Agroecology can feed people and ensure a healthy environment

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Food and farming is more then ever unsustainable

• All relevant biophysical indicators are turning negative, fast, steeply, dangerously

• The emerging context is beyond human experience

• Costs of mitigation, adaptation, remediation are rising sharply
The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)

The way the world grows its food will have to change radically to better serve the poor and hungry if the world is to cope with a growing population and climate change while avoiding social breakdown and environmental collapse.

(IAASTD, 2008)
Expert policy support for agroecology

• IAASTD advocates reducing vulnerability of global food system through *locally based innovations* and *agro-ecological approaches*

• SCAR = EU Standing Committee on Agricultural Research. Highest priority should be given to ‘low-input high-output systems - integrating historical knowledge and *agroecological principles* that use nature’s capacity and models nature’s system flows (SCAR FEG, 2011).
Definitions and scope of Agroecology

• Agroecology is “the application of ecological science to the study, design, and management of sustainable agriculture” (Altieri, 1995)

• Agroecology: the ecology of food systems (Francis et al, 2003)

• Agroecology as a science, a movement and a practice (Wezel et al, 2009)
Temporal changes in scale and dimension in the definitions of agroecology

Source: Wezel and Soldat (2009) A quantitative and qualitative historical analysis of the scientific discipline of agroecology
Agroecological principles

• Adapting to the local environment - its constraints and opportunities

• Creating favorable soil conditions for plant growth and recycling nutrients

• Diversifying species, crop varieties and livestock breeds in the agroecosystem over time and space - including integrating crops, trees and livestock from the field to landscape levels
Agroecological principles

- Enhancing biological interactions and productivity throughout the system, rather than focusing on individual species and single genetic varieties
Agroecological principles

- Minimizing soil and water losses

- Minimizing the use of non-renewable external resources and inputs (e.g. for nutrients and pest management)
Agroecology builds on the knowledge of farmers, indigenous peoples, fisherfolk and pastoralists

Four areas of peoples’ knowledge important for agroecologists who seek to maximizing the use of farmers’ knowledge and skills:

1. **Local taxonomies** — wo/men’s detailed knowledge and classification of different types of soils, plants, animals, and ecosystems.

2. **Ecological knowledge**
   - climate, winds, topography, micro-climates, plant communities, and local ecology
Four areas of farmers’ knowledge important for agroecology

3. Knowledge of farming practices
   - the intentional mixing of different crop and livestock species & varieties to stabilise yields, reduce the incidence of diseases and pest attacks on the farm, and enhance resilience to change

4. Experimental knowledge that stems from
   - farmers’ active seed selection and plant breeding work has generated myriads of locally adapted crop varieties – embodiments of the experimental knowledge, creativity and labour of generations of wo/men farmers.
Agroecological research and innovation

• Agroecological solutions are not delivered top down. They are developed through respectful intercultural dialogue between scientists and farmers/citizens, - building on peoples’ local priorities, knowledge and capacity to innovate

• Shift from a transfer of technology model of R&D to a decentralised, bottom up, and participatory process of knowledge creation tailored to unique local contexts in rural and urban areas

• Knowledge intensive, transdisciplinary and based on principles of cognitive justice
• Diversity, multi-functional agriculture & land use

• Adaptive management of dynamic complexity at different scales
## Addressing agronomic challenges: genetic engineering *versus* agroecology

<table>
<thead>
<tr>
<th>Problem</th>
<th>Genetic engineering</th>
<th>Agroecology</th>
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<tbody>
<tr>
<td>Pests &amp; diseases</td>
<td>Single gene resistance; engineered biopesticides (e.g. Bt maize/Bt coton)</td>
<td>Genetic diversity; crop rotation; intercropping</td>
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<tr>
<td>Weeds</td>
<td>Herbicide tolerant genes (e.g. Roundup resistant Soja)</td>
<td>Early soil coverage, mulches, cover crops, intercropping</td>
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<tr>
<td>Water</td>
<td>Drought tolerant genes</td>
<td>Moisture conservation practices; contour ploughing; swales; different varieties for different micro-climates</td>
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<tr>
<td>Yield</td>
<td>Yield increase for monocultures producing single commodity crop</td>
<td>Poly-cropping that yields multiple products at different times – economic diversification</td>
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Agroecology at the crossroads

Dominant agri-food model

- Agroecology as part of Sustainable Intensification and Climate Smart Agriculture (e.g. co-existence with GMOs)
- Emphasis on science
- Conforms to productivist model and ‘business as usual’ in food, farming and development

Food sovereignty and other possible worlds

- Agroecology as a science, practice and social movement
- Emphasis on peasant agroecology as part of food sovereignty
- Transformation of dominant agri-food regime
International Forum for Agroecology
Nyéléni Center, Sélingué, Mali
24-27 February 2015
Agroecology as Food Sovereignty includes:

• the right of peoples to define their own food and agriculture policies

• rights of access and control over land, water, seeds, livestock breeds, territories

• ecologically sustainable production and harvesting, principally agro-ecological production and artisanal fisheries based on high bio-cultural diversity

• right to protect and regulate domestic agricultural production and trade (e.g. restrict the dumping of products in local markets).
Agroecology for Food Sovereignty

• Transformative process that seeks to recreate the democratic political realm and regenerate a diversity of autonomous food systems based on equity, social justice and ecological sustainability

• Emphasis on the self-organizing capacities of citizens and their collective power to reclaim spaces controlled by disabling governments and corporations
Agroecology reduces carbon and ecological footprints of food and agriculture – ensuring that the Earth can continue to produce food and sustain life
**International challenge** - Current status of the control variables for seven of the planetary boundaries. The green zone is the safe operating space, the yellow represents the zone of uncertainty (increasing risk), and the red is a high-risk zone.
A shift from linear to circular metabolism
Urgent need to rethink and transform production models
Designing resilient food systems to deal with peak oil, the water crisis and climate change

Key metaphors and approaches:

• Agro-ecology
• Eco-literacy and eco-design
• Bio-mimicry
• Permaculture and holistic design/management
• Models of circular economy
Towards re-localised food systems and circular economy models

- **Appropriate scale and technology** e.g. tomato ketchup stories

- **High levels of reuse and recycling** so that a large proportion of resources and ‘wastes’ remain in the system or locality

- **Proximity**: short food webs linking food producers and consumers
Agroecology and local food initiatives are growing

- **Local Food Systems** - production, processing, trade and consumption of food occur in a defined reduced geographical area.

- **Short Food Supply Chain** - the number of intermediaries is minimised, the ideal being a direct contact between the producer and the consumer.
Study of 84 different SFSCs in Europe (Kneafsey et al, 2013. European Commission)

- CSA and AMAPs
- farm shops, pick-your-own schemes...
- farmers' markets, shops owned by farmers, farm-based delivery schemes, or through one single trade intermediary
- Farmer link with public procurement scheme

- Sell mainly to local and/or regional markets
- Products traded: fresh fruit and vegetables, animal products (meat, dairy), beverages
- Urban-driven schemes have grown rapidly in recent years in comparison with rural SFSCs
Environmental impacts of Short Food Chains

• **Agroecological production methods**: reduced GHG involved in production; reduced pesticide use; reduced soil and water pollution; enhanced biodiversity; minimum processing (reduces GHG in processing & storage)

• **Local**: reduced GHG emissions associated with transportation

• **Seasonal**: Reduced GHG emissions involved in storage
Agroecology increases food supplies and the availability of food
Agroecology increases yields per unit area

• Global survey concluded that organic methods could replace input intensive conventional farming, while maintaining, and even increasing food supply, on the same land base.

• 2007 meta-study of organic yields relative to conventional:
  -8% in developed countries
  +80% in developing countries

(Badgeley et al, 2007)
• Agroecological solutions are key here - “many organic farmers use polycultures and multiple cropping systems, from which the total production per unit area is often substantially higher than for single crops”

• Grassland studies have shown that multispecies assemblages produced 15% higher outputs than monocultures on average

• In Africa, agroecological methods could double food production in periods of 3-10 years (Pretty et al., 2011).
Incremental and transformative approaches to sustainable food & agriculture (Gliessman, 2014)

• **Level 1** practices focus on **increasing efficiency**
• **Level 2** efforts **substitute less-damaging inputs and practices**
• **Level 3** efforts **integrate agroecological practices**
• **Level 4** systems reinforce **connections between producers and consumers**
• **Level 5** systems fully develop and **integrate the agroecological practices of Level 3 and the alternative market relationships of Level 4**
Study of 84 different Short Food Chains in EU  
(European Commission, 2013)

Social impacts

• Closer connection between farmers and consumers
• Development of trust and social bonds - a sense of community and of 'living-together'
• Behavioral changes: eating habits with public health effect (reduced obesity)

Economic impacts

• A higher share of value added is retained locally by producers – economic regeneration
• Higher multiplier effect on local economies than long chains, with impacts also on maintaining local employment, particularly in rural areas
Agroecological solutions increase the income and livelihood security of farmers’ and pastoralists by regenerating local ecologies and economies.
Re-localizing production and consumption to exit unfair commodity markets

• Re-embedding agriculture in Nature, relying on functional biodiversity & internal resources, - including rediscovery of local assets

• Farmers distance themselves from markets supplying inputs (hybrid and GM seeds, agri-chemicals....)

• Farmers diversify outputs and market outlets

• Rebuild the infrastructure of local food systems (e.g. local mills, abattoirs, community food processing units, micro-dairy....)

• Trade rules that protect local economies (e.g. local food procurement)
AGROECOLOGY and

SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals
Rockström and Sukhdev, 2016
Transformative agroecology contributes to meeting *Biosphere SDGs*

- Regenerate biodiversity and life on land (SDG 15)

- Conserve and Sustainably Use the Oceans, Seas and Marine Resources (SDG 14)

- Combat climate change and its impacts (SDG 13)
Transformative agroecology contributes to meeting *Society SDGs*

- End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture (SDG 2)

- Ensure Healthy Lives and Promote Well-Being for All at All Ages (SDG 3)
Transformative agroecology contributes to meeting *Global Economy SDGs*

• Promote Inclusive, and Sustainable Economic Growth, Employment and Decent Work (SDG 8)

• Build Resilient Infrastructure, Promote Sustainable Industrialization and Foster Innovation (SDG 9)

• Ensure Sustainable Consumption and Production Patterns (SDG 12)
Merci!
Thank you!
Feeding the world

• Research published in *Bioscience* shows that production likely will need to increase between 25 percent and 70 percent to meet 2050 food demand.

• The assertion that we need to double global crop and animal production by 2050 is not supported by the data (Hunter et al, 2017).