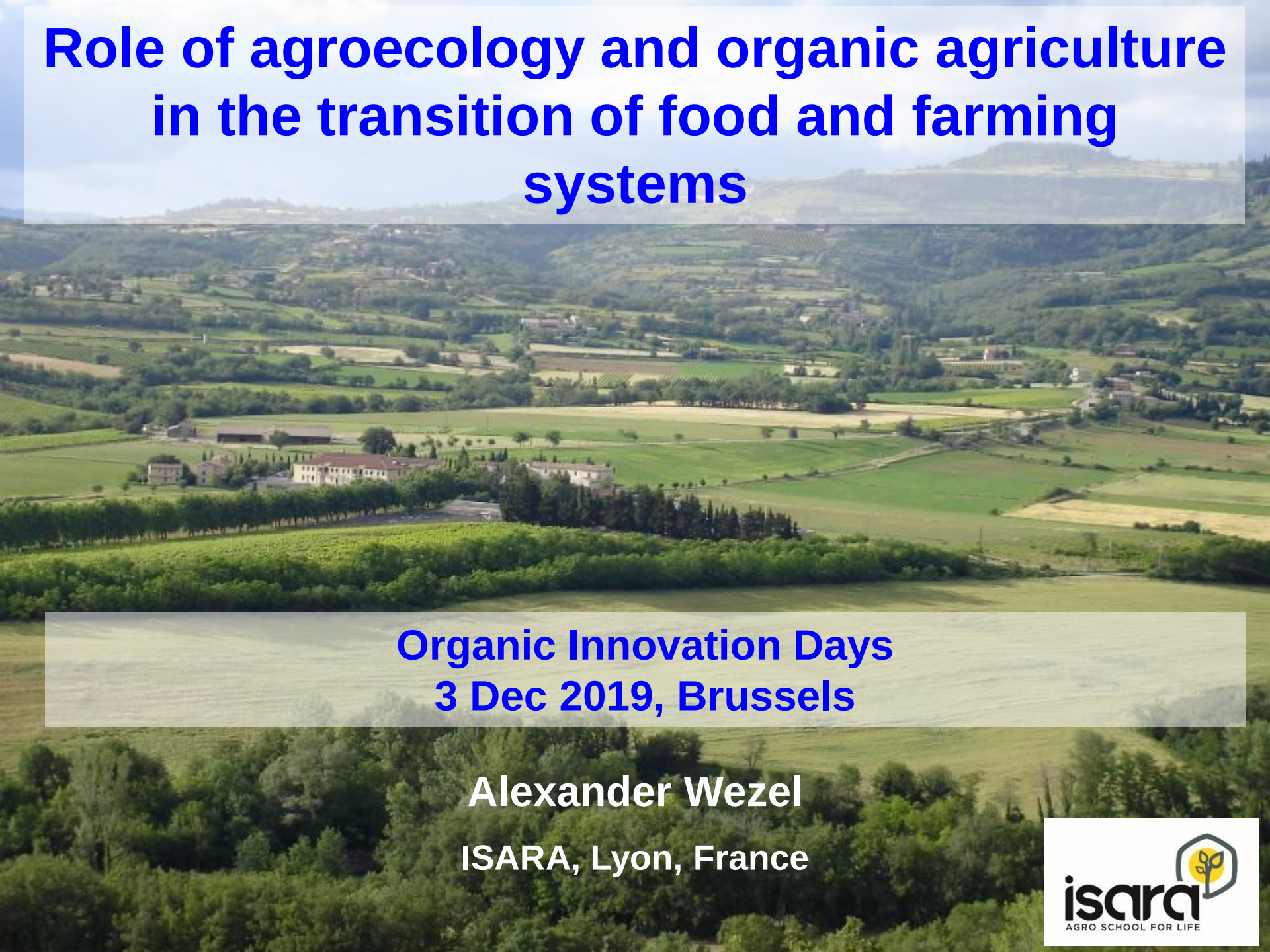
Role of agroecology and organic agriculture in the transition of food and farming systems



Organic Innovation Days
3 Dec 2019, Brussels

Alexander Wezel

ISARA, Lyon, France

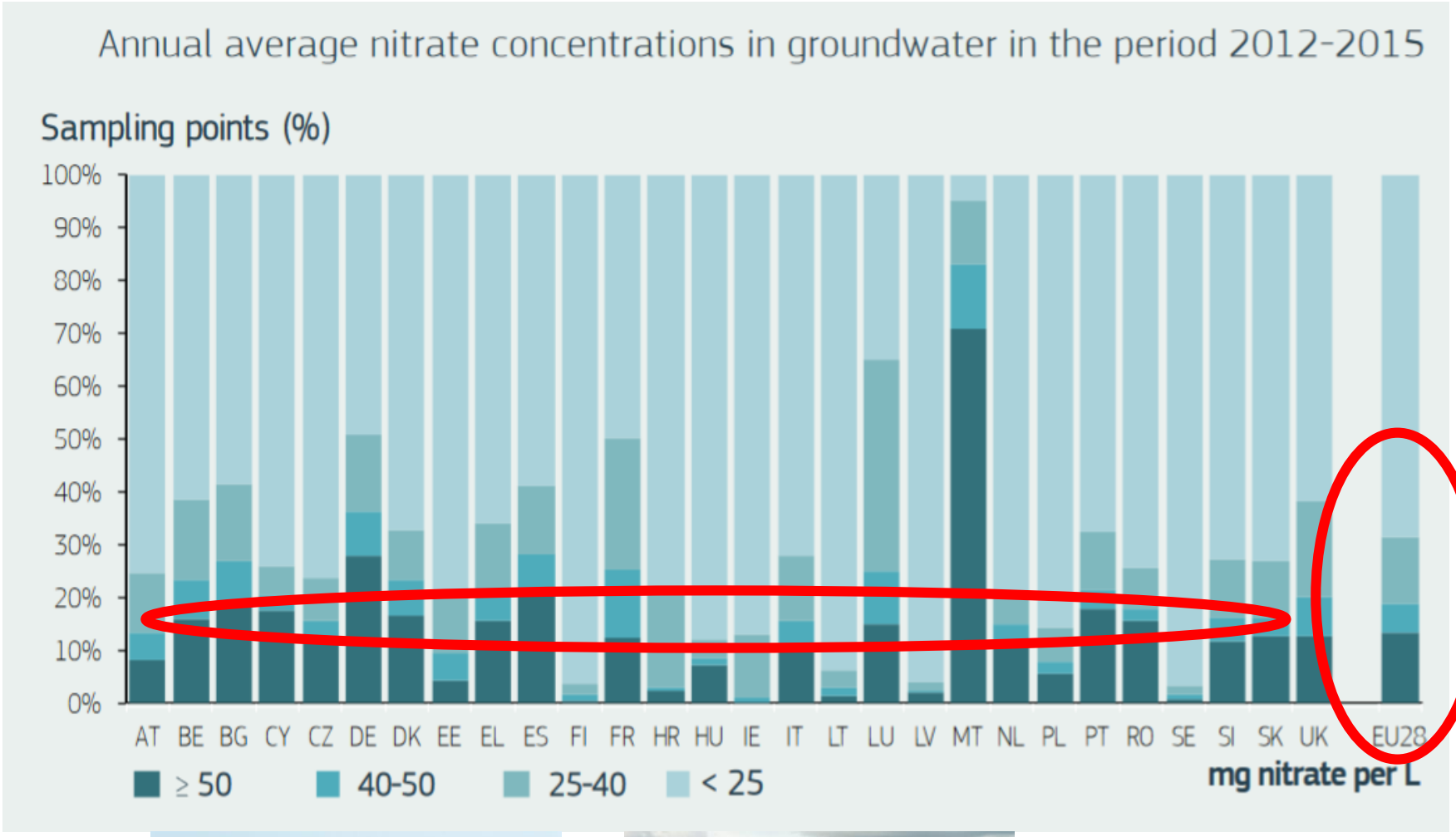
isara
AGRO SCHOOL FOR LIFE

Outline of talk

- **Challenges of today's agriculture and food systems**
- **Principles of Organic Agriculture and Agroecology**
- **Key issues in transition pathways to sustainable food systems supported by OA and AE**
- **Policies supporting OA and AE**
- **Conclusions**

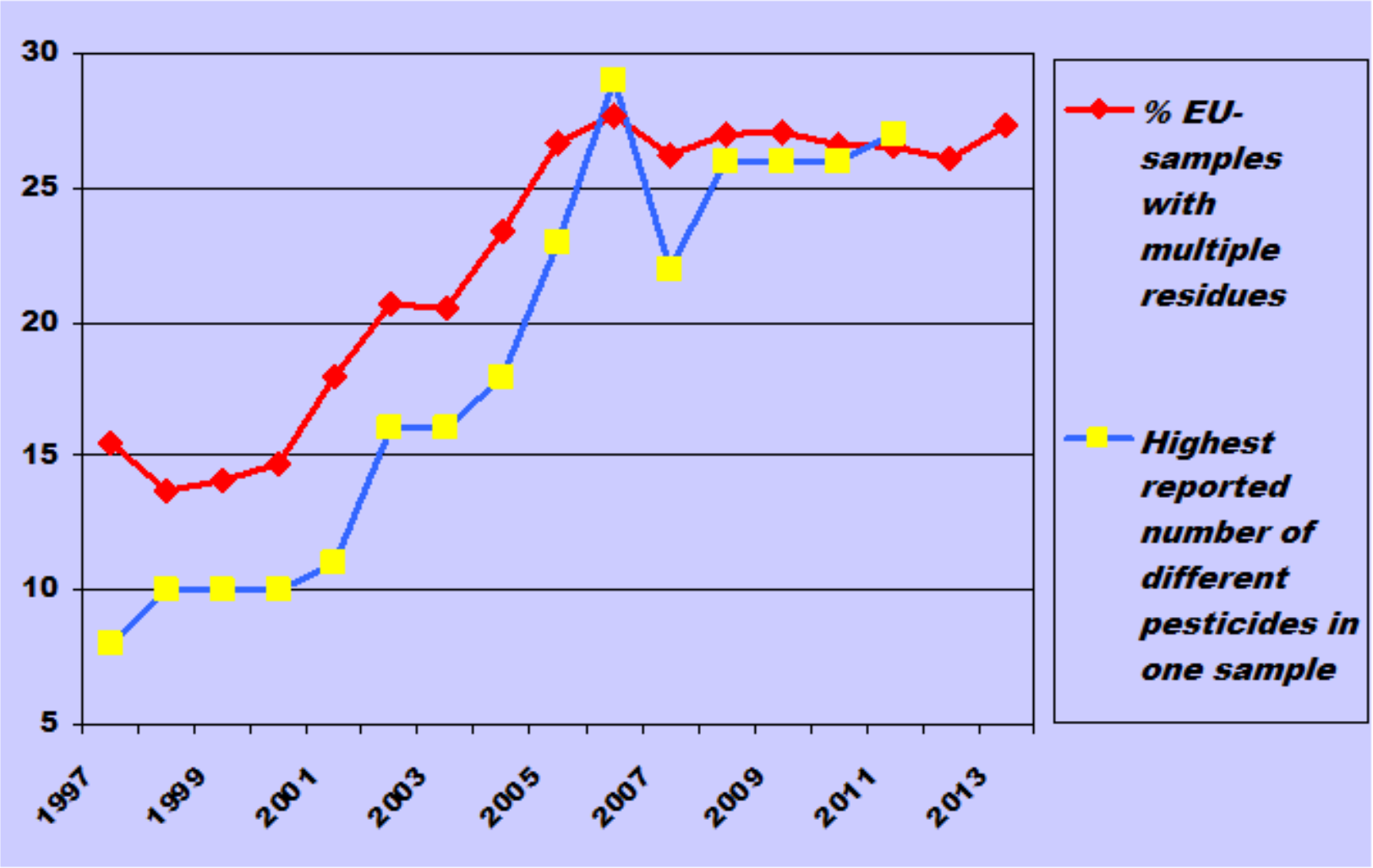
The challenges of today's agriculture and food systems

Agriculture and nitrate in groundwater



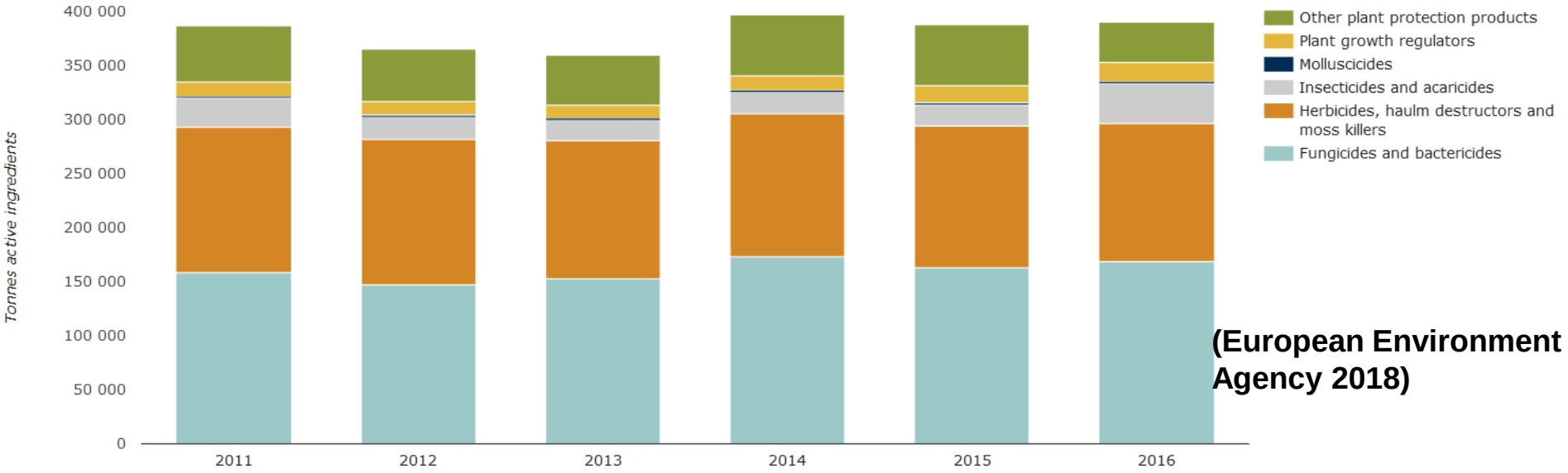
(European Commission 2018)

Fruits and vegetables in EU containing multiple pesticide residues

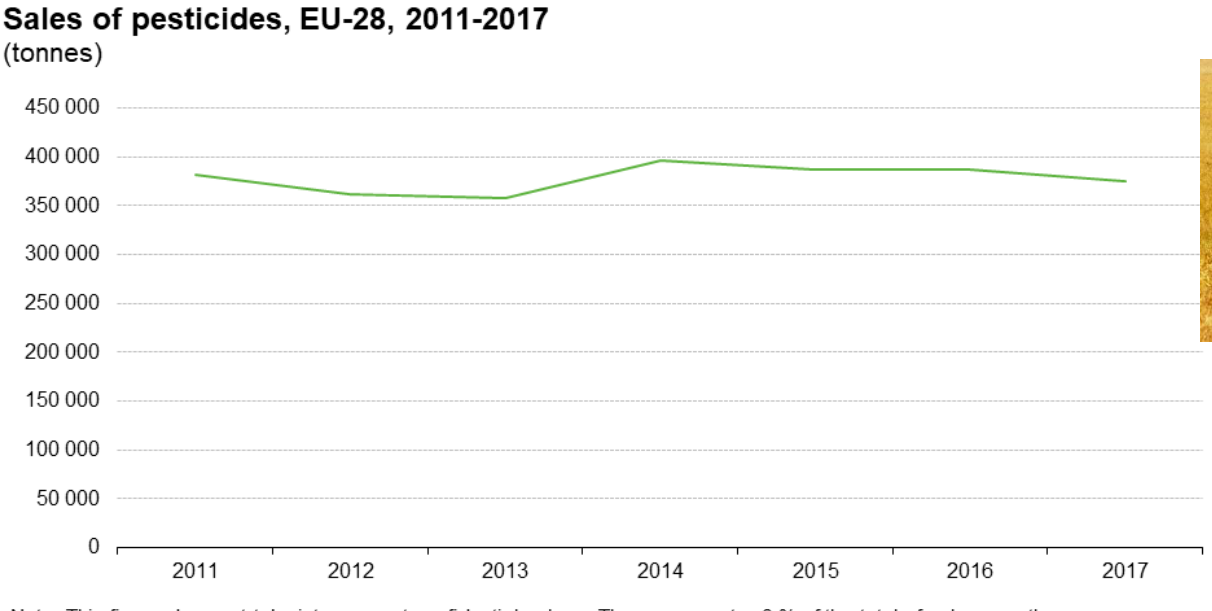


(PAN 2017)

Total pesticide sales in the EU

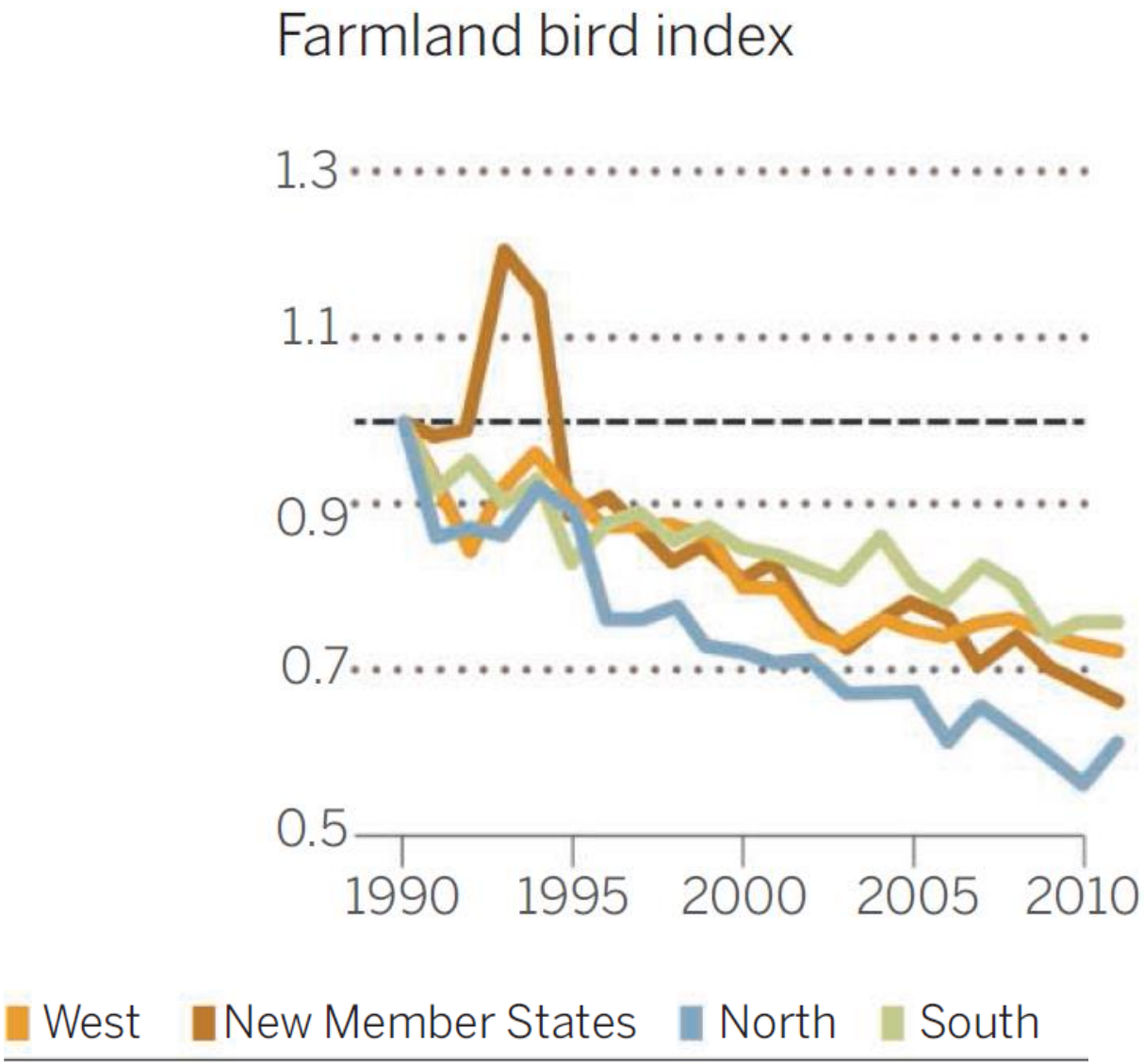


(European Environment Agency 2018)



(Eurostat 2019)

Decreasing Farmland bird index in the EU



(Pe'er et al. 2014)

Arthropod decline - 2019

of insect species, such as the Small Gold Grasshopper (Chrysochraon dispar), have significantly declined.
Fellendorf, Universität Ulm

RESEARCH NEWS | 30.10.2019 READING TIME: 3 MI

Causes of insect decline and biodiversity loss to be found at the landscape level

Insect decline more extensive than suspected

Compared to a decade ago, today the number of insect species on many areas has decreased by about one third. This is the result of a survey of an international research team led by scientists from the Technical University of Munich (TUM). The loss of species mainly affects grasslands in the vicinity of intensively farmed land – but also applies to forests and protected areas.

nature > articles > article

nature

Article | Published: 30 October 2019

Arthropod decline in grasslands and forests is associated with landscape-level drivers

Sebastian Seibold, Martin M. Gossner, Nadja K. Simons, Nico Blüthgen, Jörg Müller, Didem Ambarlı, Christian Ammer, Jürgen Bauhus, Markus Fischer, Jan C. Habel, Karl Eduard Linsenmair, Thomas Nauss, Caterina Penone, Daniel Prati, Peter Schall, Ernst-Detlef Schulze, Juliane Vogt, Stephan Wöllauer & Wolfgang W. Weisser

Nature **574**, 671–674(2019) | Cite this article

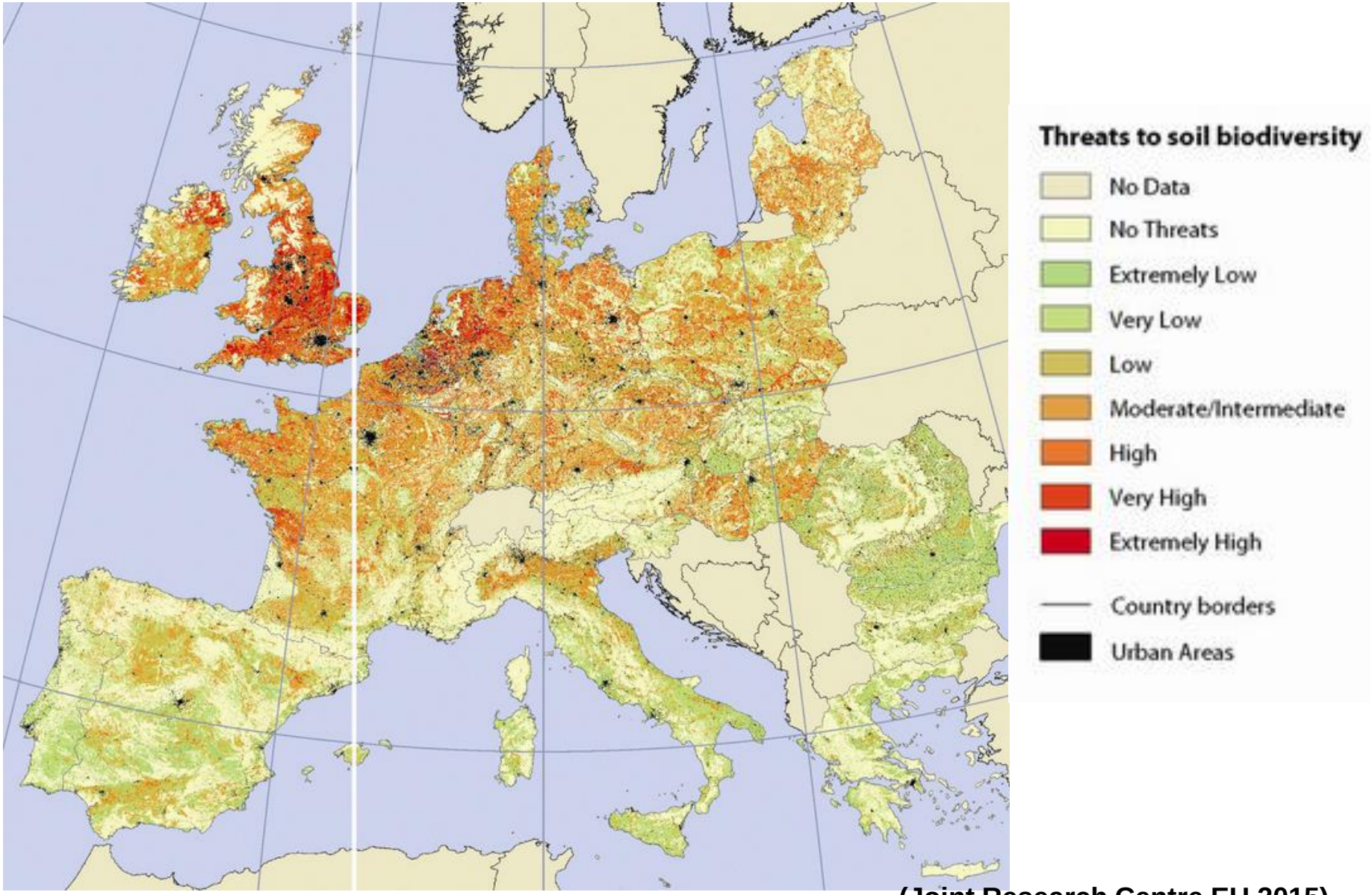
Abstract

Recent reports of local extinctions of arthropod species[1], and of massive

- **In grasslands, biomass, abundance and number of species declined by 67%, 78% and 34%, respectively.**
- **Loos of species mainly affected grasslands in landscapes with more intensively farmed land – but also applied to forest and protected areas.**

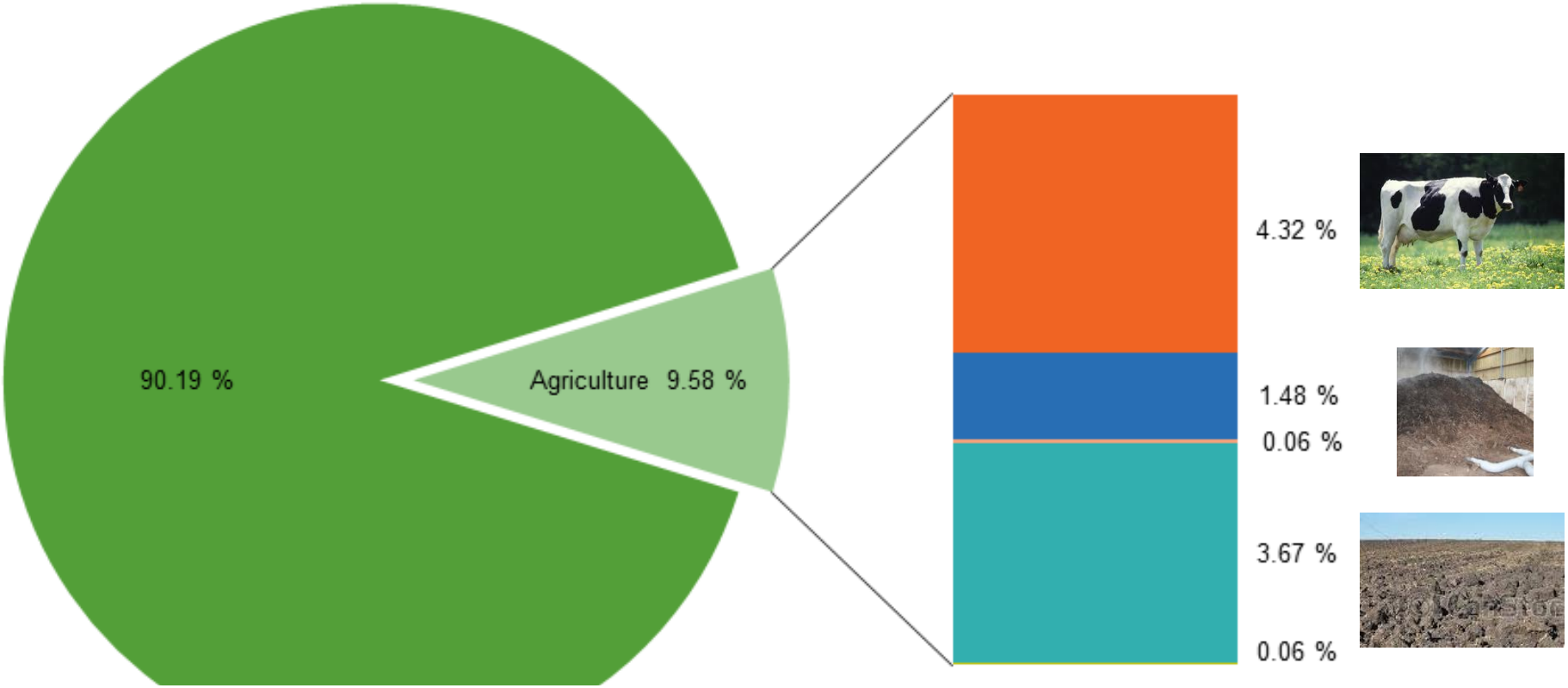
(Seibold et al. 2019)

Threats to soil biodiversity



(Joint Research Centre EU 2015)

EU agriculture impacts the climat

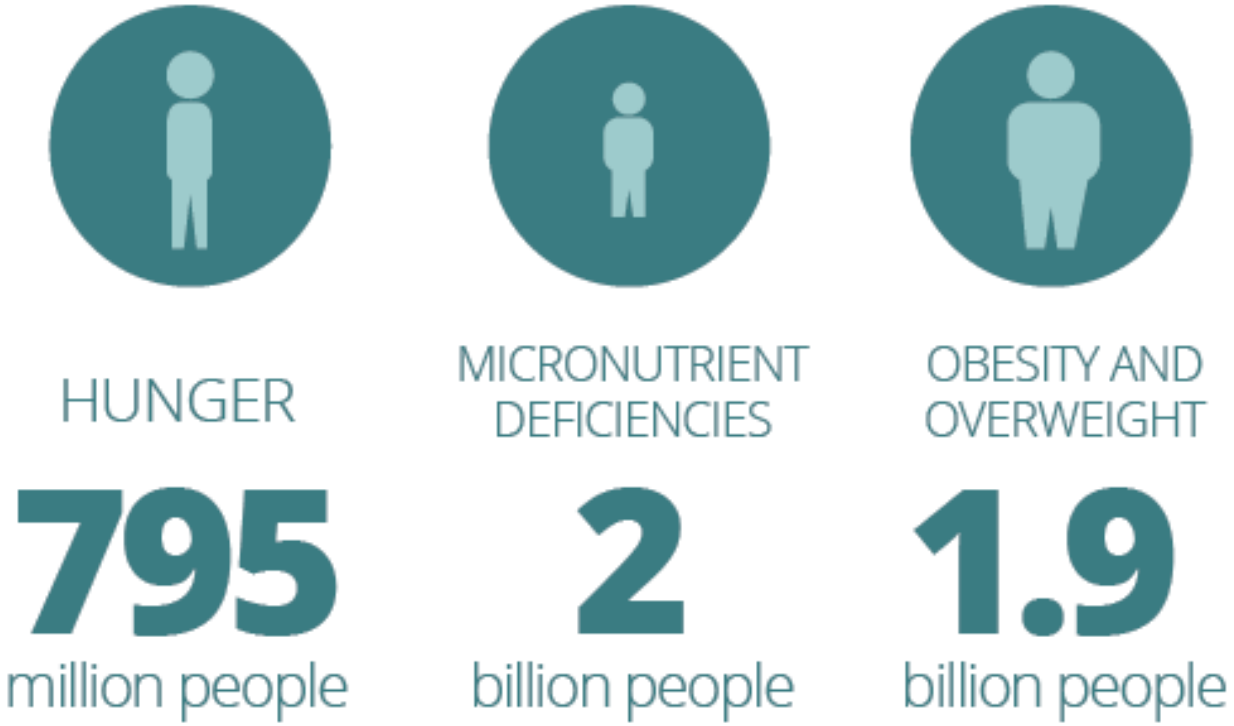


Mainly through two important GHG

- Methane (CH4) – processes in livestock digestion and stocking of manure
- Nitrous oxide (N2O) – organic and mineral fertilizers

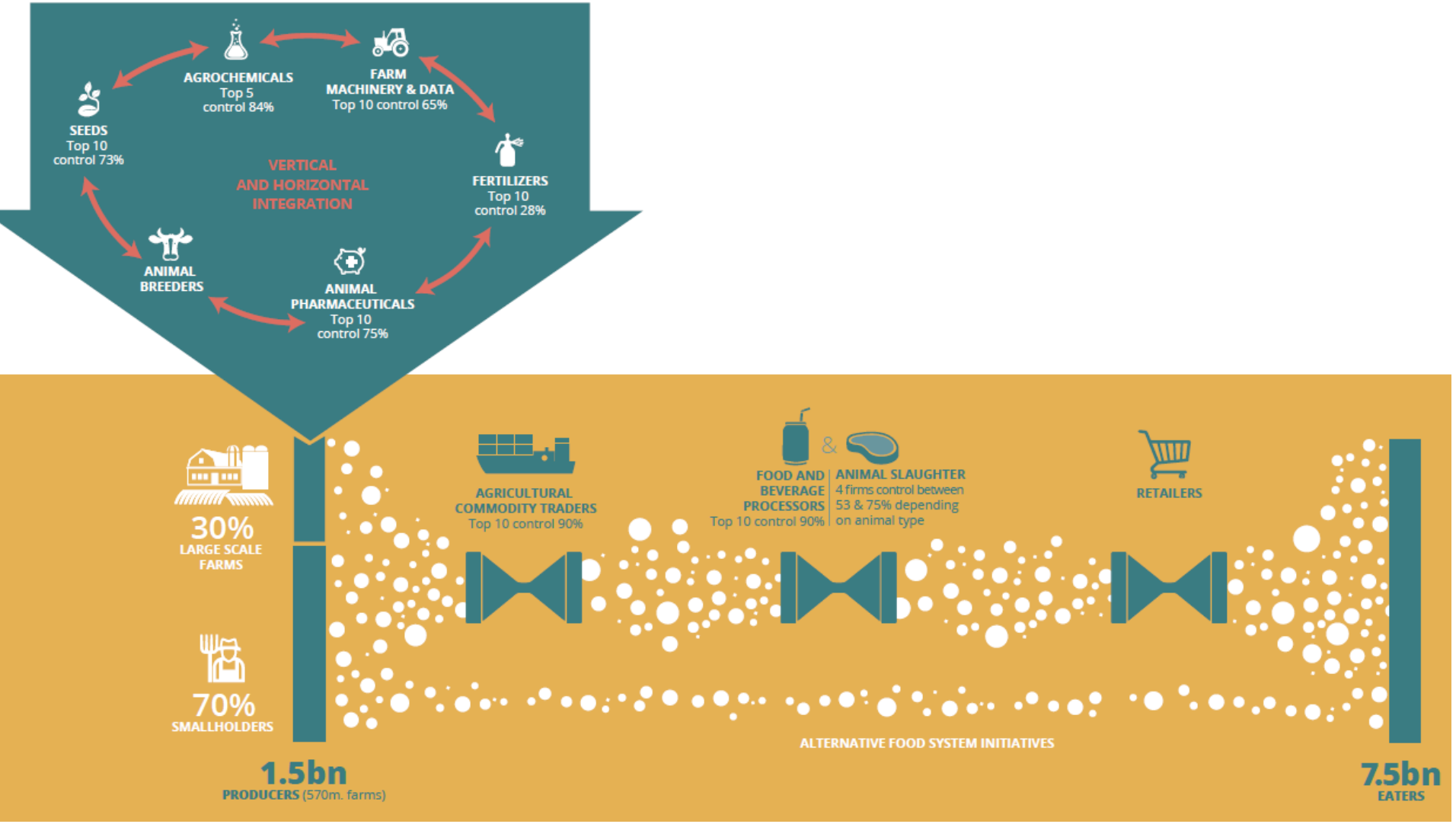
(EUROSTAT 2017: GHG emissions EU-28, 2015)

Key problems in global food systems



(IPES-Food 2016)

Concentration in the agri-food supply chain



(IPES-Food 2017)

Principles of organic agriculture and agroecology

Principles of organic agriculture

(from IFOAM 2014, EC 2007)

Principles of organic agriculture (**IFOAM**):

- **Health**: sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
- **Ecology**: OA should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
- **Fairness**: OA should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- **Care**: OA should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

(adapted from Migliorini and Wezel 2018, Agronomy for Sustainable Development)

Principles of organic agriculture

(from IFOAM 2014, EC 2007)

Principles of organic agriculture (**EU regulations**):

- Appropriate design and management of biological processes based on ecological systems using natural resources which are internal to the system.
- Restriction of the use of external inputs.
- Strict limitation of the use of chemically synthesised inputs to exceptional cases.
- Adaptation, where necessary, and within the framework of this Regulation, of the rules of organic production taking account of sanitary status, regional differences in climate and local conditions, stages of development and specific husbandry practices.

(adapted from Migliorini and Wezel 2018, Agronomy for Sustainable Development)

Agroecology principles

1. **Recycling.** Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass.

2. **Input reduction.** Reduce or eliminate dependency on purchased inputs.

3. **Soil heath.** Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and by enhancing soil biological activity.

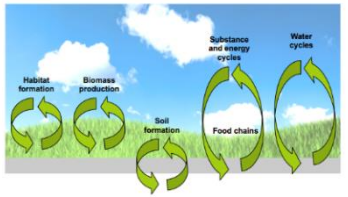
4. **Animal health.** Ensure animal health and welfare.

5. **Biodiversity.** Maintain and enhance diversity of species, functional diversity and genetic resources and maintain biodiversity in the agroecosystem over time and space at field, farm and landscape scales.

(HLPE 2019)

Agroecology principles

6. **Synergy.** Enhance positive ecological interaction, synergy, integration, and complementarity amongst the elements of agroecosystems (plants, animals, trees, soil, water).



7. **Economic diversification**. Diversify on-farm incomes by ensuring small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers.

8. **Co-creation of knowledge.** Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.

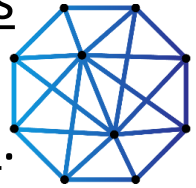
9. **Social values and diets.** Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets.

(HLPE 2019)

Agroecology principles

10. **Fairness.** Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights.

11. **Connectivity.** Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies.

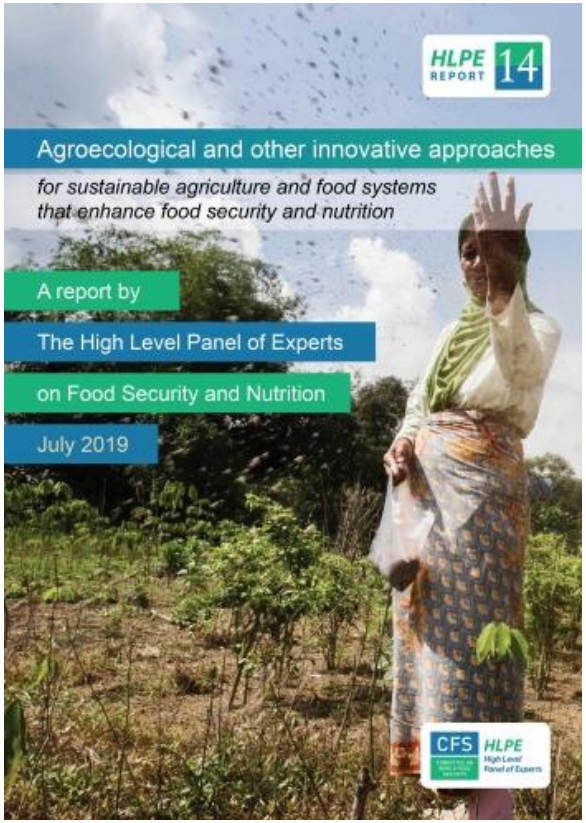


12. **Land and natural resource governance.** Recognize and support the needs and interests of family farmers, smallholders and peasant food producers as sustainable managers and guardians of natural and genetic resources.

13. **Participation.** Encourage social organization and greater participation in decision-making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems.

(HLPE 2019)

Agroecological approaches and other innovations for sustainable agriculture and food systems that enhance food security and nutrition



Committee on World Food Security (CFS), HLPE (High Level Panel of Experts) report

(HLPE 2019)

Comparison of different innovative approaches

Characteristic	Agroecological and related approaches					Sustainable intensification and related approaches			
	Agroecology	Organic Agriculture	Agroforestry	Permaculture	Food sovereignty	Sustainable intensifica-tion	Climate smart agriculture	Nutrition sensitive agriculture	Sustainable food value chains
Resource efficiency									
Regenerative production, recycling and efficiency								No evidence	No evidence
Biodiversity, synergy and integration									
Resilience									
Economic diversification versus specialisation									
Climate adaptation and mitigation									
Social equity/responsibility									
Knowledge generation and technology transfer									
Human and social values: Equity									
Human and social values: Labour versus capital intensification									
Connectivity (value chains/circular economies) versus globalization									
Governance: rights, democratization and participation									

Characteristic	Spectrum of values for each characteristic between two polar opposites
Regenerative production, recycling and efficiency	**Pole 1:** Eliminate external inputs, rely on only natural processes and have closed resource cycles
	Intermediate 1: Minimize purchased inputs, favour natural processes and try to close resource cycles
	Intermediate 2: Deliberately use purchased inputs to make efficient use of natural processes and resource cycles
	Pole 2: Use purchased inputs to intensify production per unit land while keeping leakage to a minimum

(HLPE 2019)

Key issues in transition pathways to sustainable food systems supported by OA and AE

Food system transformation level and principles

Transformational

Incremental

Food system

Agroecosystem

Level 5: Build a **new global food system**, based on participation, localness, fairness, and justice

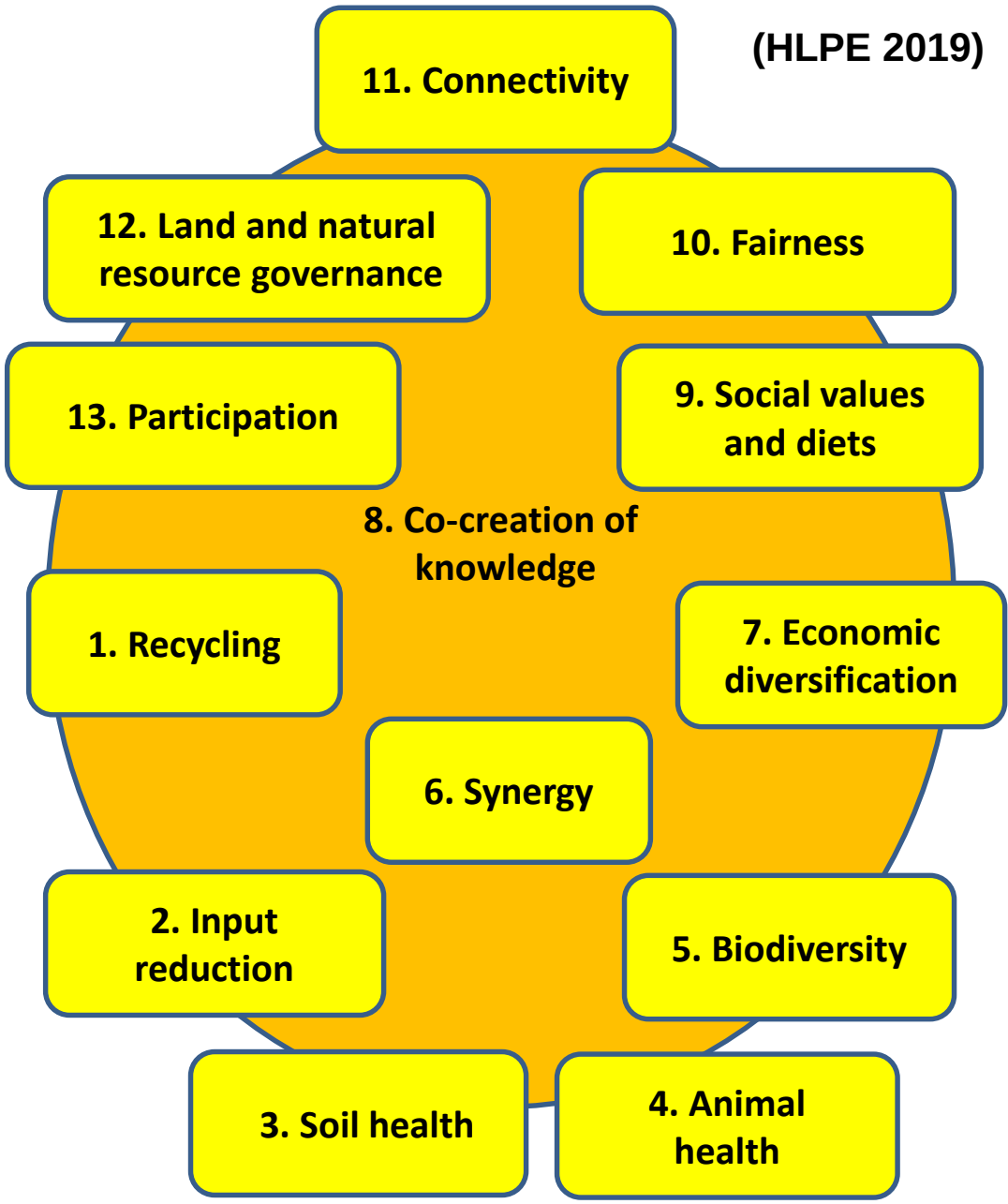
Level 4: **Reconnecting** the two most important parts of the food system - consumers and producers, through the development of alternative food networks

Level 3: **Redesign** the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resistance

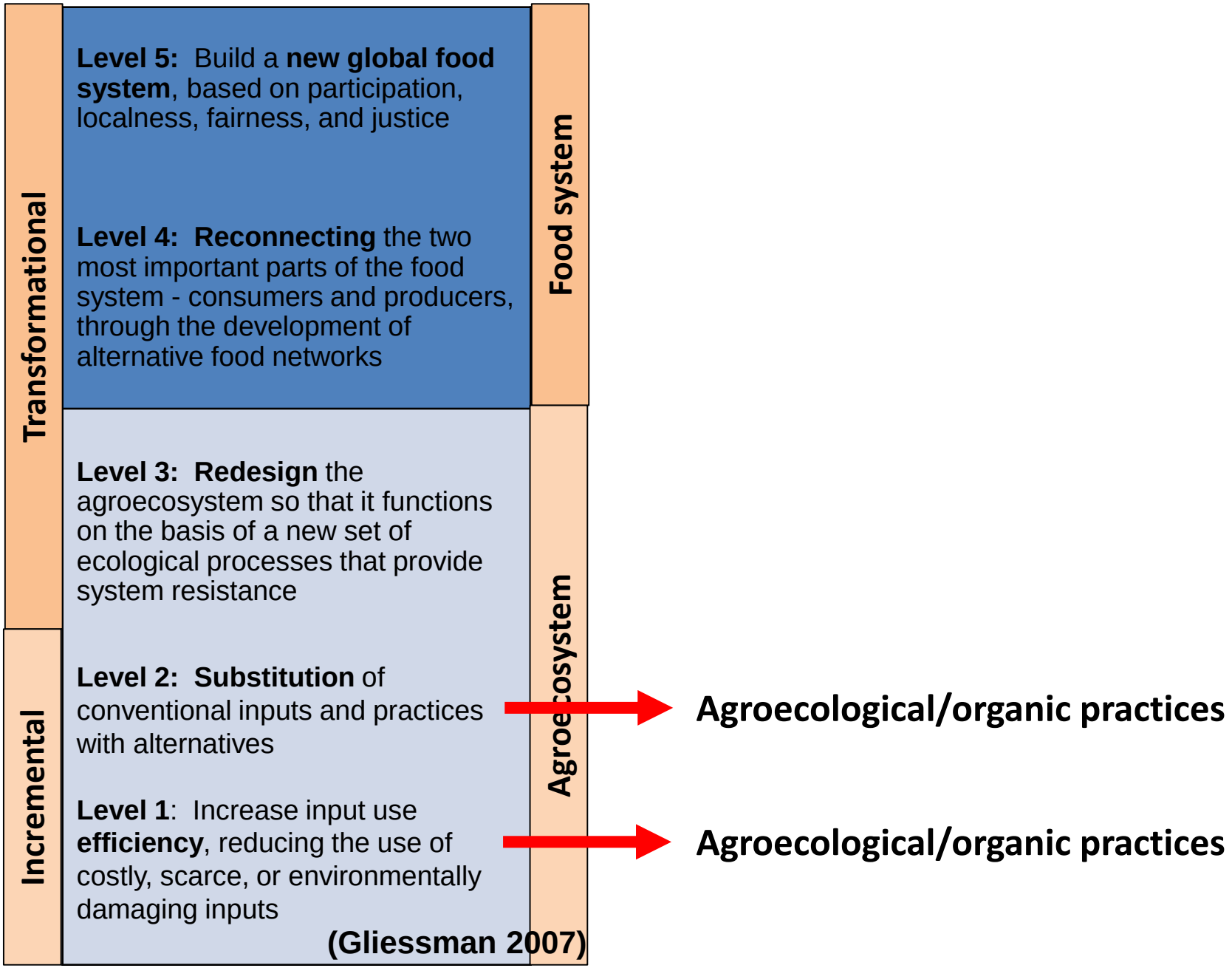
Level 2: **Substitution** of conventional inputs and practices with alternatives

Level 1: Increase input use **efficiency**, reducing the use of costly, scarce, or environmentally damaging inputs

(Gliessman 2007)



Food system transformation level and transition pathways



Agroecological cropping practices

Scale of application of agroecological practice

Landscape scale

Management of landscape elements
Integration of semi-natural landscape elements at field, farm, and landscape scales

Cropping system scale

Crop choice, spatial distribution, and temporal succession
Agroforestry, Intercropping and relay intercropping, Diversified rotations, Cultivar choice

Weed, pest, and disease management
Natural pesticides, Biological pest control, Allelopathic plants

Field scale

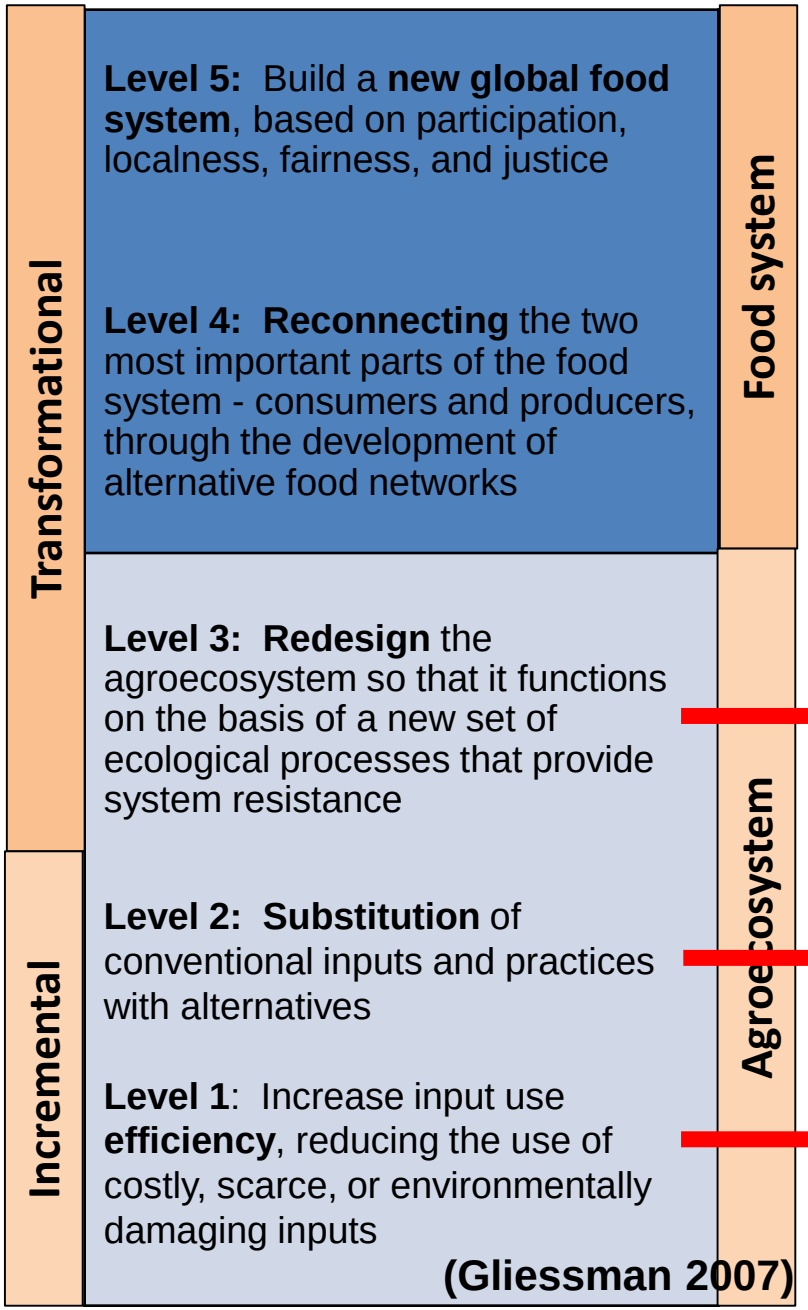
Tillage management
Direct seeding into living cover crops or mulch, Reduced tillage

Crop fertilisation
Split fertilisation, Organic fertilisation, Biofertilizer

Crop irrigation
Drip irrigation

(Wezel et al. 2014, Agronomy for Sustainable Development)

Food system transformation level and transition pathways



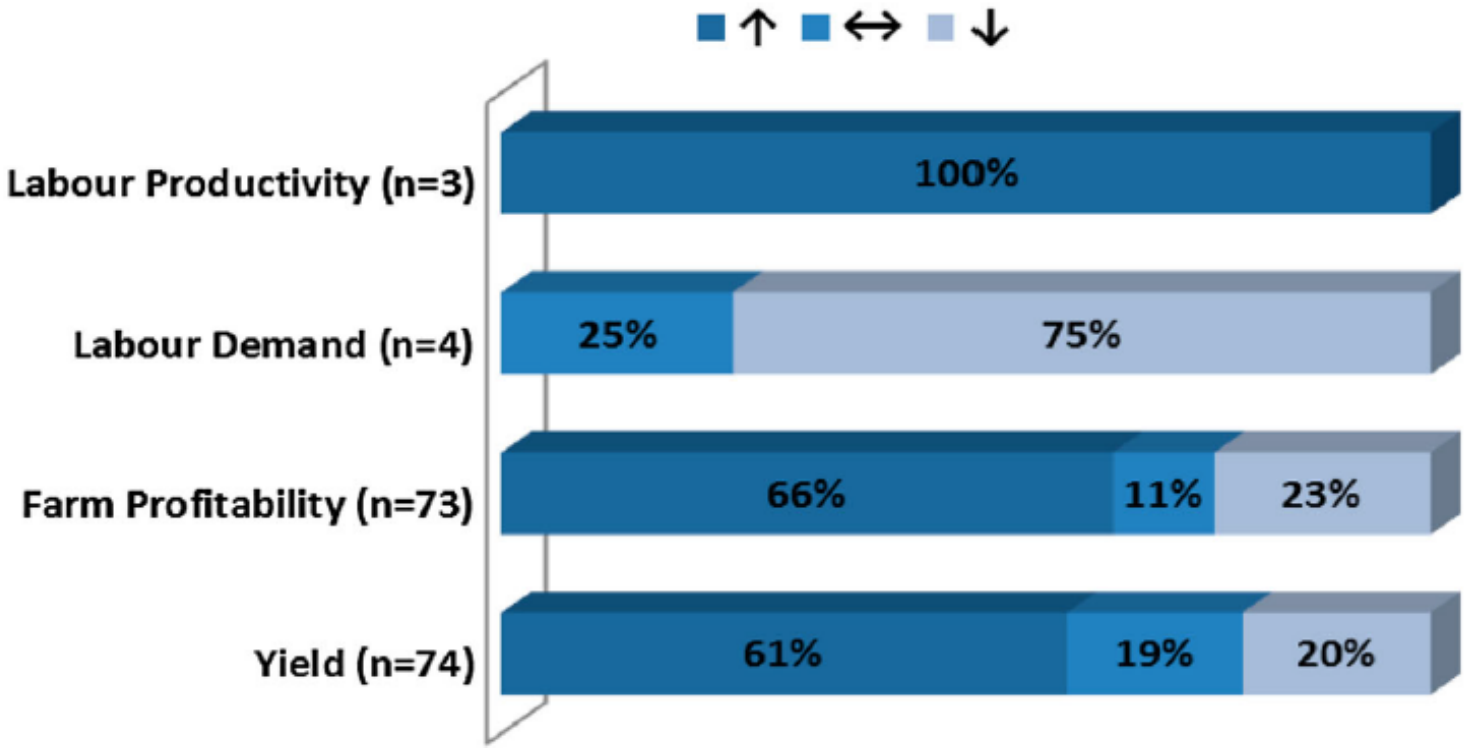
Conversion to organic agriculture, AE practices (no till, diversified rotations, agroforestry, biological pest control, intercropping)

Agroecological/organic practices

Agroecological/organic practices

Economic performance of agroecology

Effects of adopting agroecological practices on socio-economic indicators



(D'Annolfo et al. 2017)

Economic performance of agroecology

Journal of Rural Studies xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Rural Studies

journal homepage: www.elsevier.com/locate/jrurstud

The economic potential of agroecology: Empirical evidence from Europe

Jan Douwe van der Ploeg[a,*], Dominique Barjolle[b], Janneke Bruil[c], Gianluca Brunori[d], Livia Maria Costa Madureira[e], Joost Dessein[f], Zbigniew Drąg[g], Andrea Fink-Kessler[h], Pierre Gasselin[i], Manuel Gonzalez de Molina[j], Krzysztof Gorlach[g], Karin Jürgens[k], Jim Kinsella[l], James Kirwan[m], Karlheinz Knickel[n], Veronique Lucas[o], Terry Marsden[p], Damian Maye[m], Paola Migliorini[q], Pierluigi Milone[r], Egon Noe[s], Piotr Nowak[g], Nicholas Parrott[t], Alain Peeters[u], Adanella Rossi[d], Markus Schermer[v], Flaminia Ventura[r], Marjolein Visser[w], Alexander Wezel[x,1]

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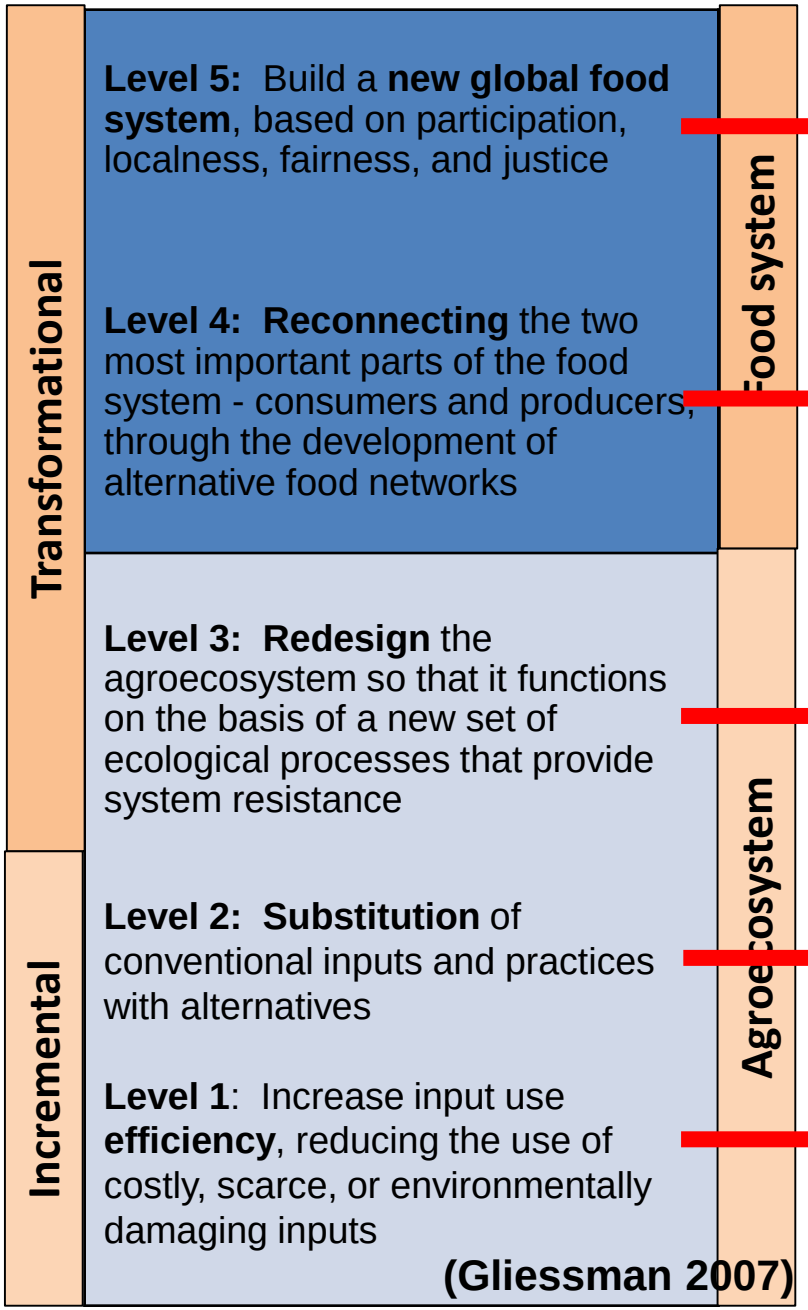
[h] Büro für Agrar- und Regionalentwicklung, Kassel, Germany

(van der Ploeg et al. 2019)

Food system transformation level and transition pathways



Fair trade agreements and markets, non-power concentrations in agri-food sector, circular economy

Short supply chains, value-based supply chains, alternative food systems and local/regional markets systems

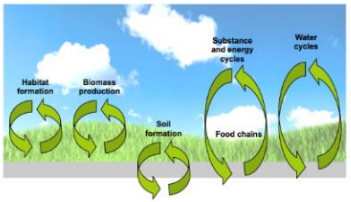
Conversion to organic agriculture, AE practices (no till, diversified rotations, agroforestry, biological pest control, intercropping)

Agroecological/organic practices

Agroecological/organic practices

Recommendations to support transition to diversified and resilient food systems

- Promote agroecological and other innovative approaches by improving resource efficiency, strengthening resilience and securing social equity/responsibility.



- Use relevant performance metrics for food systems that consider all environmental, social and economic impacts of food production and consumption;

- Improve the ecological footprint of food systems as an operational principle for transitioning to SFSs;

- Redirecting subsidies and incentives that at present benefit unsustainable practices;

OA and AE

(selected from IPES-Food 2016, HLPE 2019)

Recommendations to support transition to diversified and resilient food systems

- Shift public support towards diversified and resilient production systems that preserve and enhance biodiversity, as well as the natural resource base


- Strengthening regulations on the use of chemicals harmful for human health and the environment
  → promoting alternatives to their use and rewarding practices that produce without them;

- Mainstream agroecology and holistic food systems approach in education, research and public awareness building


OA and AE

(selected from IPES-Food 2016, HLPE 2019)

Recommendations to support transition to diversified and resilient food systems

- Enlarge appropriate food labelling and certification

- Use public procurement to support local agroecological produce

- Support short supply chains and alternative retail infrastructure

- Provide greater processing and handling capacities for fresh products from small/medium-sized farmers through supporting the development of local/regional markets, processing hubs and transportation infrastructures.

OA and AE

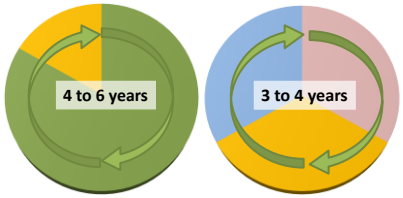
(selected from IPES-Food 2016, HLPE 2019)

Some policies supporting organic agriculture and agroecology

Policies in Europe supporting a transition to agroecological practices and farming systems

Greening in the CAP

- Maintaining permanent grasslands
- Crop diversification
- Ecological focus areas



Rural development - second pillar

- Agri-environment measures/schemes
- Organic Agriculture

(European Commission 2014)

Other policies

- **Agroecology Project in France, 2012**

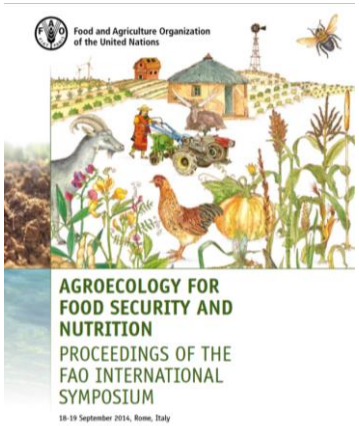
  → Law for agroecology in 2014

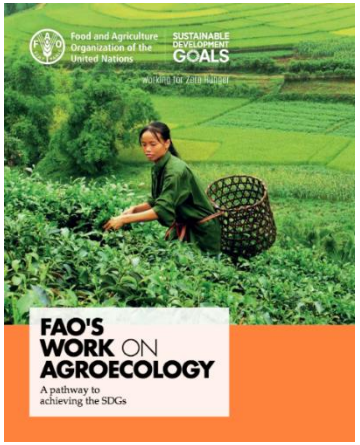
http://agriculture.gouv.fr/sites/minagri/

- **FAO and agroecology**

International Symposia 2014-2018

Scaling up agroecology





Scaling up agroecology – Sikkim, India

THE SIKKIM ORGANIC MISSION

WINNER OF THE 2018 FUTURE POLICY AWARD

CONSTRAINTS

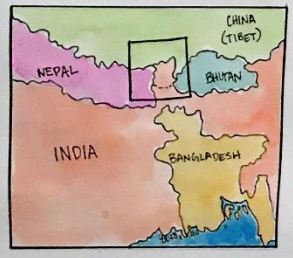
- LOWER YIELDS DUE TO PEST PROBLEMS FOR MANY FARMERS
- DEPENDENCY ON GOVERNMENT AID FOR BIO-INPUTS
- PREMIUMS FOR FARMERS ARE MINIMAL, MARKET PRICES DROPPED
- LOW DOMESTIC DEMAND FOR ORGANIC, CHEAPER CONVENTIONAL PRODUCTS STILL IMPORTED AND CONSUMED

BENEFITS

- >50% INCREASE IN TOURISM
- DISSEMINATION OF TRADITIONAL KNOWLEDGE AND SKILLS
- PROPAGATION OF LOCAL VARIETIES, PRESERVING GENETIC DIVERSITY OF CROP SPECIES
- LESS SOIL/WATER POLLUTION, HEALTHIER AGROECOSYSTEMS

BACKGROUND

WHERE IS SIKKIM?



SIKKIM IS A SMALL INDIAN STATE WITHIN THE INNER RANGES OF THE HIMALAYA. COMPRISING OF JUST 7,096 SQ KM, SIKKIM HAS A WIDE RANGE OF ECO/CLIMATIC CONDITIONS, HIGH LEVELS OF INTER/INTRA SPECIES DIVERSITY, AND NUMEROUS ETHNIC GROUPS WITH VARIED CULTURAL TRADITIONS.

AGRICULTURE IN SIKKIM

- RUGGED TERRAIN WITH STEEP ELEVATION GRADIENTS – VARIED AGRO-CLIMATIC ZONES RANGING FROM 300-5000m ASL
- TRADITIONAL INTEGRATED FARMING SYSTEMS WITH HIGH AGRO-DIVERSITY
- 60% OF THE POPULATION PARTICIPATES IN SUBSISTENCE FARMING, 65% RELY ON AGRICULTURE FOR LIVELIHOOD
- MAIN CASH CROPS: LARGE CARDAMOM, MANDARIN, GINGER
- TYPES OF LAND USE INCLUDE: TERRACED SLOPES, AGROFORESTRY, FLAT DRY FIELDS, RIVERSIDE RICE PADDY, TRANS-HIMALAYAN NOMADIC AGRO-PASTORAL SYSTEMS

2003 → SIKKIM DISCOURAGES USE OF CHEMICAL FERTILIZERS, REDUCING FERTILIZER SUBSIDIES BY 10% PER YEAR

2009 → 8,000 HA OF LAND IS CERTIFIED ORGANIC, ESTABLISHMENT OF BIO-FERTILIZER PRODUCTION UNITS AND VERMICULTURE HATCHERIES ACROSS THE STATE

2010 → THE "SIKKIM ORGANIC MISSION" IS LAUNCHED TO FACILITATE THE CONVERSION OF SIKKIM INTO A 100% ORGANIC STATE

2011 → FARMERS PROVIDED WITH SEEDS, MANURE, AND TRAINING GREEN HOUSES ESTABLISHED FOR LOCAL SEED PRODUCTION

2013 → SYNTHETIC FERTILIZERS/PESTICIDES BANNED ORGANIC FARMING INCLUDED IN SCHOOL CURRICULUM

2016 → SIKKIM IS FORMALLY DECLARED A 100% ORGANIC STATE

KEY POINTS

WHY?

SIKKIM'S FRAGILE MOUNTAIN ECOSYSTEM IS VULNERABLE TO CLIMATE CHANGE, THE EFFECTS OF WHICH ARE AMPLIFIED BY POOR SOIL MAINTENANCE AND LOSS OF BIODIVERSITY FROM CHEMICAL PESTICIDES. HOWEVER, AS ONLY 12% OF THE TOTAL LAND AREA CAN BE CULTIVATED, MOSTLY UNDER UN-MECHANIZED MANAGEMENT DUE TO STEEP SLOPES, SIKKIM HAS AN INHERENT ADVANTAGE IN CONVERTING TO 100% ORGANIC.

HOW?

1) PROMOTION OF ON-FARM PRODUCTION OF ORGANIC FERTILIZER, DISCOURAGE CHEMICAL INPUT USE
2) LARGE-SCALE ORGANIC FARMING TRAINING PROGRAMS, SUBSIDIZE ORGANIC INPUTS
3) ESTABLISHMENT OF SOIL TESTING LABORATORIES, ORGANIC INPUT PRODUCTION UNITS, RESEARCH CENTERS
4) INTERNAL CONTROL SYSTEM DEVELOPMENT TO FACILITATE CERTIFICATION PROCESSES
5) MARKET LINKAGE DEVELOPMENT, VALUE CHAIN RESEARCH, BRANDING WITH LOGO

FUTURE DIRECTIONS...

- "BUY LOCAL" INITIATIVES TO IMPROVE DOMESTIC MARKET
- MORE GOVERNMENT SUPPORT FOR ON-FARM INPUT PRODUCTION
- REGULAR IMPACT ANALYSIS: CAN SIKKIM BE AN EXAMPLE?

REFERENCES:

1. STATE POLICY ON ORGANIC FARMING (2016). GOVERNMENT OF SIKKIM [online]
2. Pauli, J. (2018). Four New Strategies to Grow The Organic Agriculture Sector. AGROFOR, 2(3). pp. 61-70
3. Taneja, S. (2017) Sikkim is 100% Organic! Take a Second Look. Downtoearth.org [online]

EMILIE VANSANT 30/11/2018

Future Policies - Silver Awards

Brazil's National Policy for Agroecology and Organic Production (PNAPO, 2012)

E.g., helped 5,300 municipalities to invest 30% or more of their school feeding budgets in organic and agroecological products purchased from family farmers.

Quito's Participatory Urban Agriculture Programme AGRUPAR (2002), Ecuador

Its participants produce now more than 870,000 kg of food products per year for the city and more than 6,600 bio-fairs have been organized so far.

Denmark's Organic Action Plan "Working together for more organics" (2011-2020)

Doubled organic farm land compared to 2007. The city of Copenhagen have 90% organic food in public kitchens since 2015, without an increase in meal prices.

Conclusions

- **Strong need to support transitions to diversified and resilient agricultural and food systems**
- **A broad diversity of agroecological practices exists, but for some a high level of systems change might be necessary**
- **Support short(er) supply chains and alternative food systems, and address power dynamics in food system**
- **Food system should be assessed holistically, and specifically with ecological and social metrics**
- **Some first policies for agroecology, but framework needed facilitating and supporting transition to SFS**

Thank you for your attention

Alexander Wezel

ISARA, Lyon, France

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AGRO SCHOOL FOR LIFE