CONVERSION TO ORGANIC FARMING: PRINCIPLES AND TECHNIQUES

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Abstract: Organic farming represents a sustainable alternative to conventional agricultural practices, promoting the production of healthy food while reducing the negative impact on the environment. This paper analyzes the sustainable techniques and practices applied in organic farms, focusing on the conversion process, soil management, and biodiversity conservation. The conversion process involves reorganizing crops, eliminating synthetic chemicals, and adopting integrated practices such as crop rotation, use of organic fertilizers, and biological pest control. Monitoring soil quality, adjusting Ph, and stimulating microbial activity are essential for maintaining long-term fertility. Additionally, promoting biodiversity through the conservation of natural areas and supporting habitats for pollinators and natural predators contributes to ecosystem health. The results demonstrate that organic farming is a holistic system in which plants, soil, and animals interact to create a sustainable balance. This approach not only supports safe and healthy food production but also contributes to the protection of natural resources, adaptation to climatic conditions, and sustainable rural development.

Keywords: conversion, organic farming, bio-farms, sustainable agriculture

1. INTRODUCTION

Organic agriculture represents a sustainable alternative to conventional agriculture, having a reduced environmental impact while providing consumers with healthy products free of pesticides and chemical fertilizers. It contributes to the diversification of ecosystems, reduction of water, air, and soil pollution, and maintenance of soil health and fertility. Organic methods include crop rotation, the use of bio-fertilizers and bio-pesticides, supported by modern technologies such as precision farming.

Organic agriculture is a production system that eliminates or significantly reduces the use of synthetic substances, such as artificial fertilizers and pesticides, growth regulators, feed additives, and genetically modified organisms. This type of agriculture is based on sustainable practices, including:

- Crop rotation
- Valorization of plant residues
- Use of manure, green fertilizers, and other organic fertilizers
- Biological pest control to maintain soil fertility
- Providing plants with necessary nutrients
- Natural control of weeds, insects, and diseases

In recent years, interest in organic agriculture has increased significantly among farmers, consumers, and policymakers. Public perception of industrial agriculture has shifted, with many people considering organic foods to be healthier, safer, and more environmentally friendly.

Figure 1. Process of implementing organic agriculture
(*Source: Special Report "Organic Farming in the EU," European Court of Auditors, 2024*)

The negative effects of certain conventional farming practices have become evident, prompting an increasing number of people to choose organic products.

2. CONVERSION TO ORGANIC FARMING

Conversion to organic farming represents the initial stage—also called "Year Zero"—in which a conventional farm reorganizes its activities according to organic principles. Before starting the actual conversion, the farmer must analyze the chances of success and potential risks, evaluate the necessary infrastructure, and assess the market prospects for the products.

A central principle of organic farming is the complete elimination of synthetic chemicals, which brings major benefits: protection of natural resources (water, air, soil) and more efficient energy use. Although organic farming requires more energy for infrastructure and equipment, resource efficiency increases in the long term.

Another important principle is the creation of closed nutrient cycles—using the farm's internal resources in an integrated and sustainable manner. Animal feed comes from the farm itself, while plant residues and organic fertilizers maintain soil fertility, feeding beneficial organisms that, in turn, supply nutrients to crops. Cultivating legumes significantly contributes to soil nitrogen enrichment, essential for crop development. Soil fertility is considered the farmer's capital. To maintain and improve it, natural fertilizers and gentle soil cultivation methods are used, avoiding harmful substances. This stimulates the activity of soil microorganisms, improving soil structure and quality, limiting erosion, and supporting crop health.

Figure 2. Fertile soil *(Source: https://blog.climatefieldview.com.br/zonas-manejo)*

A major objective of organic farming is the promotion of biodiversity. By eliminating herbicides, a varied spontaneous flora develops on the farm, providing habitats for numerous beneficial insects and microorganisms, including pollinators and natural predators of pests.

These balanced ecosystems contribute to the natural reduction of disease and pest problems. Farmers are also encouraged to create and maintain natural areas within and around the farm to support local biodiversity.

National standards for the production and processing of organic products aim to uphold the principles of organic farming through a series of objectives and requirements, including:

- Maintaining and improving soil fertility through the use of local and renewable resources
- Reducing dependency on external industrial inputs
- Conserving biodiversity through sustainable methods (crop rotation, biological plant protection)
- Promoting locally produced and distributed foods to reduce the environmental impact of transport and globalization

To obtain organic certification, farms must comply with a strict set of conditions. Monitoring is continuous and occurs at all production stages, with annual inspections carried out by accredited organizations. During the conversion period (minimum three years), synthetic fertilizers and chemical plant protection substances are completely prohibited. Parallel production of the same crops within the same farm is not allowed, and strict separation of organic and conventional products is mandatory during harvesting, transportation, and storage. Organic products must be recorded separately, and the history of the fields must be documented in detail.

Soil must be fertile, homogeneous, and uncontaminated, with crop rotation observed for at least 5–6 years. Organic farming does not allow synthetic chemicals or antibiotics, permitting only natural fertilizers and non-aggressive mineral amendments. Organic units are recommended to be physically separate from conventional ones, and 20% of the land should be occupied by leguminous crops or perennial grass-legume mixtures. Crop rotation should include a variety of species, considering biological factors, nutrient requirements, weed control capacity, and the contribution of plant residues. Animal feed must be produced within the farm, and livestock density is regulated according to species.

The conversion to organic farming involves several steps:

- Establishing personal objectives
- Analyzing the current situation
- Training in organic practices
- Acquiring knowledge about regulations
- Participating in courses and visits to model farms

The goal is to achieve a balance between plants, soil, and animals by adapting the livestock to available resources, reducing monoculture, using green fertilizers, and limiting the purchase of external feed.

Figure 3. Vegetables produced on an organic farm
(Source: organic farm vegetable photos – search images)

Monitoring during the conversion period is conducted through a contract with a certification body. Typically, over three years, the farm undergoes annual inspections, documentation reviews, and field checks. Non-compliance leads to revocation of certification. The first inspection establishes the starting situation and the necessary action plan.

The conversion plan includes four essential steps:

1. **Resource Evaluation** – Studying the land, crops, climate, pests, field history, staff involvement, and market analysis
2. **Problem Prevention** – Identifying weak points, such as acidic soils, erosion-prone slopes, or excessive weeds, and establishing solutions for each
3. **Crop Rotation Plan Development** – Essential for soil health, diversification, and pest control. Rotation helps maintain moisture, control diseases, and balance soil nutrients
4. **Production Plan Establishment** – Selecting fields suitable for conversion, choosing crops and varieties, and establishing monitoring methods and comparison with other farms

3. SOIL AND CLIMATE ANALYSIS

The annual evaluation of soil quality takes place in the autumn, after crop harvesting, and involves the following steps:

➢ *Determination of Soil Reaction (pH)*

Adjusting soil pH to the optimal range (6.5–7.5) is achieved by applying amendments and fertilizers:

- For acidic soils, amendments with a physiologically alkaline reaction are used
- For alkaline soils, amendments with a physiologically acidic reaction are applied

An acidic environment inhibits the humification process. To activate it, powdered lime is recommended, incorporated into the soil. The amount of ground lime required to increase the pH by one unit varies depending on soil texture.

Table 1. Lime quantity according to soil texture

Soil texture	g/m²	kg/100 m²	t/ha
Sandy	261	26	2.6
Sandy-loam	298	30	3.0
Loamy-sandy	335	33	3.3
Loamy-clay	410	40	4.0

- *Adjustments depending on the type of amendment:*
- Quantity is reduced by 80% for quicklime (fast action, suitable for heavy soils)
- Reduced by 35% for slaked lime (fast action)
- Reduced by 20% for dolomite (medium action)
- Increased by 35% when using defecation foam (a sugar industry residue with rapid action)

In parallel with liming, for 2–3 years, natural fertilizers with an alkaline physiological reaction are recommended where possible.

Table 2. Use of natural alkaline fertilizers

Amendment type	Recommended dose	Action speed
Thomas meal (steel by-product)	300–500 g/m² or 4–6 kg/m³ of compost	Fast
Wood ash	50–100 g/m² or 3–5 kg/m³ of compost	Fast
Fermented compost	6–12 kg/m²	Slow
Dolomite meal	100–200 g/m² or 4–6 kg/m³ of compost	Medium

Lowering soil pH by one unit can be done by applying water-soluble sulfur powder, with the required amount varying by soil texture.

Table 3. Quantity of water-soluble sulfur according to soil texture

Soil texture	g/m²	kg/100 m²	t/ha
Sandy	87	9	0.9
Sandy-loam	99	10	1.0
Loamy-sandy	112	11	1.1
Loamy-clay	137	13	1.3

- *Efficiency adjustments for other amendments:*
- Double (increase by 100%) for gypsum
- Increase by 120% for phosphogypsum (residue from trisodium phosphate production, fast action)
- Increase by 500% for lignite powder (slow action)

During acid amendments, natural fertilizers with an acidic physiological reaction are recommended if possible.

Humus Content Evaluation

Humus represents the organic matter in the topsoil layer (up to 30 cm deep), formed by the decomposition of plant and animal residues. Experienced gardeners know that humus is not spontaneously given by nature but is the result of human work and skill, essential for providing plants with easily accessible nutrients.

Humus content can be determined:

- ✓ Through precise chemical laboratory analyses;
- ✓ By visual estimation, using soil color as an indicator.

Table 4. Humus content according to soil color

Soil color	Humus content
Light gray to yellowish	Poor (<2%)
Gray-brown to brown	Moderate (2–5%)
Dark gray to dark brown	Rich (5–7%)
Dark brown to black	Very rich (>7%)

Humus Improvement

Increasing humus levels can be achieved through:

- Including leguminous plants in crop rotation;
- Using green manure;
- Applying soil-conserving techniques and mulching cultivated surfaces;
- Correcting soil chemical reaction;
- Restoring soil structure and texture;
- Stimulating soil biological activity;
- Incorporating annually, during autumn work, one of the following:
  - ✓ 4 kg dry peat/m²

- ✓ 10 kg wet peat/m²
- ✓ 6 kg semi-fermented compost/m²
- ✓ 8 kg semi-fermented manure/m²

For rapid humus improvement, green fertilizers can also be incorporated up to a depth of 15 cm. Plants for this purpose are mown and left to wilt for a few days before incorporation. In addition to humus contribution, green fertilizers act similarly to fresh manure, naturally fertilizing crops. Dead plant material can also be transformed into humus using earthworms, which contribute to aeration and water retention in the soil.

Table 5. Plants used to increase humus content

Category	Plant	Sowing period
Legumes, cold-resistant	Hairy vetch, red clover, small clover, sainfoin, sparceta, serradella	august, spring, mar–apr, apr–aug
Legumes, non-cold-resistant	Yellow lupine, Blue lupine	spring
Non-legumes, cold-resistant	Rapeseed, large rapeseed, rye	aug, aug–sept
Non-legumes, non-cold-resistant	Buckwheat, phacelia, white mustard, sunflower	apr–aug, apr–jul

➢ *Biological Fertilization*

The farm utilizes insoluble nutrient reserves through microbial activity.

Animal-based organic fertilizers**:**

- **Manure:** Poultry manure is most valuable, followed by sheep and goat manure. It is used aerobically fermented, with four composting methods: small piles, large prisms, mixed composting with other materials, or direct application. Doses vary between 20–80 t/ha depending on type and soil fertility.
- **Manure juice and diluted urine:** Urine should be diluted or treated with soil, compost, or additives to bind ammonia and reduce odor. Applied diluted at the beginning of the vegetation period.
- **Fermented excrement mixtures:** Prepared by fermenting in water for 14 days and applied monthly at a 20% concentration.

Other biological fertilizers include blood meal (high in nitrogen), bone meal (high in phosphorus, useful for acidic soils), and horn-and-hoof meal (high in nitrogen).

Some weeds accumulate significant nutrients (N, P, K, Ca, Mg) due to long vegetation periods and biomass, and can be used as organic fertilizer. Collected in aerated piles (200–300 kg), after 5–8 days, they are mixed to accelerate fermentation, then transferred to a pit and treated with an acidic solution (sulfuric and hydrochloric acid dissolved in water). After 3–4 weeks of fermentation and regular mixing, a liquid fertilizer is obtained, usable at 600–800 hl/ha.

Table 6. Nutrient content of some weed species

Species	Growth stage	N (%)	P (%)	K (%)	Ca (%)	Mg (%)
Amaranthus retroflexus (pigweed)	Green plants with 25–30% mature seeds	2.61	0.40	3.86	1.86	0.44
Chenopodium album (lamb's quarters)	Same	2.59	0.37	4.34	1.46	0.54
Polygonum aviculare (knotgrass)	Same	1.81	0.31	2.77	0.88	0.56

4. CONCLUSIONS

Organic farming represents a viable and sustainable alternative to conventional agriculture, reducing environmental impact and providing healthy and safe products for consumers. The conversion process to the organic system is complex and requires rigorous planning, adherence to standards, and the application of integrated methods to ensure soil fertility and crop health.

Soil fertility and biodiversity are the foundations of organic farming, and practices such as crop rotation, the use of green manure, composting, and biological pest control contribute to maintaining the natural balance of agricultural ecosystems.

Organic farming is not merely a production technique, it is a holistic system that promotes sustainability, the conservation of natural resources, and a balanced relationship between soil, plants, animals, and the human community.

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