

Forschungsinstitut für biologischen Landbau FiBL info.suisse@fibl.org, www.fibl.org





Research on organic agriculture and other agroecological approaches in view of the SDG's

Urs Niggli

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Content*

- Organic agriculture as part of the agroecology strategy.
- Shortfalls of research activities organic agriculture/agroecology.
- Ways forward.
- Conclusions.



Organic agriculture as part of the agroecology strategy



"While sustainable intensification is generally loosely defined, so that almost any model or technology can be labeled under it, ecological intensification proposes landscape approaches that make smart use of the natural functionalities that ecosystems offer. The aim is to design multifunctional agroecosystems that are both sustained by nature and sustainable in their nature." (Tittonell, 2014)

Relevance of organic farming: Organic farmland in 2017



In Oceania there were 35.9 Mio ha, in Europe 14.6 Mio ha, and in Latin America 8 Mio ha.



Distribution of organic agricultural land by region 2017

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Global markets: 90 billion €

Increasing trade from low income to high income countries.





14 countries have 10% or more of their agricultural land under organic management.



Top 5 countries with more than 10 percent of organic agricultural land 2017



In 2017, over 11.7 million hectares more were reported compared with 2016.



Growth of the organic agricultural land 1999-2017

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Shortfalls of research activities organic agriculture/agroecology.

Productivity in terms of yields is a challenge for organic and agroecological practices



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(Tittonell, 2014)

Resource and input efficiency



A sustainable economy is defined by 3 narratives:



(Eco-)Efficiency:

More output with less input and less environmental footprint

Consistency:

Adaptation to territorial, cultural and socio-economic context, resilience, anthropogenic and natural flow of material compatible, cradle-to-cradle.

Sufficiency:

Reduction of consumption and waste, temperance, avoidance of rebound effects



DOK long term comparision experiment, in Switzerland: One from < 300 field studies



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Organic farming: best ecological performance in temperate

ZONES
(Swiss DOK-trial 1978 – today)IPM sYields (5 x 7 years)Image: State st

Microbial biomass

Enzyme activities

Mycorrhiza

Energy efficiency of MO

Weed diversity



- 50%

Estimated annual spending on organic farming research



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Ways forward

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Organic and agroecological research programmes are characterized by system integration. This requires appropriate teams, scientists and methods.

"Even in oral traditions, agriculture has always been perceived as a system. More than ever, the science of agriculture stands at the centre of a broader system integrating human society and its physical environment."

Jean Mayer, 1974: Agriculture, the Island Empire. Tufts University, Medford, USA



Plant breeding tailored to the needs of organic agriculture





Lost opportunities of indirect selection



The development of plant protection compatible to organic standards? ~ 50 % of global research is spent by pesticide, fertilizer & seed companies.



FiBL tested >> 3000 plant extracts of the library of the University of Basel on fungicidal effects





1% of the tested extracts of the tested extracts significantly inhibited spore germination of 1-3 pathogens.



Screening in the growth chamber and in the field; identification of active compounds in the plant extracts with GC-MS or HPLC, feasibility of mass production & formulation, EU registration



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Lucius Tamm, FiBL 2017

Even more dramatic: veterinaria

E.g. antibiotics and anti-worm drugs (anthelmintics) in animal production



Bio control with *Duddingtonia flagrans* fungal strains (nematophagous fungus)

Infectious bursal disease (Gumboro) in young hens. Recombinant vaccines

Redesign of farming systems with modern technologies (digitalisation)



Clever use of novel technologies versus Dummies

Redesign of farms and crop rotation towards higher system integration with precision farming (GPS, sensors, cameras, databases on soil quality, robots etc.).

Examples shown is a 3000 hectare organic farm in Argentina owned by the Thompkins family.

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Capitalizing of organic agriculture on novel technologies



- Autonomous field mini-/micro-robots.
- Precision agriculture which foster diversity.
- Application techniques for organic inputs.
- Open source data.
- Integration of farmer knowledge in the algorithms
- Integration of public goods in the algorithm:



Conclusions

- Productivity of organic agriculture can be considerably increased with more research funding.
- All low input-high output systems (organic, agroecology, LEISA even IPM) would equally profit from agronomically better solutions.
- There is a huge research gap in tropical and arid zones.
- Truly sustainable farming systems remain less productive.
- All 3 narratives of sustainability in combination contribute to the SDG's.