Considerations for conversion to organic agriculture

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Country of first practice	Kenya
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Sustainable Development Goals	No poverty, Industry, innovation and infrastructure, and life on land

Summary

This practice highlights some consideration regarding conversion to organic agriculture depending on farm location and climate. It details how to undertake location analysis, as well as farm-related challenges to conversion (farm high, low and mixed external put use) and the implementation of practices to meet these challenges. It specifically draws attention to issues with land degradation and climate-related challenges.

Description

1. Analysis of the location

The conversion from a conventional to an organic system requires a transitory period, where the organic practices are applied progressively following an organized plan. During this period it is important to analyse carefully the actual situation of the farm and identify the actions to be taken.

1.1 The analysis of the farm

- Farm characteristics

Size, plots and crops distribution, which kind of crops, trees, animals are integrated in the farm system.

- Soil analysis

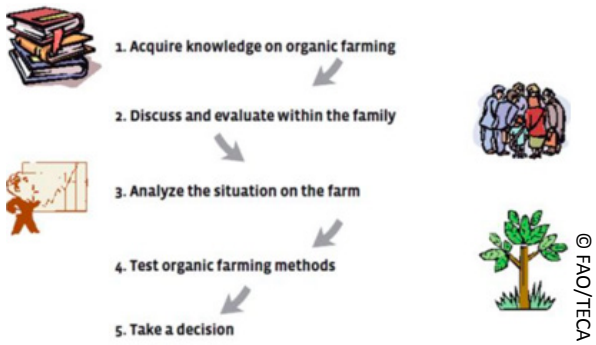
An evaluation of the soil structure, nutrient levels, organic matter content, erosion level, and/or the soil have been contaminated.

- Climate

Rainfall distribution and quantity, temperatures, frost risks, humidity.

- Organic matter sources and management (manures).
- Presence of animal housing systems and/or machinery.
- Limiting factors such as capital, labour, market access, among others.

Figure 1. Steps to get ready for the conversion to organic farming



This information will help you to have a clear picture of your farm and to take decisions.

2. Farm-related challenges to conversion

Depending on the farm situation, different challenges are to be expected during conversion.

- Farms with high external input use.
- Farm with low external input use.
- Mixed farm.
- Degraded land.

2.1 Farms with high external input use

The majority of intensively managed farms in Africa, Latin America and Asia that strongly rely on external inputs are larger farms. Such farms mostly grow a few annual or perennial cash crops relying heavily on the use of fertilizers for plant nutrition and pesticides and herbicides for pest, disease and weed control. On such farms crops are often grown without a planned rotation and farm animals are not integrated into the nutrient cycle. Diversification is usually low on these farms. Trees and bushes are mostly removed to facilitate extensive mechanization, and crops are mostly grown alone.

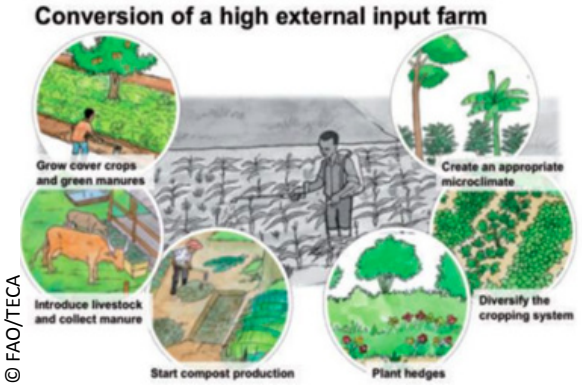
2.1.1 Potential challenges in conversion of such farms

- Establishing a diverse and balanced farming system with a natural ability to regulate itself usually takes several years.
- Major efforts may be necessary to restore natural soil fertility by providing a considerable amount of organic matter to the soil.
- Abandoning high input external fertilizers results in yield depression in the first years of conversion, before soil fertility is re-established and yields rise again.
- New approaches and practices usually involve a lot of learning and intensive observation of crop development, and dynamics of pests, diseases and natural enemies.

2.1.2 Practices to be implemented for the achievement of the conversion process

- Diversify the farming system: Select appropriate annual crops for the area and rotate them in a planned sequence. Include legume crops such as beans or leguminous feed crops in the rotation to provide nitrogen to the subsequent crops. Plant hedges and flower strips to encourage natural enemies and to control pests.
- Start recycling valuable farm by-products. Establish on-farm compost production based on harvest residues and manure, if available, and mix the compost with the topsoil. This will bring stable organic matter into the soil and improve its structure and its capacity to feed the plants and store water. Green manures can provide plenty of plant material to feed soil organisms and build up soil fertility.
- Introduce farm animals into the system. Farm animals provide valuable manure and diversify farm income through additional animal products.
- Grow cover crops. Cover crops or lay out mulches in perennial crops provide protection to the soil.

Figure 2. Conversion of a high external input farm

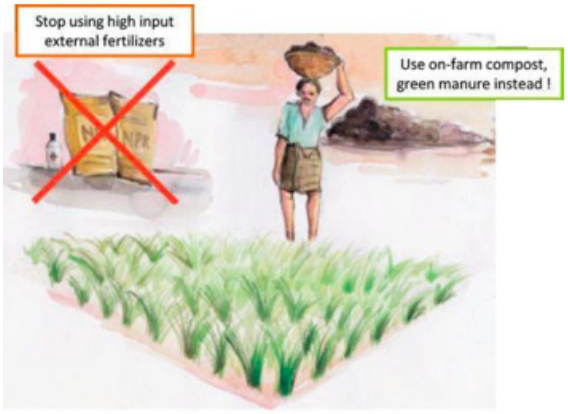


2.2 Farm with low external input use

Farmers working with little external inputs based on traditional practices may grow

many different crops in a densely mixed system on the same piece of land changing crops randomly. A few livestock such as chickens, pigs, cattle and / or goats may be kept, which scatter the manure in their feeding places, hence providing very little manure for the gardens. The trees may be extensively cut for firewood and charcoal burning. Bush and trash burning may be a common practise especially during land preparation. Harvests are probably low and increasingly becoming difficult due to unreliable and insufficient rains. The harvests may just be sufficient for feeding the family and little may be left to sell for income.

Figure 3. Minimizing external input

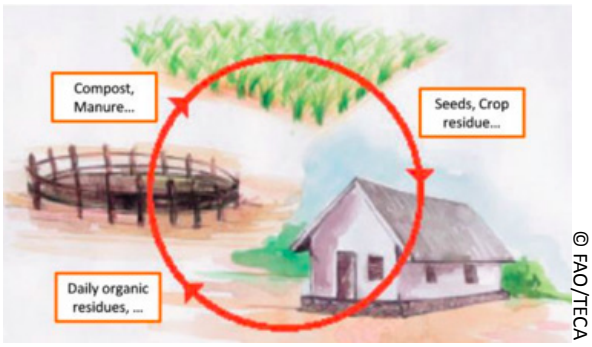


Traditional farmers fulfil some principles of organic farming already by relying on farm-own resources, growing different crops simultaneously and raising livestock. However, there are still practices, which clearly distinguish such farms from organic farms.

Certain challenges need to be addressed for conversion.

- Avoid burning of crop residues after harvest as this is, in most cases, not a viable solution, since it destroys valuable organic material and damages soil organisms.
- Establish a well organised diversification systems including a 'planned' crop rotation and intercropping systems.
- Accumulate knowledge and practice regarding efficient use of farm own resources, especially for compost production to manage and improve soil fertility.
- Avoid indiscriminate tree cutting for firewood and charcoal burning.
- Establish a system to collect the animal manure for composting.
- Apply measures to prevent loss of soil through erosion and protect it from drying out.
- Pay special attention to satisfy feed and health requirements of the farm animals. Avoid infection of seeds with diseases, gain knowledge on disease cycles and preventive measures. Avoid harvest and storage losses.

Figure 4. Recycling valuable farm by-products

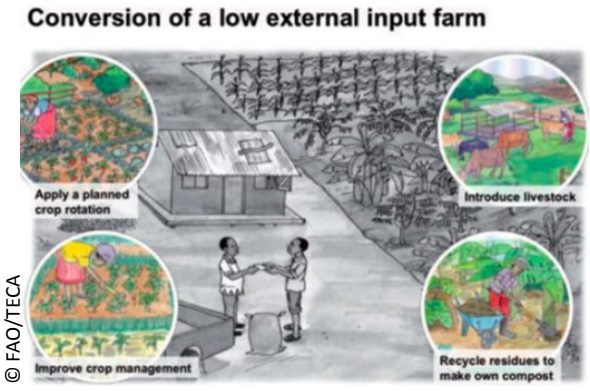


2.2.1 Some practices for conversion in this systems

- Implement planned crop rotation and intercropping systems. A combination of annual and perennial crops including leguminous green manure cover crops is needed. Combined with properly selected or improved crop varieties with good resistance to plant pests and diseases, will facilitate the crop and soil management.

- Proper integration of animals into the farming system, as well as planting rows of nitrogen fixing trees between annual crops will improve the growing conditions for the crops and encourage better growth, while providing additional feed for the ruminant animals. Better housing is also needed to facilitate collection of animal manure for field use.
- Improving the fertility of the soils, for example, through the application of high quality compost. Compost is a highly valuable fertilizer in organic farming. Instead of burning the crop residues after harvest, collect them for compost production, or work them into the soil. The animal manures and plant materials should be regularly collected for compost making.
- Growing nitrogen fixing legumes between annual crops is another possibility to feed the soil and the crops.
- Additional measures to control soil erosion such as digging trenches and planting trees along the hillside, and covering the soil with living or dead plant material should be implemented.

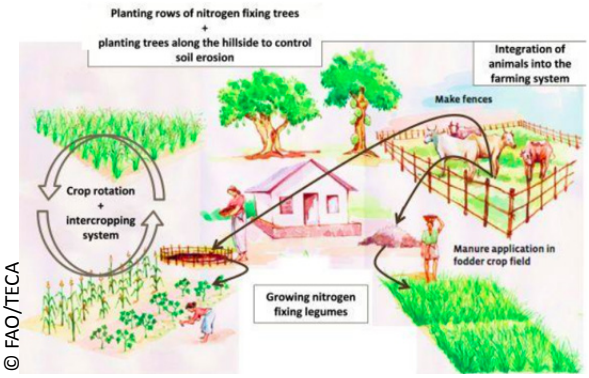
Figure 5. Conversion of a low external input farm



2.3 Mixed farm

On mixed farms, crops and farm animals may be integrated, whereby the animal manure is collected and used in the gardens after having kept it for a few weeks to rot. Some soil conservation measures may be implemented, such as mulching in perennial crops and trenches to reduce erosion. Occasionally herbicides, pesticides and treated seeds may be used to control weeds in fruit and vegetable production. Farmers of such mixed farms are obviously familiar with some of the organic farming practices. Such farmers will find it easy to learn new methods from other farmers or from a trainer and to implement organic practices throughout the farm.

Figure 6. Some organic farming methods to test in your own farm

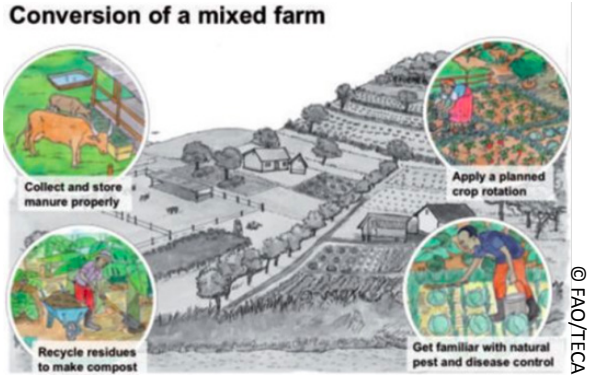


2.3.1 Recommendations for organic conversion

- Implement organic practices to manage the soil and to control weeds instead of using herbicides. For example, in fruit orchards grow a leguminous cover crop to cover the soil. Or in vegetables and arable crops implement a planned crop rotation that includes weed suppressing green manure or feed crops.
- Further improve recycling of farm own nutrients from animals and crop residues to make best uses of them, for example by mixing them with crop residues for making compost. Improve storage of animal manures to avoid nutrient losses.
- Use seeds without pesticide-treatments, if available. Make sure to use healthy

seeds only and get familiar with non-chemical ways of treating seeds.
- Get familiar with approaches and methods of natural pest and disease control.
- Learn about beneficial insects and observe population dynamics of pests through regular monitoring during crop growth.
- Further diversify the farming system to increase productivity of the land and provide habitats for beneficial insects and spiders.

Figure 7. Conversion of a mixed farm



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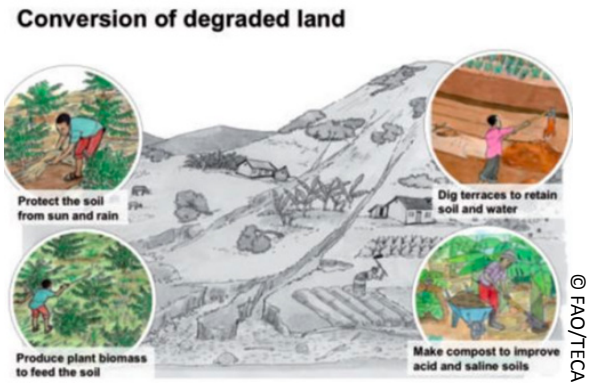
2.4 Degraded land

Land may be degraded due to shifting cultivation, overgrazing, over-cultivation or deforestation, salinity after years of intensive irrigation with ground water, or water logging and flooding. Such land may take more effort and patience to establish good growing conditions. At the same time, organic practices are an excellent approach to recover such soils. It may require specific practices to stop soil degradation and to re-establish soil fertility. Such practices include digging of terraces or sowing an intensive fallow with a leguminous green manure crop that grows well on poor soils. Many experiences show that organic farming is a promising approach to improve degraded land and bring it back into production.

In most cases, the increase of organic matter plays a key role to improve the quality of degraded soils.

Figure 8. Conversion of degraded land



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- In case of a bare and eroded soil on sloping land, organic farming calls for digging of terraces (e.g. fanya juu terraces) (Figure 9). Fanya juu ('throw it upwards' in Kiswahili) terraces are made by digging trenches along the contours and throwing the soil uphill to form embankments (bunds), which are stabilized with fodder grass like Napier (*Pennisentum purpureum*) and multipurpose agroforestry trees. The space between the embankments is cultivated with crops and over time, the fanya juu develop into bench terraces. They are useful in semi-arid areas to harvest and conserve water. Additionally, green manures and compost can be used to further build the soil to support good crop growth and yields.
- Saline soils contain large amounts of water soluble salts that inhibit seed germination and plant growth. These salts may have been accumulated through excessive use of irrigation water, especially in arid and semi-arid climates. These salts can be reduced slowly by ensuring proper irrigation and building up the structure of the soil with compost to

allow natural drainage of the excess salts. In a first period salt tolerant crops may be grown.
- Acid soils can be reclaimed by adding lime and well-made compost.
- Flooded soils can be improved by creating drainage channels to drain off the excess water.

2.4.1 How a farm is conserved using Fanya-Juju terraces

- The farm is surveyed by a technician to see if a cutoff drain is required above the fields.
- A cutoff drain is laid out along the contour. All the runoff from utside the farm is held and infiltrates.
- The soil dug out from the cutoff drain is heaped downslope.
- Contours are then surveyed with a line level.
- Soil is loosened with hoes or mattocks along the line of the contour and then thrown upslpe to make the bund. A small step is left between the trench and the bund so that soil is not washed straight back in when it rains.

Figure 9. Fanya-Juu terraces techniques of Kenya

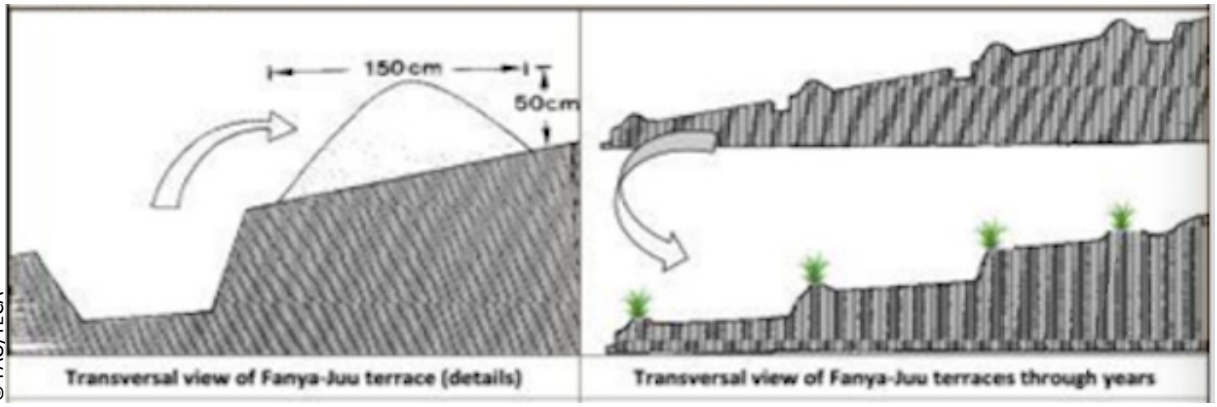


Table 1: Fanya-Juu terraces techniques of Kenya

Transversal view of Fanya-Juju terrace (details)	Transversal view of Fanya-Juju terraces through years
Cutoff drain dimensions **Ditch:** 1.25 m wide at top and 1 m wide at bottom **Depth:** approx. 1 m **Gradient:** usually sited on contour, but sometimes sited on a slight gradient when it is joined to a natural waterway	**Fanya-Juju terrace dimensions** **Spacing of terrace banks:** usually between 5 and 20 m apart, (depends on the scope of the land - the steeper the land, the closer the terrace banks) **Trench:** 60 cm wide and 60 cm deep **Bund:** 50 cm high and 150 cm wide at base **Step:** 20 cm between trench and bund **Gradient:** sited in contour (in dry areas) **Labour:** 150 - 350 person-days per hectare (for cutoff and terraces)
Where Fanya-Juju terraces can be used • in marginally/wetter zones (700 mm rainfall and above) • soils should be deep • suitable for slopes from less than 5 to 50 %.	

Source: FAO 2015

- Grass is planted on top of the bund to stabilize it. 'Bane grass' is one of the best varieties for Kenya. Bananas or other trees may be planted in the trench.
- Ploughing, weeding and natrual soil movement cause the lnd between the terrace banks to level off into benches after a few years.

3. Climate related challenges to conversion

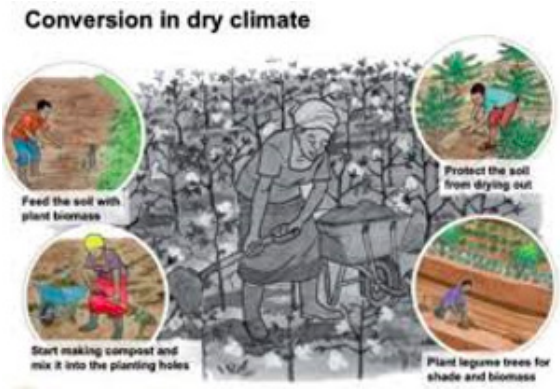
Converting a farm to organic farming in an area with very little rainfall and high temperatures or strong winds will be more challenging than converting a farm located in an area with well distributed rainfall and favourable temperatures. At the same time, the improvements that follow implementation of organic practices will be more obvious under arid conditions than under ideal humid conditions. For example, compost application into topsoil or into planting holes will increase the soils water retention capacity and the crop's tolerance to water scarcity.

In very warm and dry climate, losses of water through transpiration from plants and evaporation from soils are high. These losses may be further encouraged by strong winds, enhancing soil erosion. The soils' organic matter content is generally low, as biomass production is low, implying that the availability of nutrients to the plants is highly reduced.

Under such conditions, the key to increasing crop productivity lies in protecting the soil from strong sun and wind and increasing the supply of organic matter and water to the soil. Soil organic matter can either be increased through compost or through cultivation of green manure crops. In the case of compost production the challenge is to increase production of plant biomass, which is needed for compost production.

In warm and humid climate, high aboveground biomass production and rapid decomposition of soil organic matter imply that the nutrients are easily made available to the plants. But it also involves a high risk that the nutrients are easily washed out and lost. Under such conditions a balance between production and decomposition of organic matter is important to avoid depletion of soil.

Figure 10. Conversion in dry climate



Combining different practices to protect the soil and feed it with organic matter proves to be the most effective approach to choose.

These practices include creating a diverse and multi-layer cropping system ideally including trees, growing nitrogen-fixing cover crops in orchards and applying compost to enrich the soil with organic matter and in this way increase its capacity to retain water and nutrients.

4. Further reading

- IFOAM. 2003. Training Manual for Organic Agriculture in the Tropics. Edited by Frank Eyhorn, Marlene Heeb, Gilles Weidmann, p 214, 219-224
- FiBL 2011. African Organic Agriculture Training Manual – Conversion. Version 1.0 June 2011. Edited by Gilles Weidmann and Lukas Kilcher. Research Institute of Organic Agriculture FiBL, Frick

- Agricultura Ecológica, Manual y Guía Didáctica. Javier Flórez Serrano, IRMA S.L. (Instituto de Restauración y Medio Ambiente, León-España)
- Oxfam. 1991. Looking after our land: Soil and Water Conservation in Dryland Africa, Will Critchley, Published by Oxfam on behalf of the Arid Lands Information Network and the International Institute for Environment and Development., 1991, Part 3, Kenya, URL

5. Related/associated technologies

- Introduction to organic agriculture: 8359
- Step by step conversion to organic agriculture: 8364
- Mulching in organic agriculture: 8365
- Water management in organic agriculture: 8366
- Crop planning and management in organic agriculture: 8367
- Nutrient management in organic agriculture: 8368
- Pest and disease management in organic agriculture: 8372
- Weed management in organic agriculture: 8375
- Soil cultivation and tillage in organic agriculture: 8376
- Plant propagation in organic agriculture: 8377
- Animal husbandry in organic agriculture: 8378

6. Agro-ecological zones

- Tropics, warm

7. Objectives fulfilled by the project

7.1 Women-friendly

The technology is very accessible and adaptable to all

7.2 Resource use efficiency

Improvement of crop and livestock management whilst being environmentally conscious

7.3 Pro-poor technology

Increased knowledge, improved soil and more diversity of crops leads to more yield income and food source.