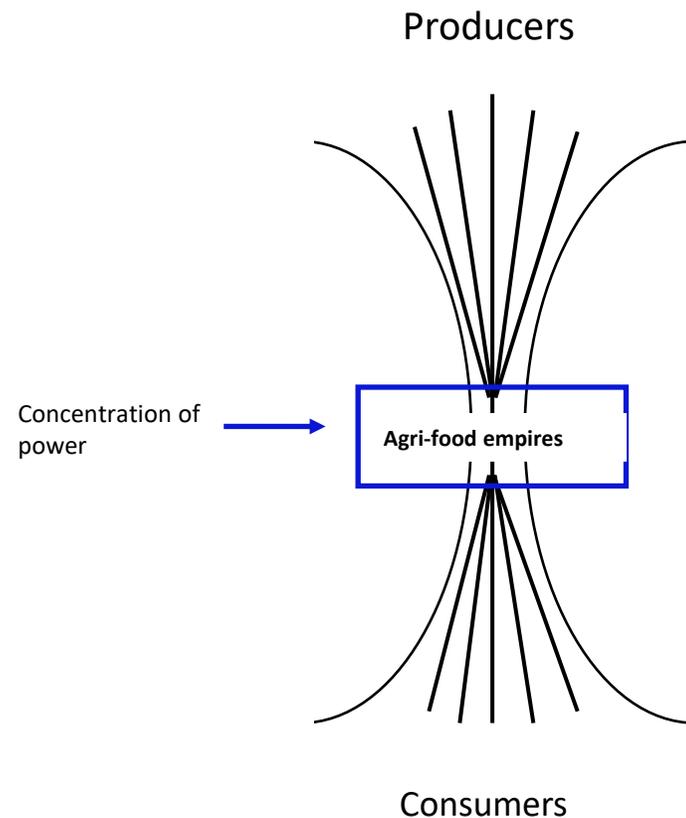
- Shapes market dynamics by creating demands
- Shapes technologies and innovation agendas
- Shapes policy and governance frameworks



Agro-vet store in Kenya. Image: Jacobi, 2017

# The “Hour Glass” – Model of power concentration in agri-food systems

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# What do we get from this situation?

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- «green» soybean (e.g., Baletti 2011)
- Green grabbing and evictions of local people from their ancestral land (Fairhead et al., 2012)

→ More appropriation, more extractivism, more environmental degradation, more exploitation in the name of «Sustainable Development» (e.g., Rist et al. 2023 «Critical Sustainability Sciences», Routledge).

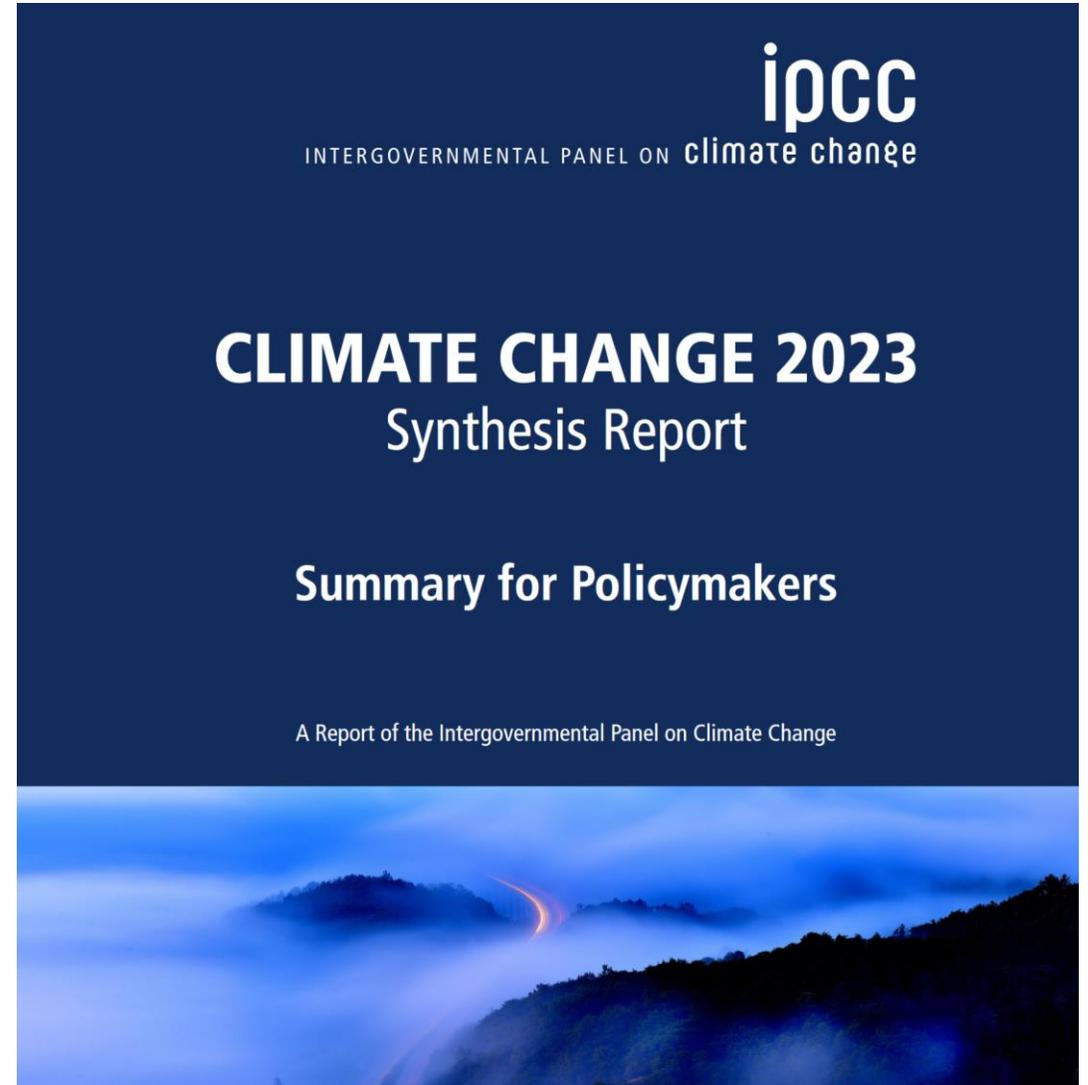
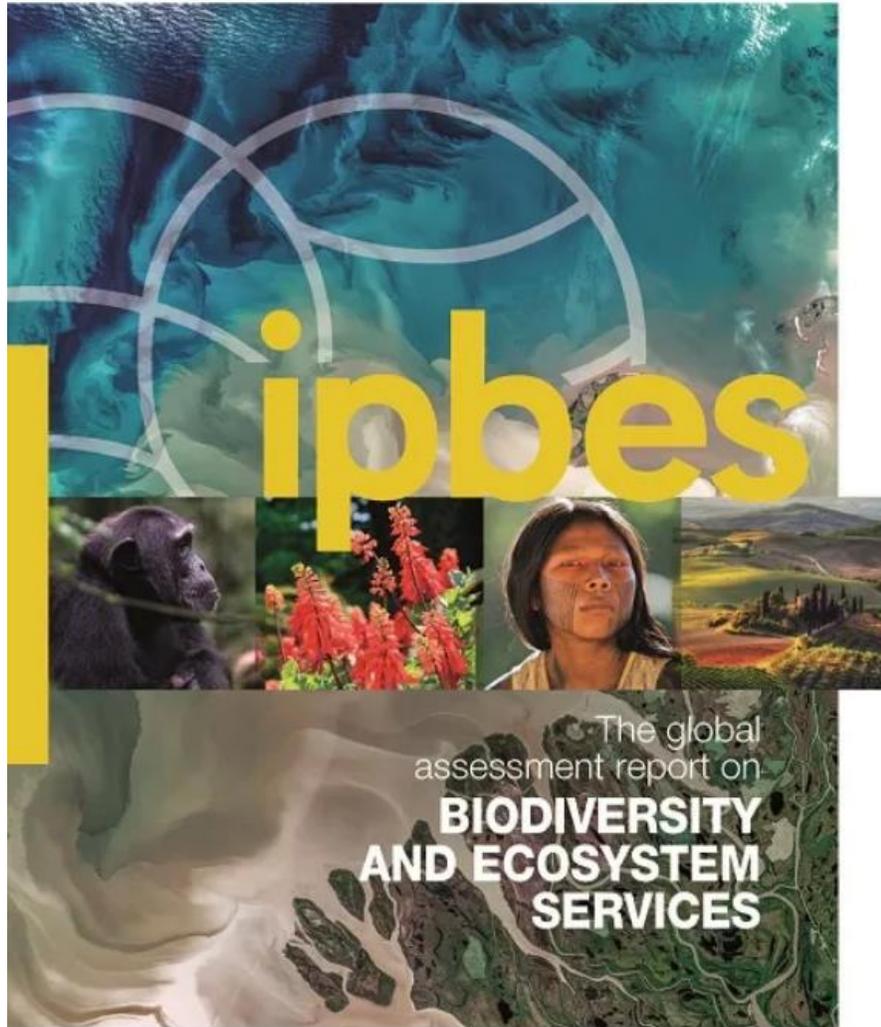
## References:

Baletti, B. (2011, April). Saving the Amazon? Land Grabs and “sustainable soy” as the new logic of conservation. In *International Conference of Global Land Grabbing*.

Fairhead, J., Leach, M., & Scoones, I. (2012). Green grabbing: a new appropriation of nature?. *Journal of Peasant Studies*, 39(2).

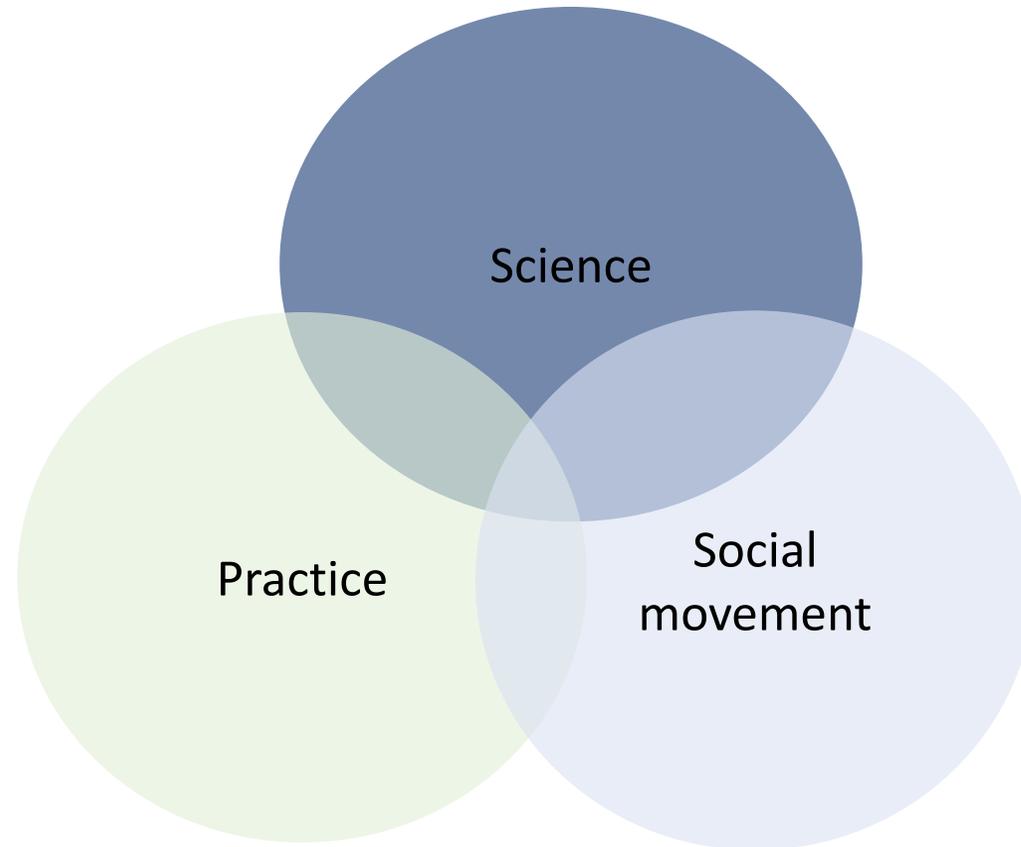
Rist, S., Bottazzi, P., & Jacobi, J. *Critical Sustainability Sciences*. Routledge

# Agroecology as a real alternative



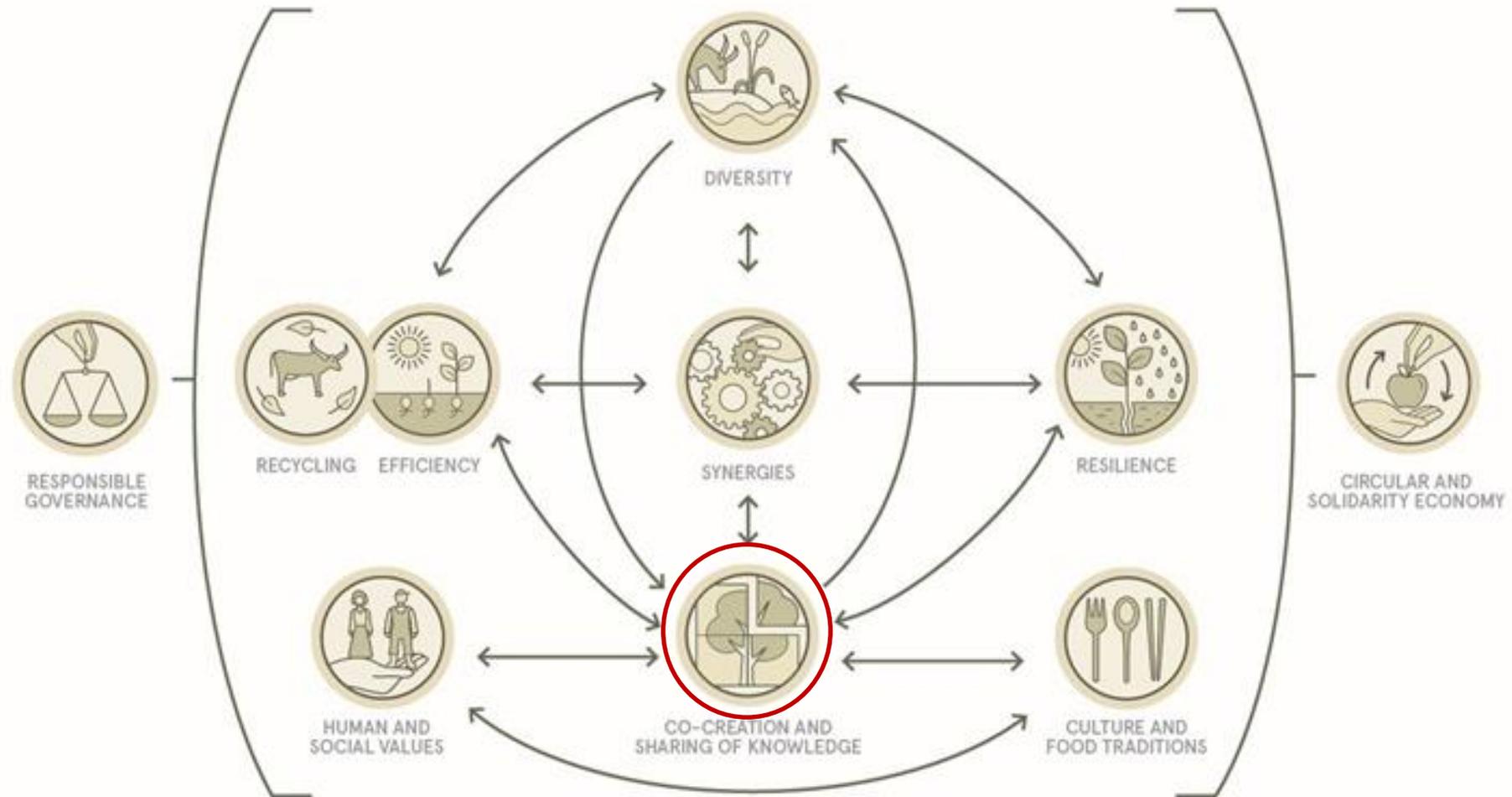
# Agronomy + Ecology = Agroecology

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Agroecology: The Science of Sustainable Agriculture (Altieri 1987, Wezel 2018)

# FAO's 10 Elements of Agroecology



10 Elements of Agroecology (FAO 2018)

# The agroecology movement is political

- Emerged as a reaction to industrial agriculture
- A way of resisting neoliberal globalization
- Part of emancipatory governance
- Strongly linked with the concept of Food Sovereignty

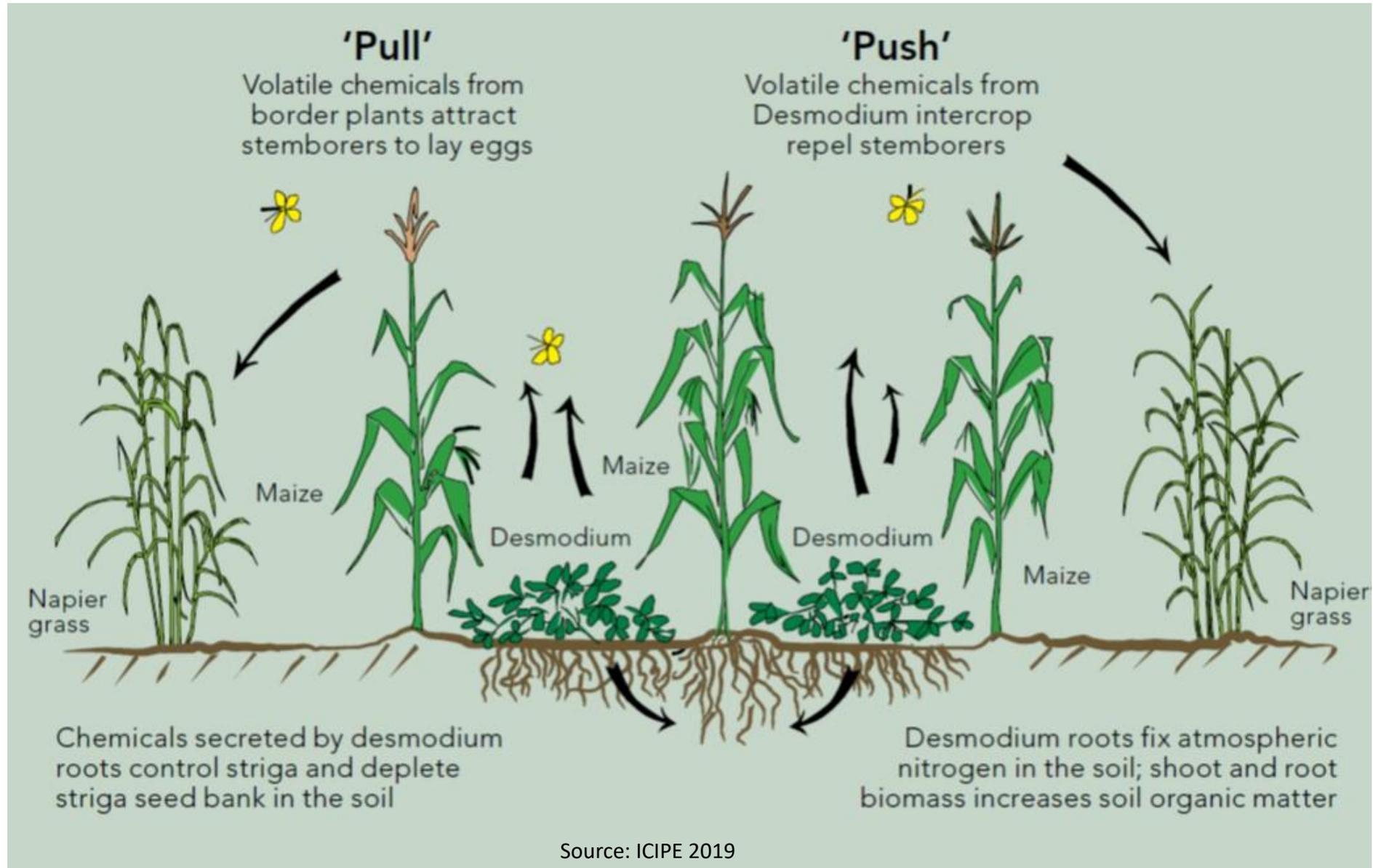


# A global movement demanding (and living) change

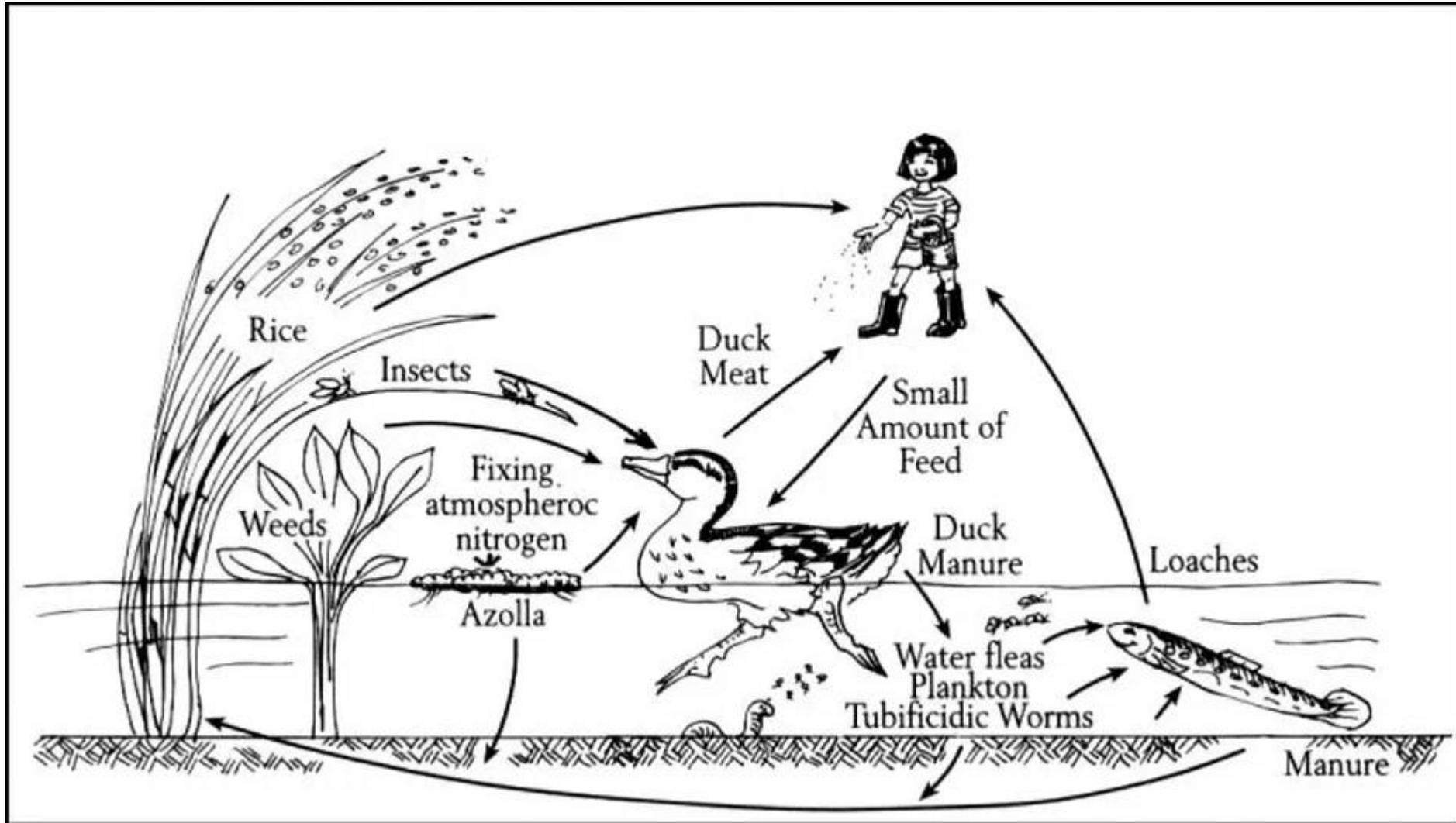
- La Via Campesina, AFSA (Alliance for Food Sovereignty in Africa), Landless Movement (MST) and many more, e.g. subnational groups, cooperatives, women farmers etc.
- With anti-racist, (eco-) feminist, post-growth, abolitionist, and other justice-related movements (Holt-Gimenez 2018, Montenegro 2021)
- UN Special Rapporteurs on the Right to Food; Declaration on the Rights of Peasants (2018), approved by 119 countries
- Participatory research, testing and implementation



# Agroecology example: The Push-Pull-System



# Agroecology example: Rice-Duck-Fish-Agroecoystem



Source:

Furuno, T. (2012). The One Duck Revolution. Lulu. com.

Zhang, Y., Guan, C., Li, Z., Luo, J., Ren, B., Chen, C., ... & Huang, H. (2023). Review of Rice-Fish-Duck Symbiosis System in China—One of the Globally Important Ingenious Agricultural Heritage Systems (GIAHS). Sustainability, 15(3), 1910.

# Total productivity and land-equivalent ratio





Environmental Research Letters

Cocoa agroforestry systems versus monocultures: a multi-dimensional meta-analysis

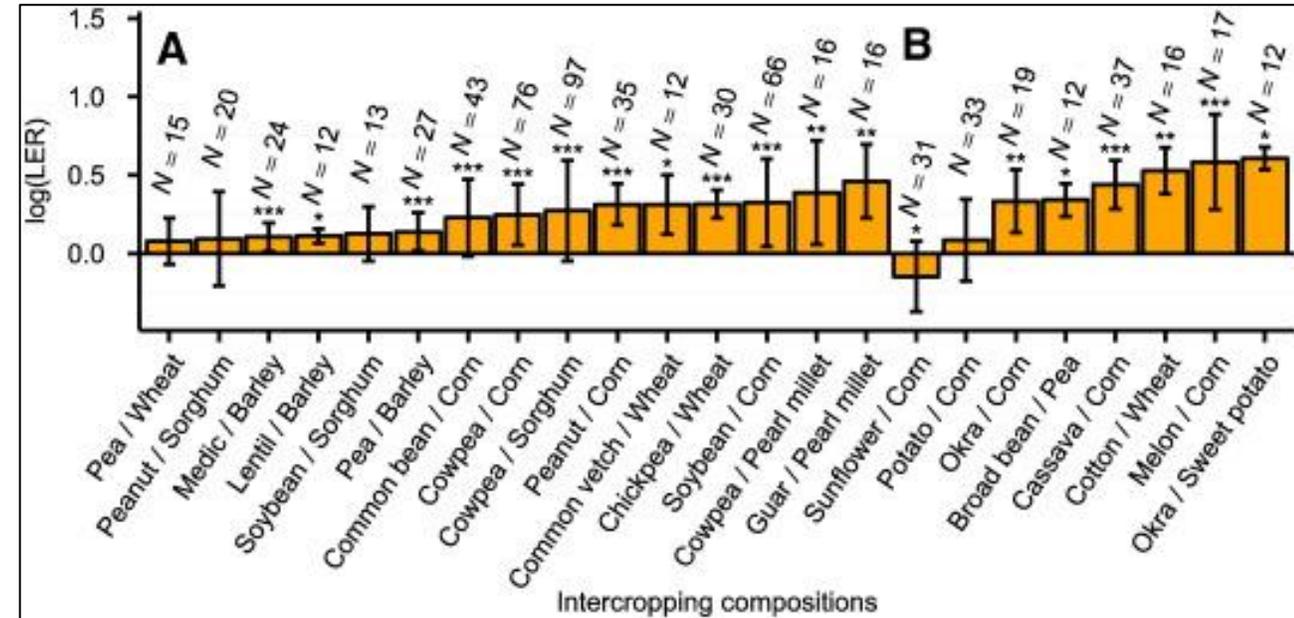
Wiebke Niether<sup>1</sup>, Johanna Jacobi<sup>2</sup>, Wilma Blaser<sup>3</sup>, Christian Andres<sup>4</sup> and Laura Armengot<sup>5</sup>

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<sup>2</sup>Centre for Development and Environment, University of Bern, 3012, Bern, Switzerland  
<sup>3</sup>School of Biological Sciences, The University of Queensland, St Lucia, Brisbane, QLD 4072, Australia  
<sup>4</sup>Department of Environmental Systems Science, ETH Zurich, 8092, Zurich, Switzerland  
<sup>5</sup>International Cooperation Department, Research Institute of Organic Agriculture, FiBL, Switzerland  
 E-mail: [wiebke.niether@agrar.uni-giessen.de](mailto:wiebke.niether@agrar.uni-giessen.de); [johanna.jacobi@cde.unibe.ch](mailto:johanna.jacobi@cde.unibe.ch)









Meta-analysis of intercropping productivity studies. Source: Martin-Guay et al. 2018

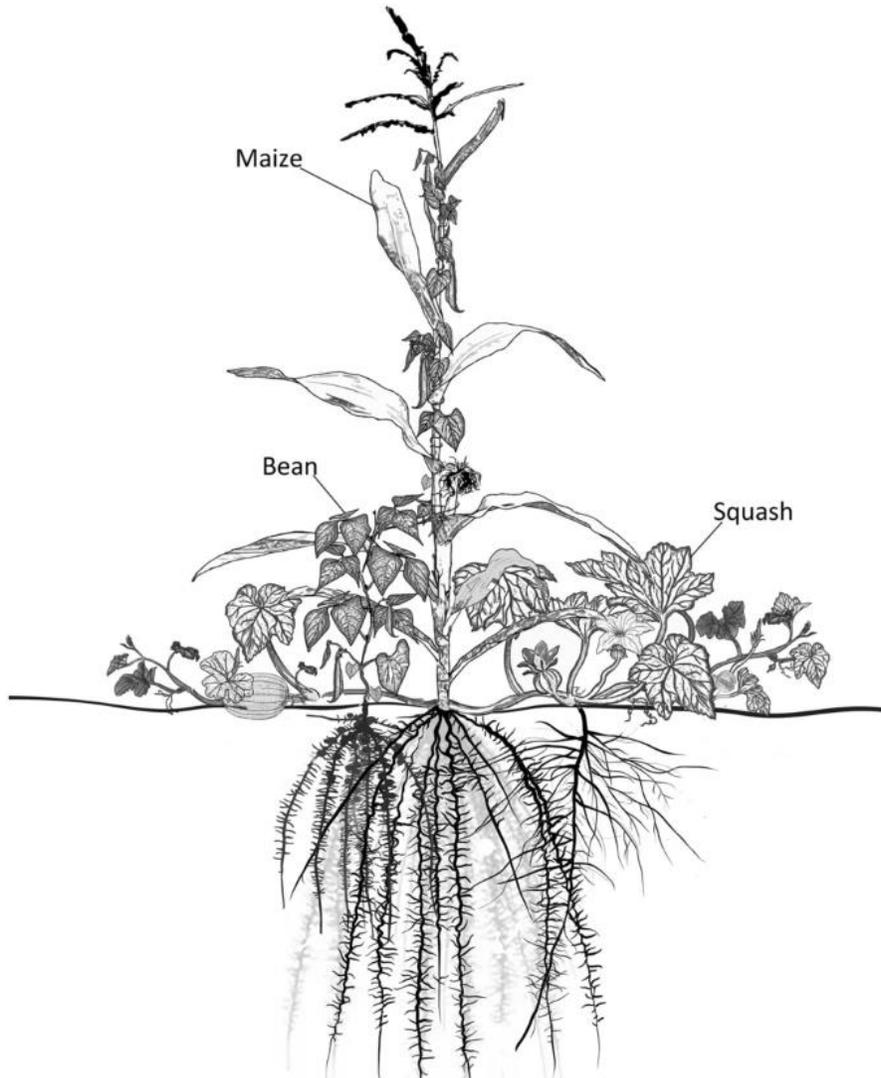
Total system yield in agroforestry > 10 times higher than in monocultures (cocoa alone was 25% less, but depends more on management e.g. hand pollination)

$$LER = \sum_{i=1}^m \frac{IY_i}{SY_i}$$

m= number of intercropped plants  
 IY=yield of one crop in intercropping  
 SY=yield of one crop in monoculture

LER shows the land that would be required for the same yield in monoculture. If it is >1, intercropping is more productive

# Milpa (maize/bean/squash) system productivity



LER of maize/bean/squash Milpas in Guatemala: 1.6-1.9

High potential nutrient adequacy (PNA)

Problem: Families' plots are too small (<0.25 ha)

→ Land distribution is the problem rather than a lack of productivity of the agricultural system

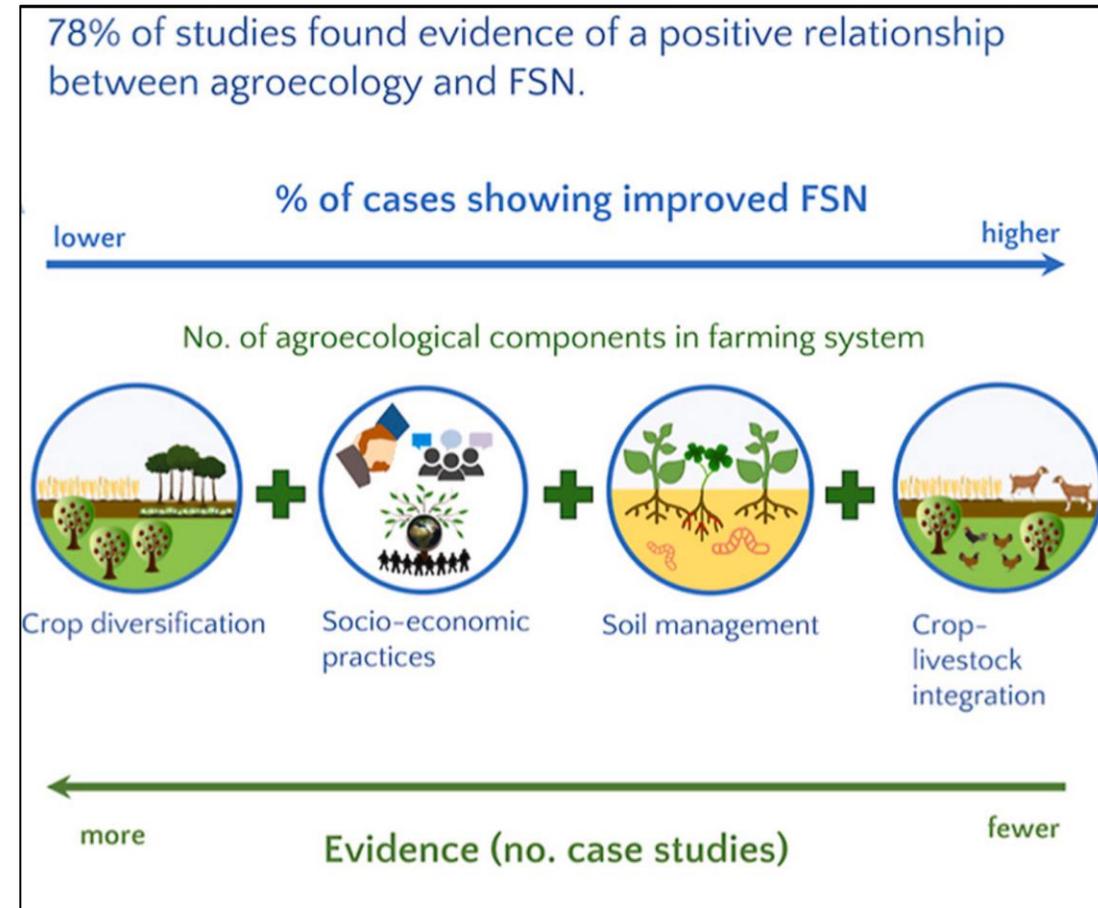
# Can agroecology improve food security and nutrition?

- Meta-study of 56 articles (Bezner-Kerr et al., 2021)
- 78% showed a positive impact of agroecological practices on food security and nutrition
- Combinations most successful:

Malawi: Farmer-to-farmer training + legume intercropping + composting + mulching + crop diversification + botanical pesticide use

Brazil: School feeding program encouraging agrobiodiversity + cover cropping + intercropping + premium for agroecological production + collectively supported farmer autonomy

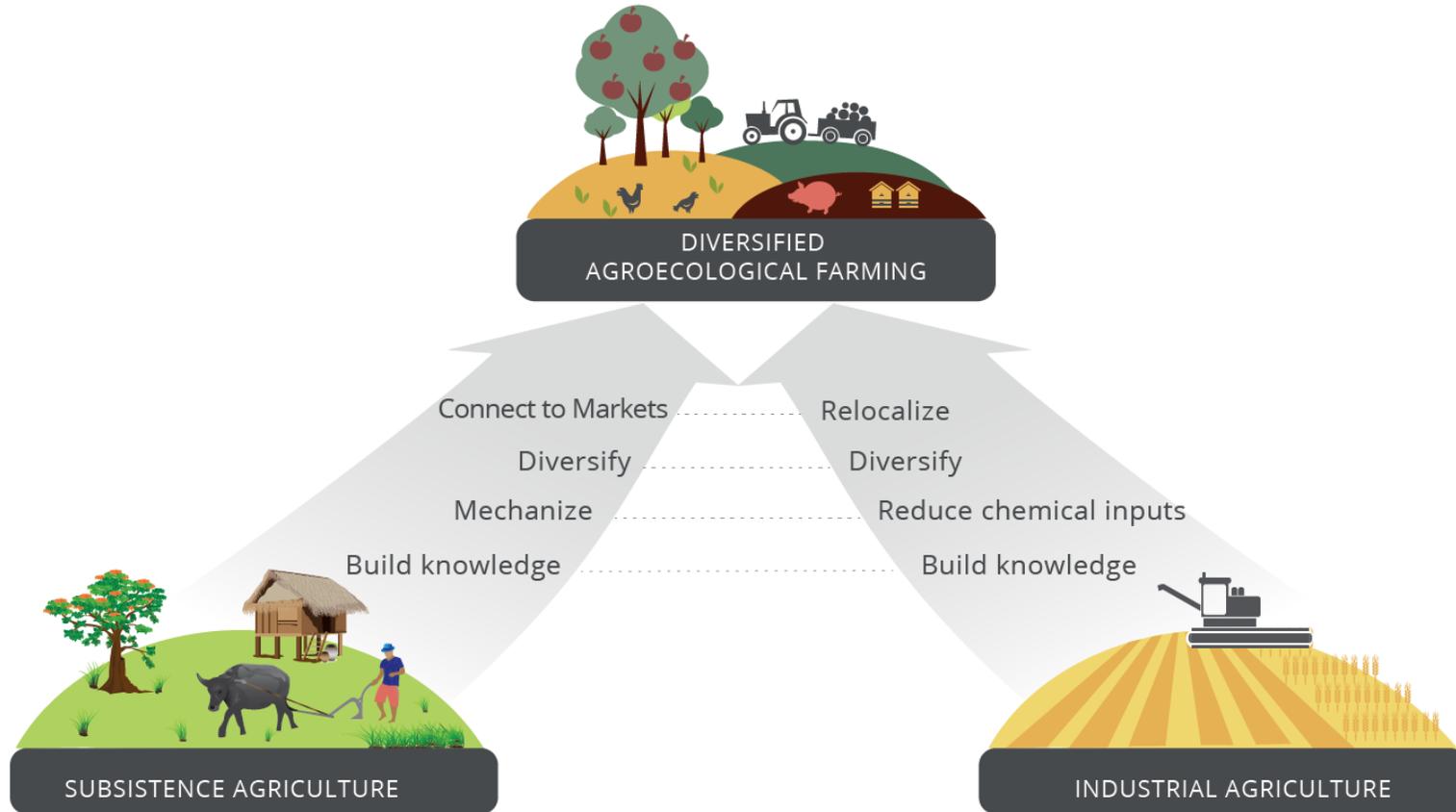
- More complex systems were more likely to have positive food security and nutrition outcomes
- This is besides biodiversity, production, resilience and other health benefits besides nutrition



Source:

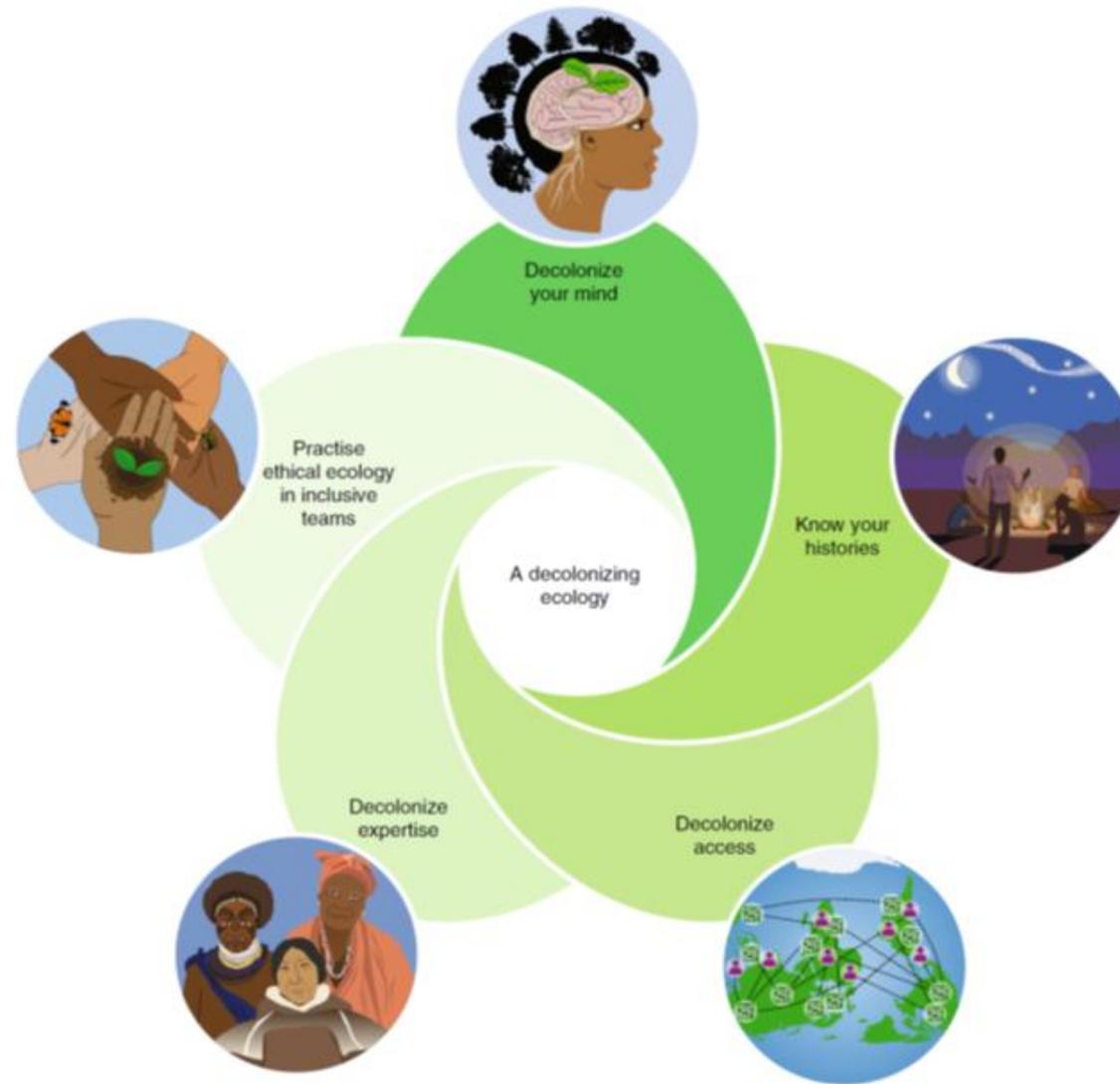
Bezner Kerr, R., Madsen, S., Stüber, M., Liebert, J., Enloe, S., Borghino, N., ... & Wezel, A. (2021). Can agroecology improve food security and nutrition? A review. *Global Food Security*, 29, 100540.

# Agroecological transition from different starting points



# Decolonization of of agricultural sciences?

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**There is science here**



**Here there is also science**

# “Old” and “new” knowledge

- **1.5 bn small farmers** on ~380 million farms (Samberg et al. 2017)
- ~ **2 million crop varieties**, adapted to a wide range of ecosystems, “**test of time**” (Altieri and Koohafkan 2008)
- **Indigenous peoples** are ~5 % of humanity but are connected to **80% of biodiversity** (UN 2020)
- “**First system thinkers**”: complex, relational understanding of ecosystems and the coevolution of humans and non-humans (Montenegro 2021)
- The **right to seeds** is enshrined in the UN Declaration on the Rights of Peasants (UNDROP 2018)
- But: **Loss of skills**, loss of **agrobiodiversity**, “**epistemicide**”
- Agroecology: Link “**old**” and “**new**” knowledge, inform, innovate, co-developing new solutions with **transdisciplinarity**



Quechua farmer, Maragua, Sucre, Bolivia. Source: Jacobi 2018

# The need for food democracy

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**«Hunger is not a problem of a lack of production,  
it is a problem of a lack of democracy»**

Frances Moore-Lappé, founder of Food First, Oxford Real Farming Conference, January 2021

# Why food democracy?

- We have extraordinary productive capacities. If we had democratic control over production and organized it around well-being, we could end poverty & ensure good living standards for everyone on the planet
- But refers also to energy and materials, not just agricultural production
- To democratize, we need to decolonize!



World Development Perspectives  
Volume 35, September 2024, 100612



## How much growth is required to achieve good lives for all? Insights from needs-based analysis

Jason Hickel<sup>a b c</sup>  , Dylan Sullivan<sup>a d</sup>

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# Postgrowth principles for sustainable agri-food systems

*"Agroecological life processes support healthy communities rather than serving as inputs for the relentless pursuit of economic growth"*

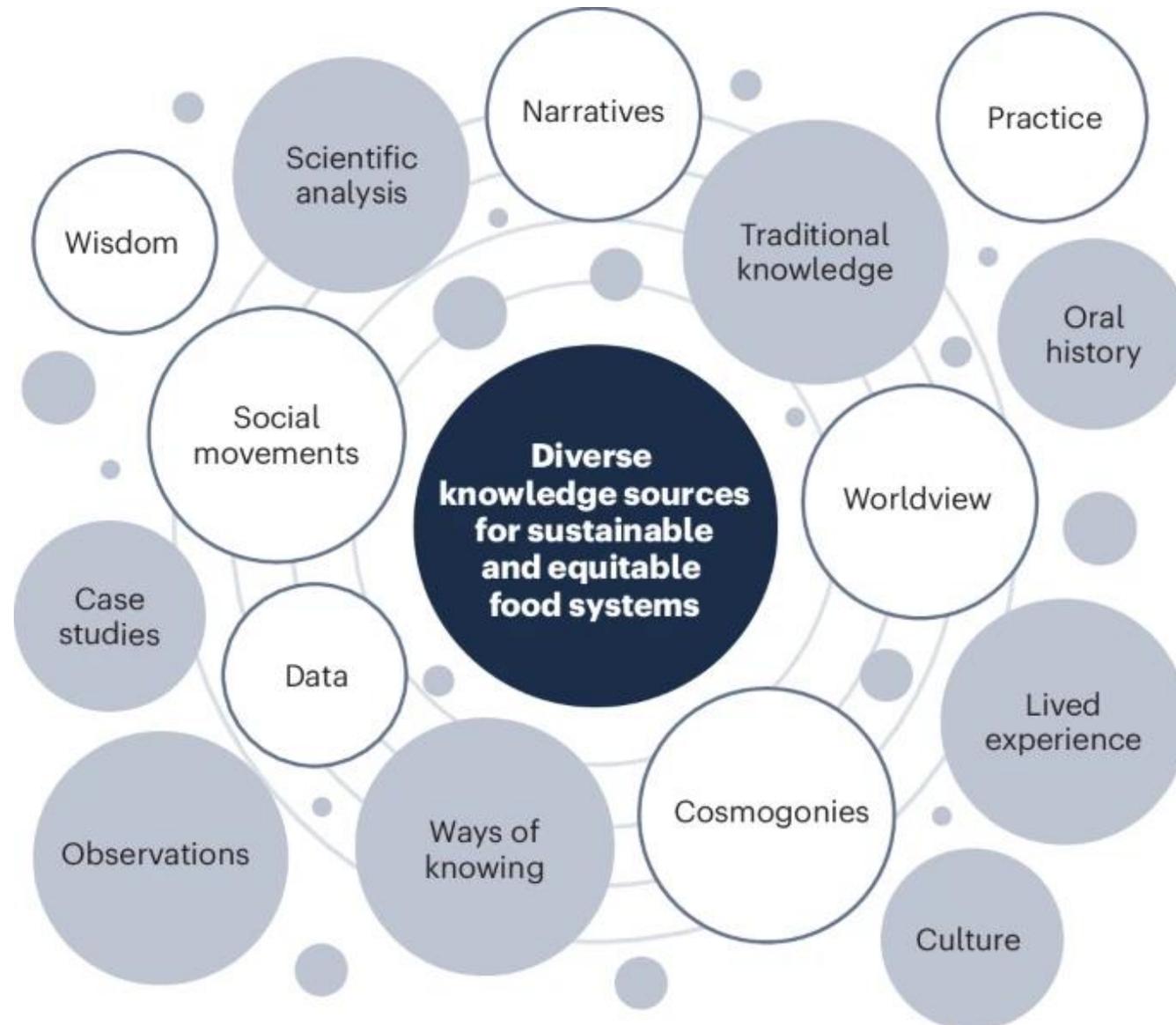
**Table 1 | Principles by which growth and post-growth metabolisms operate arranged by category**

	<b>Economic principles</b>	<b>Social-ecological principles</b>	<b>Allocative principles</b>	<b>Institutional principles</b>	<b>Relational principles</b>
<b>Growth metabolism</b>	Efficiency	Extraction	Accumulation	Private ownership	Control
<b>Post-growth metabolism</b>	Sufficiency	Regeneration	Distribution	Commons	Care

*"Agroecological food systems apply the principles of sufficiency, regeneration, distribution, commons and care through the observation of and engagement with the complex relationships between plants, soils and pollinators"*

Source: McGreevy et al. 2022, Nature Sustainability

# Diverse knowledge sources for sustainable and equitable food systems



# Critical science

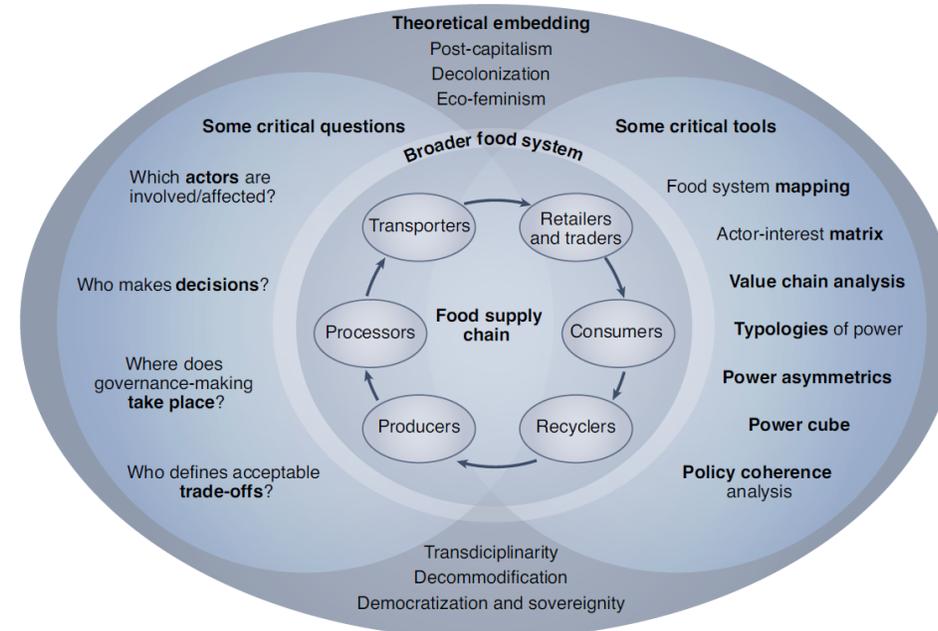
*“A critique is not a matter of saying that things are not right as they are. It is a matter of pointing out on what kinds of assumptions, what kinds of familiar, unchallenged, unconsidered modes of thought the practices that we accept rest” (Michel Foucault)*

# Towards political ecologies of food

Political ecology approaches are relatively absent from food systems research. With deep inequalities in food production, distribution and consumption, the study of power asymmetries is central to food justice and the co-creation of alternative futures.

Johanna Jacobi, Gabriela Valeria Villavicencio Valdez and Kenza Benabderrazik

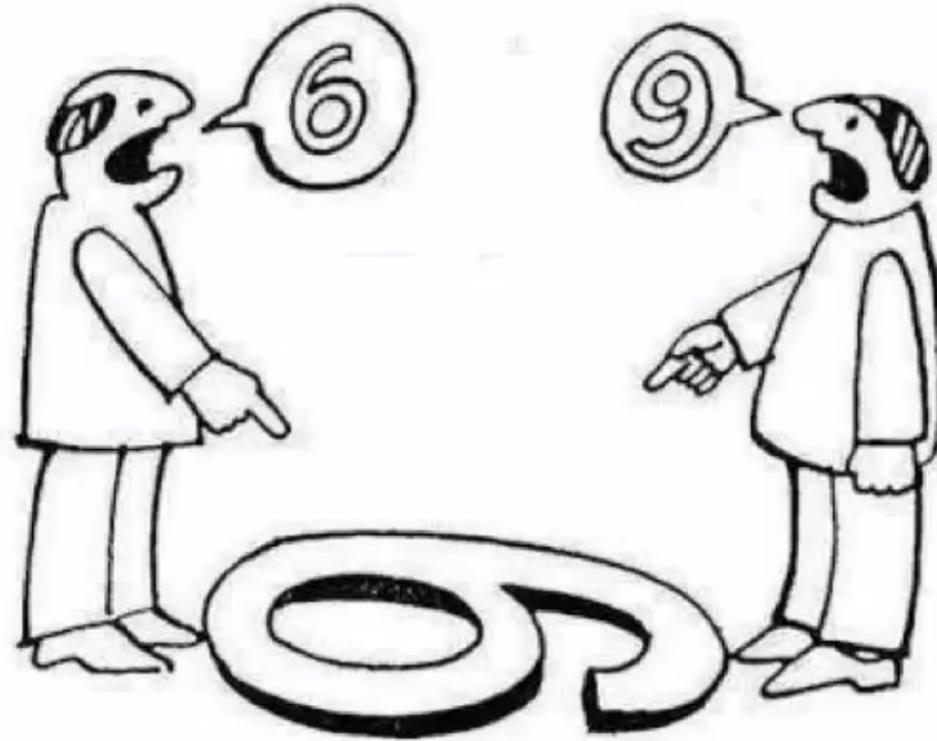
Sustainable production and healthy food are a privilege in today's world: practising a healthy diet can be nearly five times more expensive than practising an unhealthy one<sup>1</sup>, while agricultural incomes are typically too low to ensure a dignified living. Food system activities linked to the uniformization of landscapes give rise to an unequal distribution of benefits and harms — the latter including deforestation, eutrophization and contamination. At present, food systems are responsible for one-third of anthropogenic greenhouse gas emissions<sup>2</sup>. Ongoing processes of land concentration are forcing small-scale food producers to abandon agriculture. Worldwide, the number of people suffering from hunger is increasing, and, simultaneously, a 'global syndemic'<sup>3</sup> of food-related diseases is spreading. Overall, our food systems are shaped by multidimensional and increasingly asymmetric power relations — defined as the uneven capacity of different actors to influence the goals, processes and outcomes



**Fig. 1 | Critical analysis of food systems.** A conceptual framework built around food system actors facilitates the compilation of questions and critical tools to study the political ecologies of food systems.

# How does change happen through and with science?

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Transdisciplinarity: Co-creation of knowledge from different realities. Image: unknown

# Transdisciplinary research

«Agroecological ways of knowing, living and producing food differently, namely the ontological, epistemic and experimental dimension of agroecology that produces different subjectivities and understandings of peoples' sense of living in the natural world» (Rosset et al., 2019)

Three forms of co-created knowledge: Systems knowledge, target knowledge, transformation knowledge (Hirsch-Hadorn et al., 2006, 2008)

Environmental Science and Policy 129 (2022) 107–115

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Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research

J. Jacobi<sup>a,b,\*</sup>, A. Llanque<sup>c</sup>, S.M. Mukhovi<sup>d</sup>, E. Birachi<sup>e</sup>, P. von Groote<sup>f</sup>, R. Eschen<sup>g</sup>, I. Hilber-Schöb<sup>h</sup>, D.I. Kiba<sup>i</sup>, E. Frossard<sup>j</sup>, C. Robledo-Abad<sup>k</sup>

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Image: Casa Nova, Bahia, Brazil. Llanque 2019

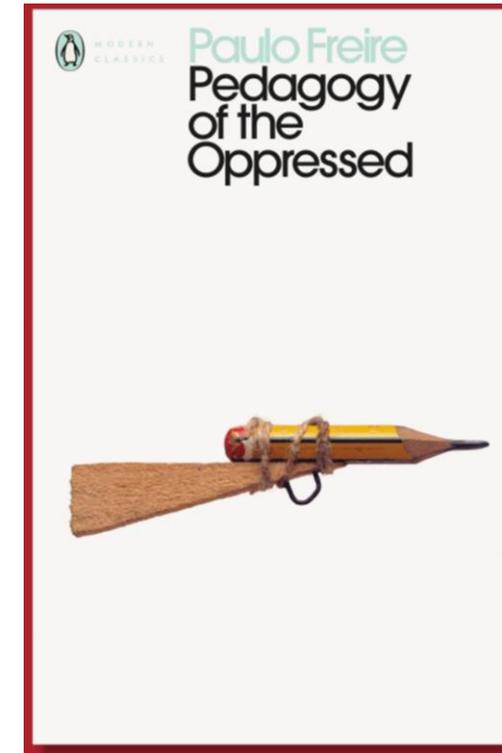
# Participatory Action Research (PAR)

PAR engages in **reflected, transformative research** linked to **collective action**. It works predominantly with **marginalized groups**. The subjects of the research originate from their communities with the goal to improve their situation and agency.

Coming from Fals Borda in Brazil, who drew on Paulo Freire's work of «**liberation pedagogy**»:

- Do not monopolize your knowledge or impose arrogantly your technologies
- Do not trust elitist versions of history
- Do not depend solely on your culture to interpret facts but recover local knowledge

(Source: Wakeford 2018: Participatory Action Research)

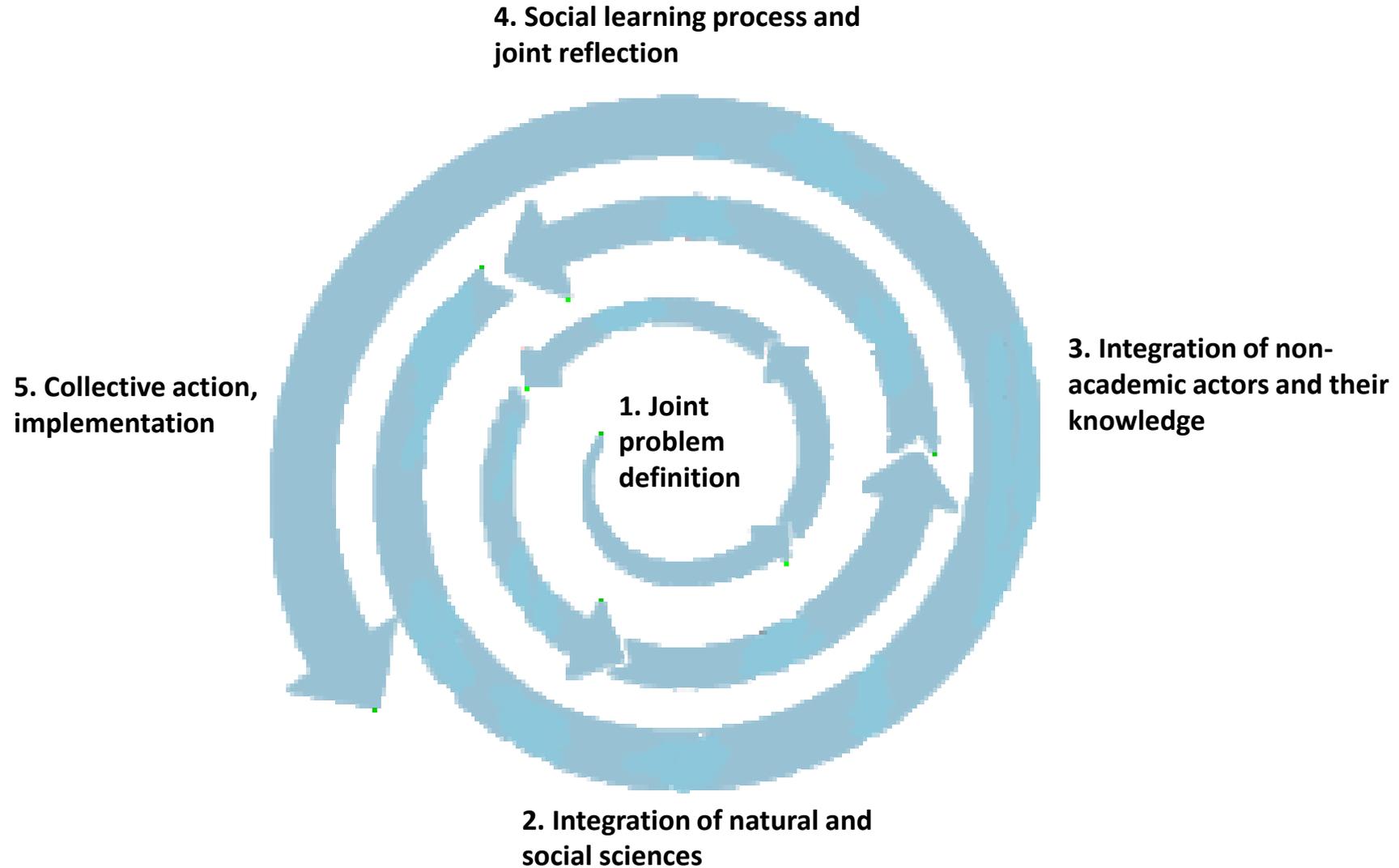


**Rural  
Development**  
**Putting the Last First**

**Robert Chambers**

**PARTICIPATORY  
ACTION RESEARCH:  
TOWARDS A  
MORE FRUITFUL  
KNOWLEDGE**

# Transformative research



# Case studies of PAR (or TAR): Seara, Santa Catarina, Brazil

Swiss r4d project «Towards Food Sustainability» (FoodSAF), 2015-2021)

Raw-milk cheese has been produced >100 years in Santa Catarina

Sanitary regulations in Santa Catarina prohibited raw-milk cheese

Swiss and Brazilian researchers engaged with local actors, especially women

We evaluated the food system together using the FOODSAF tool (Rist et al., 2020) and supported a self-organization process

A cheese contest where organizers were forced to incinerate the cheese, caused outrage far beyond the municipality.

After about half a year, the municipality and later the state changed the law, raw milk cheese is now no longer prohibited.



# Transformative pilot action in the Chaco, Bolivia

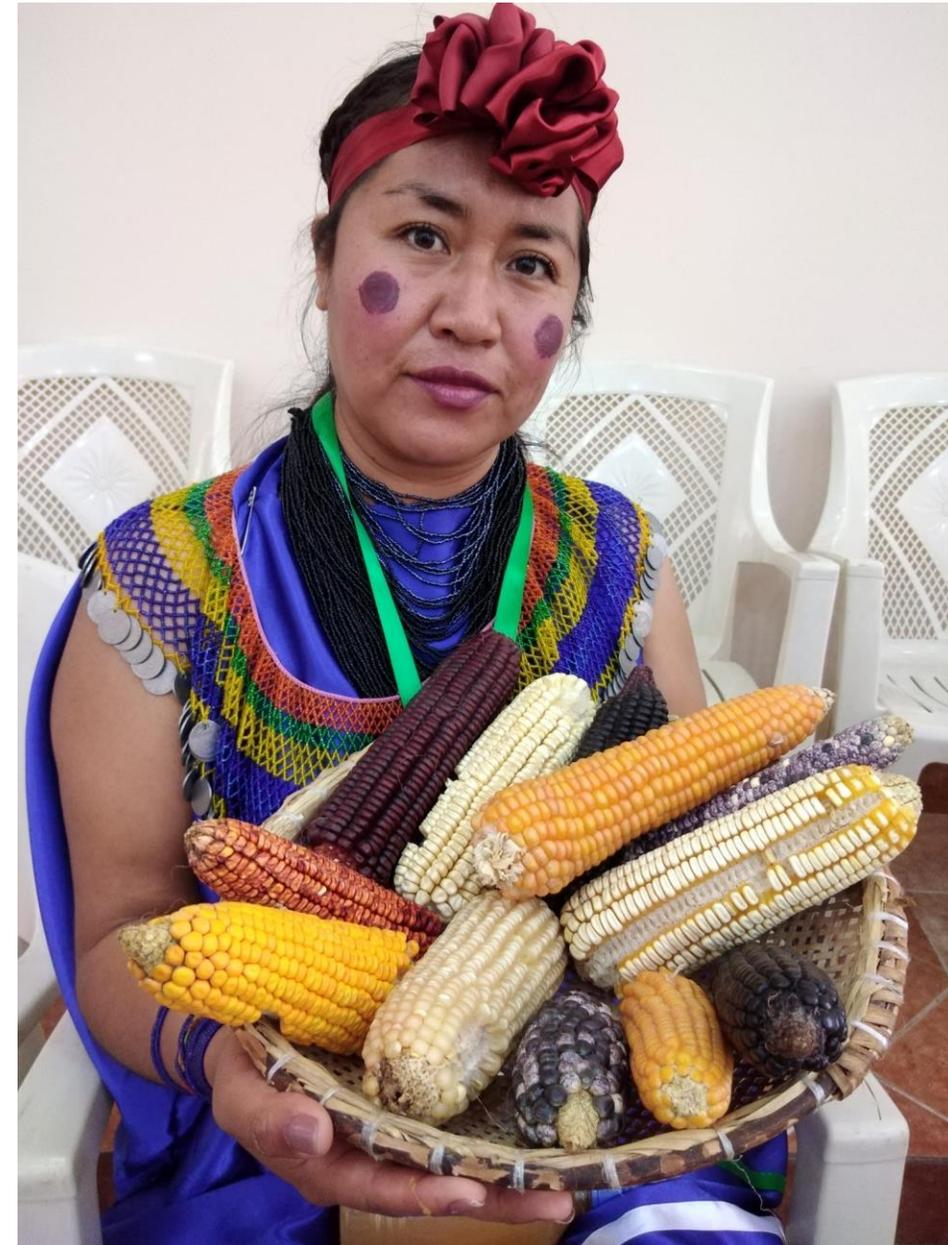
Swiss r4d project «Towards Food Sustainability» (FoodSAF), 2015-2021)

Two Guarani municipalities: Monteagudo Tentamí

A participatory analysis showed that agrobiodiversity and food security are rapidly lost as soybean agribusiness is spreading

Monteagudo: communitarian Economic Organization (OECOM) “Amandiya” for the products from native crops cultivated agroecologically and fruits from the forest of the Capitanía Ingres

Tentamí: exchange network of native maize varieties among seven communities, construction of a facility for a women’s group for dried products, a communal garden for horticultural and medicinal plants.



Mburuvicha (community leader) Angela, Chaco, Bolivia

# Transformative Pilot Action in Sucre, Bolivia

Swiss r4d project «Towards Food Sustainability» (FoodSAF), 2015-2021)

Sucre is the “national capital of urban agriculture” in Bolivia

70% of urban farmers are women, 80% of production is sold

Diversified production without pesticides, supported by the municipal government (materials, extension, value chain development, participatory certification)

Professional training and titling “Technician in sustainable food systems”

Why University? Transdisciplinary research process leading to collective action; researchers’ role as a facilitator and reflective scientist (Pohl et al. 2010)



# «Changing hearts and minds with agroecology»

(Borsatto et al. 2022 in Agriculture and Human Values)

*“Perhaps not enough emphasis has been placed on the fact that one of the **greatest despoilments of industrial agriculture** was the loss of the ability to act with the **body**, to trust the **senses**, to dialogue with **nature** and open up collectively to its mysteries, to find, through bonds of friendship, concrete solutions to common problems, making use of orality and direct experience as the most elective means of learning and living together (...). But we must also say that this is exactly what emancipatory agroecology restores, and therein lies its **mobilizing power**: it makes people live an agriculture with deep roots, not motivated by subsidies, nor by elite market fashions, nor by short-term policies, nor economicism, but because this sort of agroecology is a **life project** with an enormous capacity to **transform hearts**, to **regenerate community ties**, to **reinsert the culture** into the ecological order of the inhabited place.”* (Giraldo and Rosset, 2022: Emancipatory agroecologies: social and political principles)



Workshop on land rights in Casa Nova, Bahia, Brazil 2019



Thanksgiving table, Solawi «Möhreblick», Black Forest, 2022

# Example Solawi/CSA

- **Multifunctionality** instead of one-sided efficiency
- Ecological and social **added value**
- **Individual resilience** for the consumer
- Democratic and **participatory** governance
- **Proximity** between producers and consumers against alienation and food waste
- «**Prosumers**» actively shape the CSA
- **Meaningful** work, agency in times of climate/biodiversity/financial/health crisis
- **Regional resilient** supply structures compatible with eco-friendly technologies
- Structural **independence** from growth
- **Disributional justice** through many small producers + job creation
- **Cooperation** instead of competition at three levels: prodcuers and members, CSAs among each other, regional economy actors.

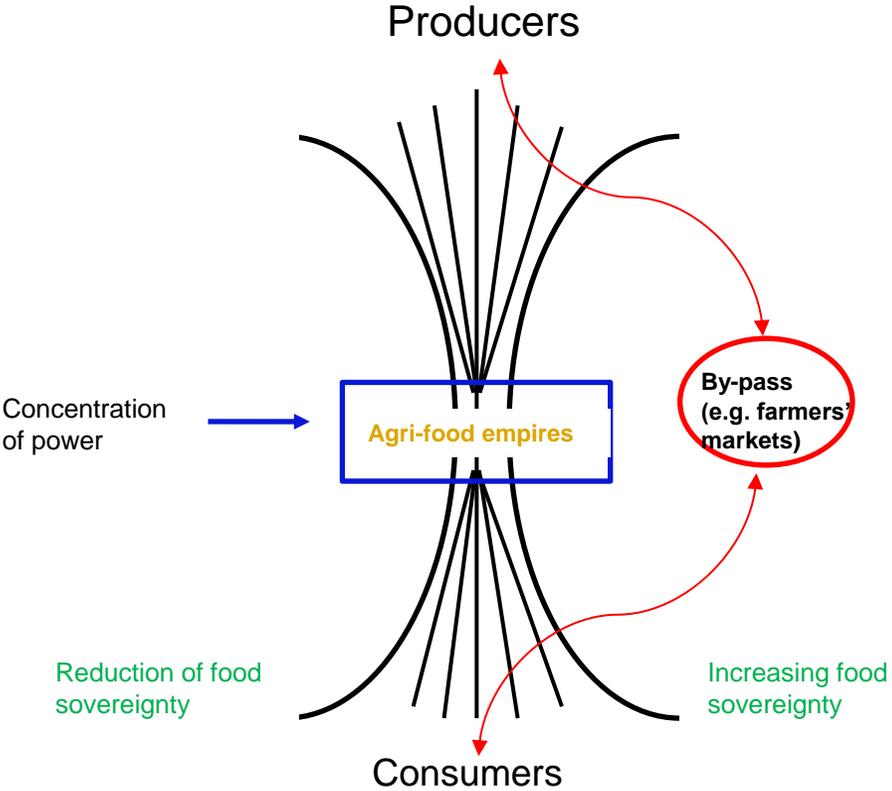


Image: Martin Egbert



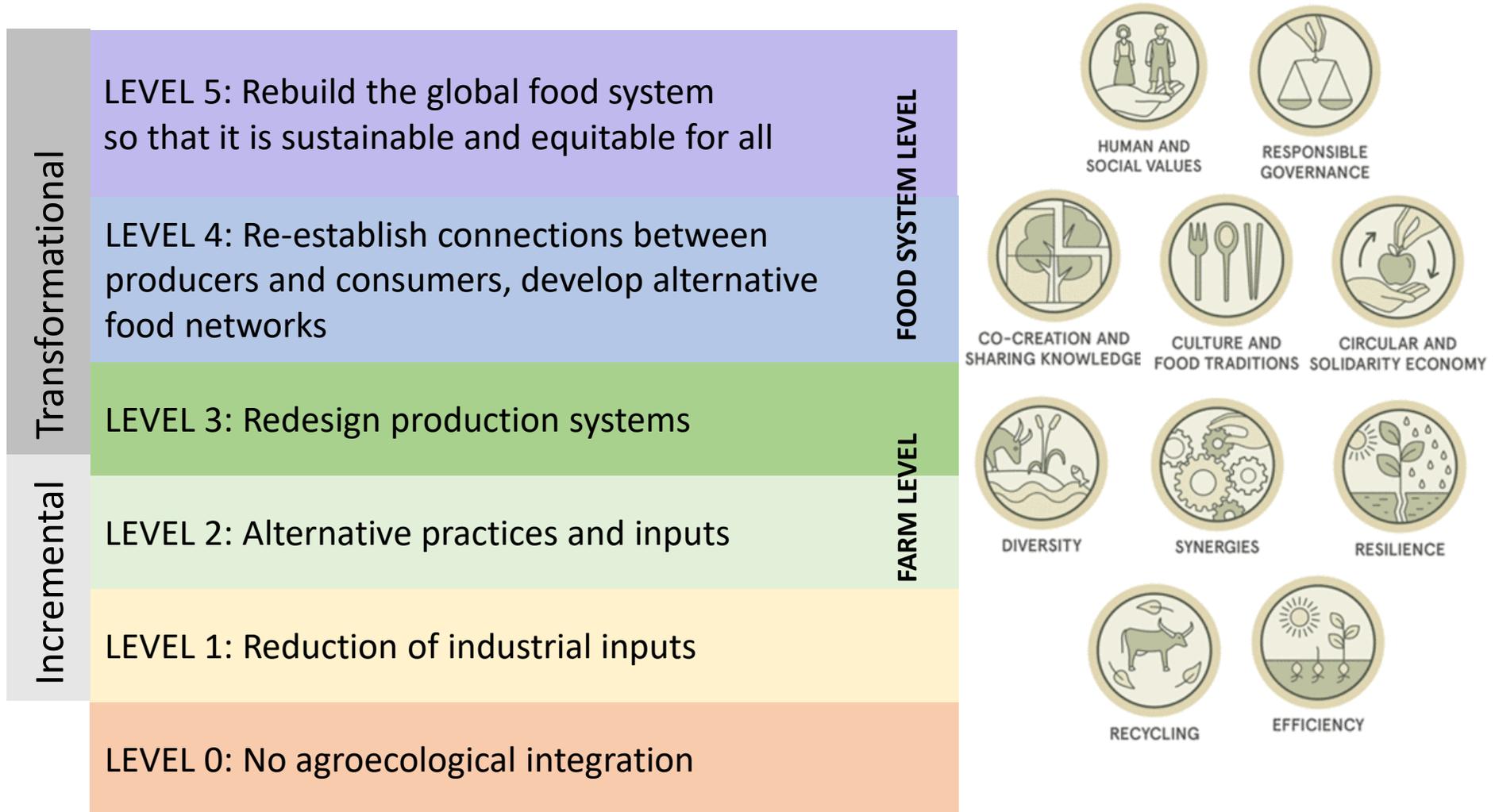
Onion harvest at the Valli Unite cooperative in Italy. Image: Cooperative Valli Unite

Core principle of agroecological transitions: connect producers and consumers through shorter/more direct food value chains



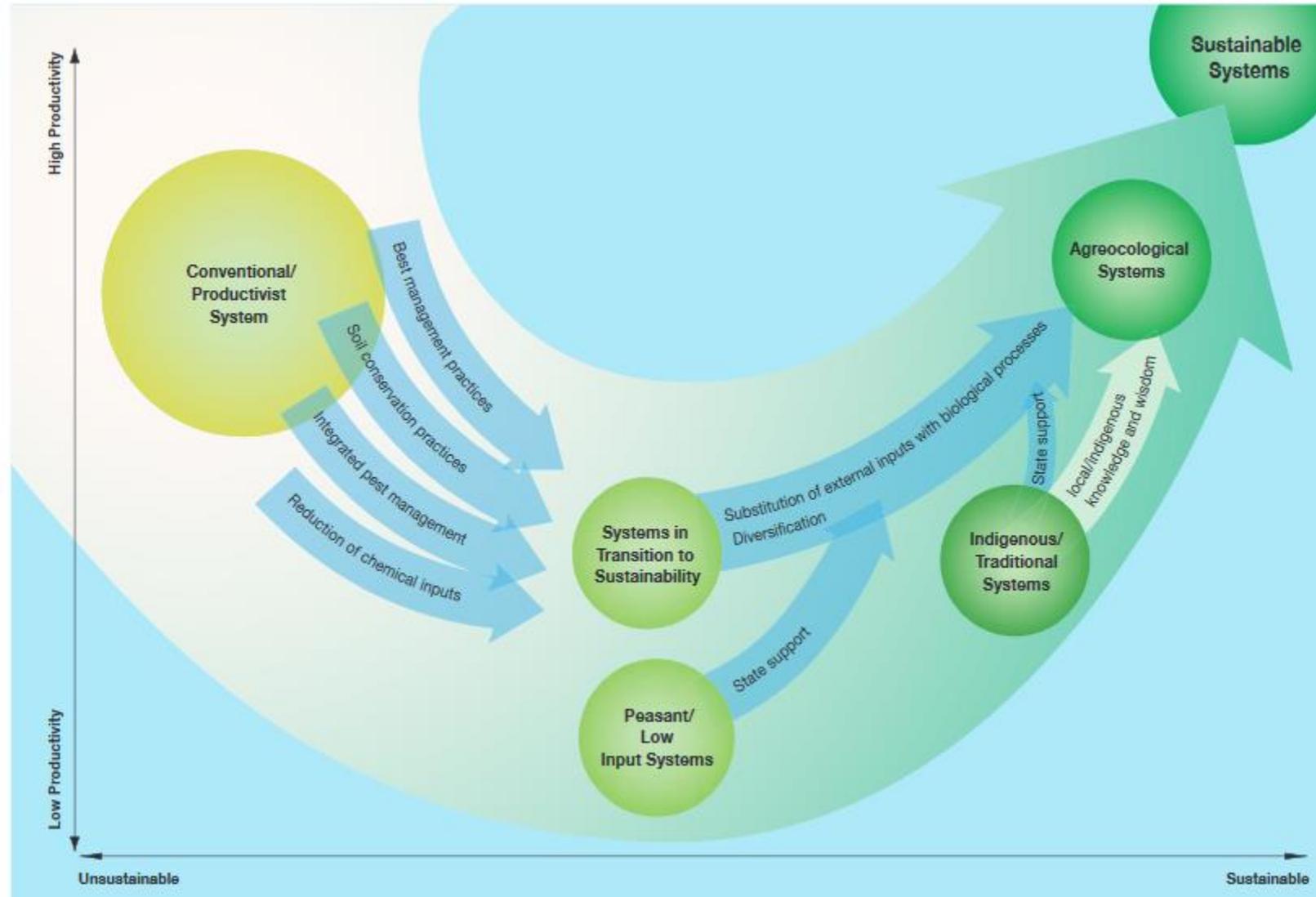
Van der Ploeg 2018: The New Peasantries: Struggles for Autonomy and Sustainability in an Era of Empire and Globalization. Routledge. Also: Loconto et al, 2018

# Agroecological transitions



# Transformation research: also in the Global North!

- **Science:** transformative, transdisciplinary and engaged
- **Practice:** Living and developing the alternatives
- **Movement:** demanding political support and change and co-create deliberative governance



Source: IAASTD 2009. Agriculture at a Crossroads. Synthesis Report.

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