

Organic Agriculture



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Why is Intensive Farming Unsustainable?

- Loss of soil fertility due to excessive use of chemical fertilizers and lack of crop rotation.
- Nitrate run off during rains contaminates water resources.
- Soil erosion due to deep ploughing and heavy rains.
- More requirement of fuel for cultivation.
- Use of **poisonous biocide** sprays to curb pest and weeds.
- **Cruelty to animals** in their housing, feeding, breeding and slaughtering.
- Loss of biodiversity due to mono culture.
- Native animals and plants lose space to exotic species and hybrids.

The increased use of inorganic fertilizers and pesticides in highyielding systems increases greenhouse gas emissions. Also, there is growing evidence of yield plateaus or abrupt decreases in the rate of yield gain over years



https://www.nature.com/articles/ncomms601

What Is Organic Agriculture?

- Organic agriculture is a system that relies on ecosystem management rather than external agricultural inputs.
- It is a system that begins to consider potential environmental and social impacts by eliminating the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation.
- These are replaced with site-specific management practices that maintain and increase long-term soil fertility and prevent pest and diseases.



(Credit: BT via Straits Times)

Key Features of Organic Farming

- Protecting soil quality using organic material and encouraging biological activity
- Indirect provision of crop nutrients using soil microorganisms
- Nitrogen fixation in soils using legumes
- Weed and pest control based on methods like crop rotation, biological diversity, natural predators, organic manures and suitable chemical, thermal and biological intervention
- Rearing of livestock, taking care of housing, nutrition, health, rearing and breeding
- Care for the larger environment and conservation of natural habitats and wildlife



Organic Farming and Carbon Benefits

Climate change mitigation potential

- **Benefits**: Organic farms typically have lower energy use and lower green-house gas (GHG) emissions than conventional farms.
- Costs: When lower organic yields are taken into account, GHG emissions might actually be higher under organic management.

Environmental Benefits of Organic Farming

- Sustainability over the long term
- Fighting the Effects of Global Warming
- Reduce Exposure to Pesticides and Chemicals
- Organic Farming Builds Healthy Soil
- Combats Erosion
- Organic Farming Supports Water Conservation and Water Health
- Supports Animal Health and Welfare
- Organic Farming Encourages Biodiversity



Organic agriculture in Argentina

FAO 2014

Chait 2018

Where Is Organic Farming Practiced?

- The markets share for organic products are highest in North America (30%) and Europe (40%).
- As of 2007 Austral-Asia (Australia, New Zealand, and neighboring islands in the Pacific Ocean) has **39% of the total organic farmland**, including Australia's 1,180,000 hectares. US sales are 20x as much.
- **Europe** farms **23 % of global organic** farmland (6,900,000 ha), followed by Latin America with 19 percent (5.8 million hectares). Asia has 9.5 percent while North America has 7.2 percent. Africa has 3 percent . African nations are among the countries with the fewest organic farms (WorldAtlas 2018).
- In **China**, there is **a growing market for "green food"** which, according to government grading standards, is produced without certain pesticides and fertilizers and with biological methods. Chinese farmers also produce organic food for export (e.g. tea to the Netherlands, soybeans to Japan) (FAO 2014).

Organic Farming in Africa (1)

 The countries with the most developed organic farming in Africa by area are **Uganda**, Tanzania, Ethiopia, and Tunisia. Other top African countries for organic farming are Egypt, Sudan, DR Congo, South Africa, Madagascar, and Ghana

Top African Countries for Organic farming

Rank	Country	Organic Area (ha)
1	Uganda	231,157
2	Tanzania	186,537
3	Ethiopia	164,777
4	Tunisia	137,188
5	Egypt	82,167
6	Sudan	54,845
7	DR Congo	51,838
8	South Africa	43,170
9	Madagascar	30,265
10	Ghana	28,161

https://www.worldatlas.com/articles/top-african-countries-for-organic-farming.html

Organic Farming in Africa (2)

- It is very difficult to establish organic farming in Africa, although it offers many advantages over conventional cultivation. A key challenge is to generate sufficient biomass for organic soil management in semi arid areas.
- Soil rehabilitation and sustainable resource management must be key priorities, apart from improving agricultural productivity.

<u>wwhttps://www.dandc.eu/en/article/despite-obstacles-organic-farming-makes-more-sense-sub-</u> <u>saharan-africa-conventional</u>

Organic Farming: Case of Uganda

- Over 40 million Ugandan farmers are small-scale organic farmers.
- In total, these farmers till land equivalent to 231,157 hectares.
- Uganda is the top country for organic farming due to the government support that it receives.
- The Ugandan government strictly prohibits the use of synthetic inputs such as fertilizers, pesticides, and drugs.
- The objective of the prohibition is to promote sustainable agricultural growth for the long-term improvement of the people's lives.
- Consequently, the country is popular for its organic exports. The effects of organic farming in Uganda include reduced agricultural chemical runoff, improved food security, and increased organic exports (WorldAtlas 2018).



The use of fertilizers and pesticides are strictly regulated in Uganda.

www.worldagroforestry.org

https://www.worldatlas.com/articles/top-african-countries-for-organic-farming.html

Organic Farming: Case of Tanzania

- Organic farming in Tanzania is championed by the Tanzania Organic Agriculture Movement (TOAM).
- It has resulted in **fertile soils**, great ecosystems, and a healthy population.
- TOAM came into being in **200**5. Since then, its role has been to facilitate and coordinate organic farming in Tanzania.
- Growth of organic farming in Tanzania is also attributed to the growing support received from the consumers and stakeholders.
- Organic farmers focus on protecting the environment, health of consumers, and soil.
- Some of the methods used in organic farming include the use of **organic manure, intercropping, and crop rotation.**
- Consequently, approximately **186,537 hectares** of Tanzanian land is under organic farming. Hence, Tanzania is the **second top** African country for organic farming.

In Which Areas of Africa Is <u>Organic</u> <u>Farming</u> Most Suitable?

• Building up organic matter requires precipitation/irrigation, because biomass is only built up when it rains (Neubert 2016).



How Is Organic Farming Implemented? (1)

Organic Fertilizers

- Animal Manure. A traditional source of soil organic matter has been animal manures.
- **Green Manures.** Another very old, traditional source of organic matter and nutrients is growing plants on the land and then plowing them into the soil to decay and release nutrients for the next crop.
- **Compost.** A third primary source of organic matter and nutrients, particularly for smaller plots of land or gardens is compost. Compost is the end product of biological breakdown of organic matter.
- Composting or breakdown can result from fungal activity at lower temperatures (<90 F) and bacterial activity at higher temperatures (from 120 to 160F). During composting, carbon from the organic matter is lost as carbon dioxide and heat and water are generated.
- **Organic fertilizers and amendments.** There are naturally occurring fertilizers or amendments that are acceptable for certified organic production. They can be categorized as either mineral derived, animal derived, or plant derived.

How Is Organic Farming Implemented? (2)

Micro-Dosing:

To resolve the problems of poor soil fertility and to fight against the striga weed with limited means, some farmers in Niger apply micro-doses to their sorghum and millet crops. Compared to broadcasting, the localized application of micro-doses requires less manure, compost or mineral fertilizer.





Video:

https://www.accessagriculture.org/microdosing (Produced by Agro-Insight, FAO, Fuma Gaskiya, ICRISAT, INRAN, PPILDA)

How Is Organic Farming Implemented? (3)

Beneficial insects

Some organic farmers introduce **beneficial insects** such as ladybugs, soldier beetles, green lacewings, big-eyed bugs and beneficial nematodes that eat harmful insects.

Crop rotation

Organic farmers often do not grow the same crop on the same field year after year. **Crop rotation** naturally replenishes the soil because as different plants contribute varying nutrients to the soil. Disrupting the habitats of insect pests and weeds helps control them.

Buffers

Organic farmers designate the edges of their land as **buffer zones**. This means the land is managed in accord with organic practices, but the crops grown on them aren't sold as organic because some plants in the buffer may have been exposed to genetically engineered crops or chemicals used in conventional agriculture but barred for organic farms.

Cover Crops

Cover crops such as clover, rye, and wheat are planted between growing seasons to help replenish the soil with nutrients and prevent soil erosion. They also help maintain populations of beneficial insects. Cover crops can control weeds by smothering and shading them and outcompeting them for nutrients.

Organic Livestock: Case of USA

- Organic livestock producers provide living areas that encourage the health and natural behavior of their animals.
- Organic practices reflect concerns for animal welfare and a desire to balance productivity with both animal well-being and environmental quality.
- Organic livestock must have access to outdoor areas, shade, shelter, space for exercise, fresh air, clean drinking water, and direct sunlight.

www.worldagroforestry.org

https://www.ams.usda.gov/sites/default/files/media/Organic%20Practices%20Factsheet.pdf

Economics of Organic Farming

- In Europe the yields of organic farms are around 20 % lower on average than those of conventional ones.
- Higher prices make up for this yield difference (Neubert 2016). A recent study 32 percent more revenues for organic farms than for conventional crops (Despain 2017).

Costs and Benefits of Organic Farming (1)

Yields

- **Benefits:** Some studies suggest that the stability of yields might be higher under organic management.
- **Costs**: Yields under organic management are on average 19 to 25 per cent lower than under conventional management.
- **Context**: Many cereals show higher yield gaps, while forage crops (like hay or alfalfa) have lower yield gaps.



Costs and Benefits of Organic Farming (2)

Biodiversity

- **Benefits:** On average, organic management results in a 40 to 50 per cent increase in organism abundance in agricultural fields.
- Costs: We don't know whether organic agriculture provides any benefits for biodiversity if lower organic yields (and thus probably more land to produce food) are taken into account.
- **Context:** Plants and bees benefits the most, while other arthropods and birds benefit to a smaller degree.

These days, it normal to hear news about extinct species and this should be a major concern. In the last century alone, it is approximated that **75 percent of agricultural diversity of crops has been wiped out.**

Costs and Benefits of Organic Farming (3)

Soil quality

- Benefits: Organic management leads to improved soil quality, as organic soils tends to have higher organic matter, and likely lower soil erosion rates.
- **Costs**: We do not know what the impact on soil quality is when lower organic yields are taken into account.



Costs and Benefits of Organic Farming (4)

Water quality

- **Benefits**: Fields managed organically have on average lower nitrogen loss and lower pesticide leaching than conventional farms. Organic agriculture also uses more recycled nitrogen and phosphorus, thereby introducing less new nitrogen and phosphorus into our water systems.
- **Costs**: Due to lower organic yields, the nitrogen loss per unit food produced might actually be higher under organic management.
- **Context**: Organic systems that apply large amounts of animal manure have a stronger negative impact on water quality than organic farms that use nitrogen-fixing crops as fertilizers.

Costs and Benefits of Organic Farming (5)

Water quantity

- Benefits: Organic soils may have higher capacity to hold water.
- Costs: Unknown as there are very few studies on the water use of organic farms.



Costs and Benefits of Organic Farming (6)

Farmer livelihood

- **Benefits:** Organic agriculture is typically more profitable than conventional agriculture.
- **Costs:** Organic farmers in low-income countries are usually dependent on export markets and exporting agents and therefore lose some of their autonomy.
- **Context:** In regions with high labour costs, organic agriculture is probably less profitable due to its high dependence on agricultural labour.

Costs and Benefits of Organic Farming (7)

Farm worker livelihood

- **Benefits:** Organic agriculture reduces the exposure of farm workers to toxic agrochemicals.
- **Costs:** Organic farm workers are likely exploited in similar ways to conventional farm workers.
- **Context:** Agricultural workers in regions with high rural unemployment rates can benefit from the increased employment opportunities in organic agriculture.



Costs and Benefits of Organic Farming (8)

Consumer health

- **Benefits**: Organically grown foods have lower pesticide residues and are most likely slightly higher in some micronutrient contents. But it is not clear whether the higher micronutrient contents provide any actual health benefits to consumers.
- **Context:** Consumers in countries with weak pesticide regulations benefit the most from consuming organic food.

Costs and Benefits of Organic Farming (9)

Consumer access

- **Cost:** Organic food is more expensive and therefore less accessible to consumers with low income.
- **Context**: Being a member of a community supported agriculture (CSA) initiative can provide cost savings to organic consumers.

Scaling-up Organic Farming

- Benefits: The yield gap between organic and conventional agriculture could probably be decreased further if we conducted more research on organic agriculture.
- **Costs:** Organic farms currently are highly dependent on nutrient inputs (e.g. animal manure) from conventional farms. It is not clear whether we would have enough organic fertilizers to feed everyone in the world.

What Needs to Be Considered? (1)

Global demand

The demand for organic products has created new export opportunities for the developing world. Many developing countries have begun to export organic products successfully (e.g. tropical fruit to the European baby food industry, Zimbabwean herbs to South Africa, six African nations export cotton to the European Community) (FAO 2014).

However, entering this market is not easy:

 Certification is expensive.
Farmers are denied access to developed country organic markets for two to three years after beginning organic management
Farmers will probably experience some loss in yields when converting their operations to organic production.



Organic Farmers Market – Nairobi, Kenya

What Needs to Be Considered?(2)

Local

In Africa, animal manure typically accrues in too small quantities.

Only pastoralists, who do not belong to the same ethinic groups as the farmers, hold cattle in relevant numbers, and their relationship to farmers is mostly competitive.

Reestablishing **win-win situations** in which crop farmers and pastoralists benefit from one another' manure and plant residues would make a lot of sense

Support is Needed at Several Levels

- Suitable agricultural policies must foster sustainable land-management approaches and offer agricultural extension services that are competent in ecologically sustainable land management practices,
- **Research** is still needed to identify the most suitable approaches for smallholders in different agro-ecological regions,
- loans and credits must be made available for means to transport manure and compost,
- Farmers need devices for minimum tillage (as a substitute for the plough) and for mechanized weed control or even, in breach of orthodoxy, herbicides so they can reduce manual labor intensity,
- Subsidies are needed for the acquisition of **suitable seed** (plant varieties and tree species), and
- Targeted subsidies (e-vouchers) must promote soil enhancement.

Land Issue

 Organic farming requires more land than conventional farming, to produce the same quantity of food. This shall not mean cutting down more forest or using up more pasture to create farmland.

Further Learning Resources

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Thank you!