Organic Agriculture, Climate Change and Environment

Organic Agriculture and the multi-dimensional challenges of future food and farming systems

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Challenges for Sustainable Agricultural Production and Farming Systems Dev.

- Abundant food insecurity (FAO, 2006)
- Demand for food will increase (Evans, 2009, and others)
- Unsustainable use of natural production factors such as soil, biological diversity and water (Pimentel et al., 1995; FAO, 2003)
- 60% of ecosystem services are degraded (Millennium Ecosystem Assessment, 2005)
- Intensive agriculture is depends on high energy but could be energy self-reliant and could mitigate GHG emission considerably (Smith et al., 2007)
- Agriculture is insufficiently prepared to cope with unpredictability and adaptation to climate change (Lobell et al., 2008)
International Assessment of AKST for development (IAASTD)

IAASTD Executive summary (2009):

- Degradation of ecosystems limits or reverses productivity gains
- A fundamental shift in AKST is required to successfully meeting development and sustainability goals
- Recognition and increased importance to the multifunctionality of agriculture is necessary
- Accounting for the complexity of agricultural systems within the diverse social and ecological contexts
- Success requires increased public and private investment in Agricultural Knowledge Science and Technology
- An interdisciplinary and Agro-ecosystems approach to knowledge production and sharing will be important
Main challenge (IAASTD): ”increased productivity of agriculture in a sustainable manner”

From focus on increased productivity alone

To holistic integration of Natural Ressource Management with food and nutritional security

Organic principles may contribute to a valuable framework for a future sustainable agricultural production!
Main challenge (IAASTD): “increased productivity of agriculture in a sustainable manner”

- 70% of the world’s poor live in rural areas (< USD 2/day)
- 90% of farms in the world are less than 2 ha covering 60% of the arable land worldwide
- Widespread subsistence production in isolated and marginal locations with low levels of technology
- Widespread food insecurity in spite of sufficient food being produced at global level food

Thus…..

Organic principles may contribute to a valuable framework for a future sustainable agricultural production!
Organic agriculture is a production system that sustains the health of soils, ecosystems and people.

It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.

Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

www.ifoam.org
The four basic principles of organic agriculture
Endorsed by IFOAM, September 2005

**Principle of HEALTH**
Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.

**Principle of ECOLOGY**
Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

**Principle of FAIRNESS**
Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and the opportunities.

**Principle of CARE**
Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

- Healthy soil
- Healthy crops
- Healthy livestock
- Healthy people
- Agro-ecology
- Diversity
- Recycling
- Ecological and social justice
- Fari Trade?
- Precaution
### What is OA in developing countries?

#### Certified OA:
- Oriented towards products
- Focused on few high-value crops and quality
- Agro-organic methods used in varying degrees
- Gives access to the market and better prices
- Increasing market, globally
- Will remain a niche in the great number of small householders

#### Non-certified/informal OA:
- Agro-ecological farming systems
- Conscious use of organic methods
- Follows the principles or ideas of IFOAM,
  - but is not necessarily certified
- Improving the soil fertility
- Using primarily local resources
- Using diversity in time and space
- Promote natural regulation and recycling
- Decreasing the use of limited resources
OA is a viable approach that can be suitable for smallholders.

Particularly useful in difficult environments
Reduces risk by encouraging localized input production
Fostering soil and water conservation
Encouraging the diversification of production (IFAD, 2005)

OA can help raise the productivity and income of low-input agricultural systems

“There seems to be a strong indication that the proliferation of organic agriculture could be a viable strategy to improve livelihoods in Asia’s rural areas.” (ESCAP, 2002)
Organic Agriculture and Value Chains
Linking smallholders to markets: The EPOPA Experience

Organic Exports - A way to a Better Life?
Export Promotion of Organic Products from Africa

Pilot project in Eastern Africa
Cocoa, coffee, tea, fresh and dried fruit, cotton and spices
80,000 farmers involved and trained, 1997-2007
Price premiums and improved productivity
Farm gate value of certified cash crop production: 15 Mio US$ yearly

Local processing factories for drying, canning etc.
Total export value > 30 Mio US$ (last season)
Need for more innovation, uptake of agro-ecological methods and for institutional support

http://www.grolink.se/epopa/Publications/epopa-experience.htm
Organic Agriculture and Value Chains

Making diverse use of the certified organic land in a Chinese village, - attracting new market players

Transplanting strawberries in paddy fields for export of freeze dried berries to the US market
### Organic Agriculture and Farm Economy

#### Selected examples of comparisons between organic vs. conventional cash crop production in smallholder farms in Asia

<table>
<thead>
<tr>
<th></th>
<th>Rice, Philippines, 2000</th>
<th>Soybeans, China</th>
<th>Cotton, India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>650.00</td>
<td>1088.00</td>
<td>33849.00</td>
</tr>
<tr>
<td>Cash costs</td>
<td>39.00</td>
<td>(305.00)</td>
<td>7796.00</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>149.00</td>
<td>(640.00)</td>
<td>2369.00</td>
</tr>
<tr>
<td>Net revenue</td>
<td>462.00</td>
<td>783.00</td>
<td>23684.00</td>
</tr>
<tr>
<td>Yields, kg ha⁻¹</td>
<td>3250.00</td>
<td>3750.00</td>
<td>1348.00</td>
</tr>
<tr>
<td>Labour use, Man days ha⁻¹</td>
<td>49.00</td>
<td>52.00</td>
<td>190.00</td>
</tr>
</tbody>
</table>

1. Mendoza, 2004
2. A 25% price premium was obtained in certified organic
3. Giovannucci, 2005
4. Own calculations based on 2 years prices given in Giovannucci (2005)
5. Eyhorn et al., 2005. Numbers presented are averages of two years, own calculations
6. Includes value of pulse intercrop and a 20% price premium on organic
7. Mainly opportunity costs of own labour
Organic Agriculture is a “good option for food security in Africa”

"... organic agriculture can be more conducive to food security than most conventional systems, and .. it is more likely to be sustainable in the long term."

(UNEP-UNCTAD, 2008).
### Yields of organic and Agro-ecological agriculture in Africa

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of countries represented</th>
<th>Number of projects analysed</th>
<th>Number of farmers in projects (million)</th>
<th>Number of hectares* million ha</th>
<th>Average change in crop yields** per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa***</td>
<td>24</td>
<td>114</td>
<td>1,900,000</td>
<td>2.0</td>
<td>+116</td>
</tr>
<tr>
<td>East Africa</td>
<td>7</td>
<td>71</td>
<td>1,600,000</td>
<td>1.4</td>
<td>+128</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1</td>
<td>9</td>
<td>27,000</td>
<td>0.06</td>
<td>+67</td>
</tr>
<tr>
<td>Uganda</td>
<td>1</td>
<td>17</td>
<td>241,000</td>
<td>0.68</td>
<td>+54</td>
</tr>
</tbody>
</table>

* Organic and near-organic agriculture, million ha
** compared with beginning of projects, per cent
*** all countries with data

After Pretty et al., 2005
Soil degradation and food security

- Soil degradation
  - Erosion
  - Compaction
  - Crusting and salinization
  - Nutrient mining
  - Loss of soil organic matter

- Food security
  - Yield reduction
  - Efficiency of input use reduced
  - Micro nutrient deficiency

Need for paradigm shift in land husbandry and Principles and practices for soil management

R. Lal, Food Security journal, 2009
Solutions for soil and food quality improvements

- Mulching and recycling organic residues
- Improve soil structure and quality
- Water conservation and water use efficiency
- Adoption of diversified cropping systems, indigenous foods, GMO’s high in nutrients
- Agro-forestry and mixed farming
- No-till agriculture
- On-farm experimentation and adaptation

- Use of micronutrient rich fertilisers, nano-enhanced, Zeolites
- Inoculating soils for improved Biological Nitrogen Fixation
- Microbial processes to increase P-uptake

With adoption of proven management options, global soil resources are adequate to meet food and nutritional needs of the present and future population

R. Lal, 2009; Okalebo et al., 2006
Organic Agriculture and soil quality

Results from different long term experiments:

- The organically treated soils were physically more stable, contained smaller amounts of soluble nutrients and were found to be biologically more active than conventional. (DOK trials, Mäder et al., 2002)

- Under organic farming the soil organic matter captures and retains more water in the crop root zone. Water capture in organic fields can also be 100% higher than in conventional fields during torrential rains. (Rodale Institute, 2008)
OA is good for biodiversity and biodiversity is good for OA

Organic farmers use more
Agro-ecological methods:
- Mixed crop rotations, intercropping, …
- Grasslands and green manure,
- Habitats and non-farmed areas
- Non-chemical pest management

Promoting functional diversity means enhancing and benefitting from Ecological service functions:
- Pollination
- Pest and disease prevention
- Biodiversity preservation,
- Soil quality
- Resilience
- In situ conservation of genes
Organic Agriculture promotes biodiversity
Scientific evidence.....

Meta analysis of comparative studies (Bengtsson et al., 2005):

- Species richness 30% higher in organic farms (n=32)
  - Birds, Plants
  - Predatory insects, carabidae

- Species abundance 50% higher in organic farms (n=117)
  - Weeds, Soil organisms (earthworms)
  - Predatory insects, carabidae
  - Not potential pest species!

Same picture in review Hole et al., 2005 (n=76)

Causes for higher diversity and abundance under organic farming:

- Non use of pesticides & fertiliser
- Friendly treatment of hedgerows and non-crop habitats on organic farms
- Preservation of mixed farming and diversified land use

Agro-ecological methods could also be used in non-organic
- but in reality is not!
Organic Agriculture contributes to eco-functional intensification

Potentials of OA:

- Competitive productivity in low input
- Improved farm economy (less costly inputs and premium prices in certified OA)
- Improved food security (availability, access, stability, utilization)
- Improved soil health (fertility, stability, water-holding capacity)
- Improved biodiversity and landscape preservation
- Reduced risk of pesticide toxication and residues in food
- Reduced nutrient losses from intensive systems
- Climate change adaptation and mitigation

Innovation, adaptation of agro-ecological methods is needed to obtain the full potential of OA
Needs for Research and Innovation in Organic Agriculture

Agroecology & Environment

Value Chains & Economics
- Improved Market linkages and chains

Social Capital
- Improved Health & Empowerment in rural communities

Eco-functional intensification is knowledge intensive
International Centre for Research in Organic Food Systems (ICROFS)

- Centre without walls
- Coordinator of research programmes
- Disseminating organic research results and knowledge: Organic E-prints
- International board
- Asia, Africa, America, Europe, IFOAM
- Core Organic II
- Collaboration with international funding bodies and research organisations interested in supporting development of Organic food systems

New multipartner initiative: ORCA.....

www.icrofs.org  www.orgprints.org
Thank you for your attention!

ICROFS’ Big Hairy Audacious Goal:

The principles of organic agriculture become a global reference for sustainability in agriculture and food systems due to evidence based on research and adaptive management.
Example: Science for development of agro-ecological methods

`vuta sukuma` = __pull - push system__
for reducing stem borer and striga infestation’ in Maize and Sorghum in Eastern Africa

- Trap crops to attract moths to reduced pest problems in crops: Napier and other fodder grasses
- Intercrops with repellant properties: legumes
- Striga control by intercropping with Desmodium species (legumes)
- "Opportunities for breeding and use of molecular genetics"

Exploiting chemical ecology and species diversity: stem borer and striga control for maize and sorghum in Africa†

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![Figure 1. Volatile compounds from host plants having EAG activity with stem borers.](image)
Needs for Research and Innovation in Organic Agriculture

Agroecology & Environment
Improved Food & Fibre Production

- Improved integrated Crop / Livestock management
- Improved Soil management
- Improved biodiversity for Pest management

Value Chains & Economics
Improved Market linkages and chains

Social Capital
Improved Health & Empowerment in rural communities

ICRIOFS
The multi-dimensional challenges of OA

- Eco-functional intensification is knowledge intensive
- Development of agro-ecological methods
- Adoption of agro-ecological methods
- Value chain development for various markets
- Organic agriculture’s place in development strategies
- Evidence for decision makers
- Global collaboration in research and innovation