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Feedback and suggestions for improvements are welcome!

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## Preface

The first IFOAM Training Manual for Organic Agriculture in the Tropics (the Basic Manual) was published in 2004. The Research Institute of Organic Agriculture (FiBL) together with partners of the organic movement in the Tropics were commissioned by IFOAM to complete two new training manuals that build on the Basic Manual. The new IFOAM training manuals address the two basic climatic zones of the Tropics, the Arid and Semi-Arid Tropics, and the Humid Tropics.

For both new manuals, already existing material was collected, screened and condensed into comprehensive training manuals. Additionally, a large number of farmers, trainers and scientists were asked for their experience. Partner institutions from the Tropics actively collaborated in the development of the manuals. The partners of the manual for the Arid and Semi-Arid Tropics are from Asia (India), Africa (Senegal and Tunisia) and Latin America (Chile).

The training manuals contain case studies of organic farming systems, describe successful organic marketing initiatives and offer guidelines for the main crops of the Tropics. With the informative text, transparencies and didactical recommendations the training manuals offer a resource basis for trainers with the idea of encouraging individual adaptation and further development of the material according to need. The training manuals are available on separate CDs in English, French and Spanish.

The training manuals were commissioned by IFOAM and funded through its program IFOAM-GROWING ORGANIC II (I-GO II). The Research Institute of Organic Agriculture (FiBL) and the Swiss Import Promotion Programme (SIPPO) provided co-funding.

The development of this manual was a much bigger and longer process than expected. The result is the start of a continuing process. The training manual shall be a living document, modified and further developed by those who use it. All copyrights are retained by IFOAM.

We hope that this training manual will be an inspiring source for all its users. We invite all to contribute their suggestions and material for further improvements of the manual. Contact: [headoffice@ifoam.org](mailto:headoffice@ifoam.org).

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- IFOAM for funding, facilitating and providing feedback
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- FiBL for co-funding; the International Cooperation Division and the Communication Division for the concept, elaboration, review and layout
- Contributing partners

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# Principles of Organic Agriculture

## Preamble

These Principles are the roots from which organic agriculture grows and develops. They express the contribution that organic agriculture can make to the world, and a vision to improve all agriculture in a global context.

Agriculture is one of humankind's most basic activities because all people need to nourish themselves daily. History, culture and community values are embedded in agriculture. The Principles apply to agriculture in the broadest sense, including the way people tend soils, water, plants and animals in order to produce, prepare and distribute food and other goods. They concern the way people interact with living landscapes, relate to one another and shape the legacy of future generations.

The Principles of Organic Agriculture serve to inspire the organic movement in its full diversity. They guide IFOAM's development of positions, programs and standards. Furthermore, they are presented with a vision of their world-wide adoption.

Organic agriculture is based on:

- **The principle of health**
- **The principle of ecology**
- **The principle of fairness**
- **The principle of care**

Each principle is articulated through a statement followed by an explanation. The principles are to be used as a whole. They are composed as ethical principles to inspire action.

## Principle of health

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

This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people.

Health is the wholeness and integrity of living systems. It is not simply the absence of illness, but the maintenance of physical, mental, social and ecological well-being. Immunity, resilience and regeneration are key characteristics of health.

The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In particular, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and well-being. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

## Principle of ecology

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

This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem; for fish and marine organisms, the aquatic environment.

Organic farming, pastoral and wild harvest systems should fit the cycles and ecological balances in nature. These cycles are universal but their operation is site-specific. Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to

maintain and improve environmental quality and conserve resources.

Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

## Principle of fairness

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

Fairness is characterized by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings.

This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties - farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products.

This principle insists that animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behavior and well-being.

Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

## 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.**

Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and well-being. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken.

This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time. Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering. Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes.

# 1 Introduction

## 1.1 Description of climate and soil

### 1.1.1 Climatic conditions

Areas which are not irrigated, and which depend only on rainfall to produce crops are often called "drylands" and are the living resource base for almost one fifth of the world's population. They cover over 15% of the tropics and include the Sahel region, the Kalahari region and some regions of India, as well as parts of Northern and Southern America. The typical vegetation of semi-arid climatic zones are grasses, thorny shrubs and trees. The predominant agricultural systems are livestock ranching and rather extensive crop production, sometimes using shifting cultivation. In areas where there is water available for irrigation, intensive plant production can be found. In very dry regions, however, where annual rainfall is less than 300 mm, agricultural production is marginal.

The dry climatic zones in the tropics are characterized by a long dry season with a short, often intense, wet season of up to 2 months for arid areas and 4.5 to 7 months for semi-arid areas. Precipitation varies from 0 to 300 mm for arid areas, and 400 to 700 mm for semi-arid areas. Rainfall occurs mainly in violent storms during either summer or winter, depending on the area. The greater the distance from the equator in any given place, the shorter the rainy season.

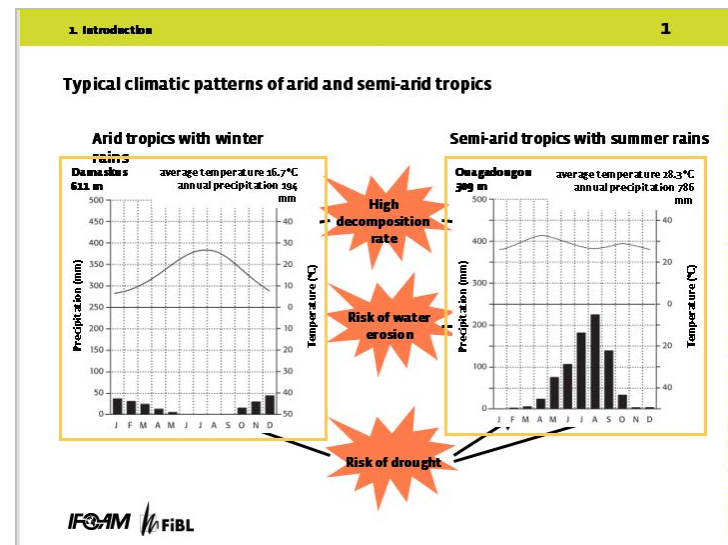
Average temperatures in the semi-arid and arid tropics are higher than in the humid tropics. These warm temperatures result in high water-evaporation levels from both the plants (transpiration) and the soil surface itself (evaporation), reducing humidity and soil moisture. While in humid climates evapo(transpi)ration is less than rainfall, in dry climatic zones water losses from evapotranspiration can exceed rainfall, sometimes reaching up to twice the level of rainfall. In most dry areas, hot, dry winds occur, increasing the already high evaporation rate. These strong winds often prevent moisture-bearing air from penetrating the soil. The resulting water scarcity significantly limits agricultural yields. However, when the level of moisture in the soil can be maintained above a certain level, the semi-arid conditions become suitable for cropping, since high day and low night temperatures prevail. However, if temperatures climb to 40 °C or more, plant productivity is limited. High temperatures and strong irradiation are harmful to soil organisms and therefore have a negative effect on the fertility of the soils.

#### Lessons to be learned:

- Water scarcity is the most limiting factor for agriculture in the arid and semi-arid tropics.
- Climate is variable and rainfall is unreliable.
- Soils in the drylands are vulnerable and tend to degrade.
- Building up and protecting soil organic matter is crucial for soil fertility.
- Agroforestry has considerable potential. However, it must be carefully adapted to local climatic conditions.
- Ecosystem diversity is an important tool for managing pests and diseases.

#### Group work: Local climate

Divide the participants into groups and let them draw graphs of the climatic pattern of their region (see transparency 1.1 (1)). Ask them to explain through individual presentations the challenges for agriculture under their own climatic conditions.



TRANSPARENCY 1.1 (1): CLIMATIC PATTERNS OF ARID AND SEMI-ARID REGIONS

# 1 Introduction

Despite the generalizations above, it is important to remember that the climate of the arid and semi-arid tropics is very variable and the rainy seasons unreliable. The distribution of the rains, as well as the total amount of rainfall, varies considerably from year to year. There is sometimes a complete absence of rain, particularly in the Sahel, where rainfall levels have declined by 20–40 % over recent decades. Increases in the frequency and severity of drought contribute substantially to dryland degradation and desertification, and have resulted in serious migration problems.

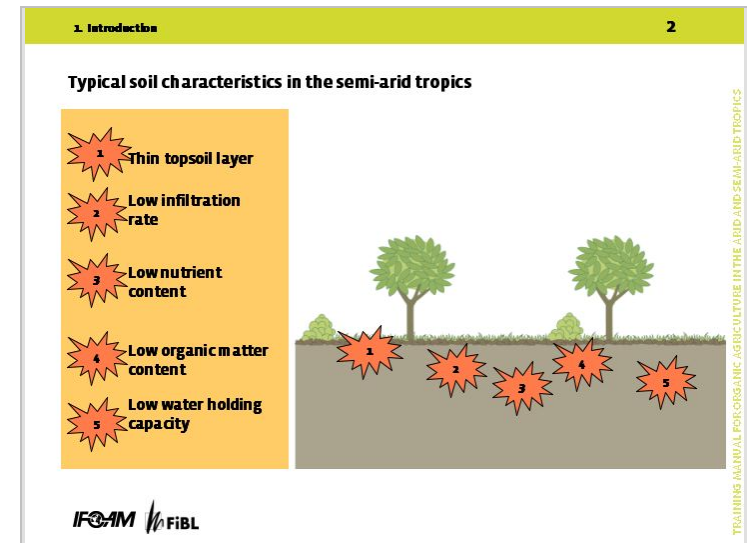
## 1.1.2 Soils of the arid and semi-arid tropics

The soils in the tropical drylands vary quite widely, as do their respective climatic and geological conditions. In spite of these differences, all of them are highly influenced by two factors: low annual rainfall and high temperatures. These give rise to two problems. First, these temperatures promote rapid soil organic matter oxidation which, together with low nutrient content, makes the soils vulnerable to overexploitation. Second, hot temperatures can lead to soil crusting, especially on bare land, which in turn leads to impermeable soil surfaces. As a consequence, a large part of the rainfall is lost as runoff.

The predominant soils in the arid tropics are Aridisols (mostly dry mineral soils with a high-pH, sometimes calcitic, sodic or saline). Moisture is the main limiting factor on plant growth in these soils. When there is sufficient water, the high calcium carbonate content may cause some fertility problems, such as reduced availability of phosphorous and increased salinity and alkalinity. Aridisols with high gypsum content can cause engineering problems for irrigation projects.

Psammments and lithic soils are commonly found in both arid and semi-arid tropics. They are dry, sandy soils with low water-holding capacities, with low nutrient exchange and water retention capacities. Poor soil structure makes these soils vulnerable to wind erosion. The agricultural potential of these sandy soils depends on the availability of sufficient water for crop cultivation and provision of sufficient nutrients. If appropriately managed, sandy soils can be highly productive.

Solonetz and Solonchaks, both saline soils, are formed where salts are present in moderate to high amounts in the parent material of the soil or where there is a saline water table close to ground level.



TRANSPARENCY 1.1 (2): GENERAL CHARACTERISTICS OF SOILS OF THE SEMI-ARID TROPICS

### **Discussion: The difficulty and potential of cultivating the typical soils of the semi-arid tropics**

Collect samples of common soils in this region and exhibit them in the classroom. Ask the participants the following questions:

- Which of the exhibited soils do you know? What are their properties?
- What are the typical problems that arise when cultivating these soils?
- What is the agronomic potential of these soils?
- What (climatic and human) factors influence the productivity of the soils?

For further information about soil structure, soil organisms and soil testing consult chapter 3 on "Soil fertility" in the Basic Manual.

## 1 Introduction

Vertisols are mineral soils that have 30% or more clay and exhibit deep wide cracks when dry. They are often called heavy, cracking clay soils. When these soils become moist, the soil volume expands. This shrink/swell action can create serious engineering problems and generally prevents the formation of distinct, well-developed soil horizons.

Typical soils of the Mediterranean zones are Phaeozems, Rendzinas, Kastanozems and Cambisols. As these all have a high humus content good yields are possible when water is available.

# 1 Introduction

## 1.2 The influence of climate and soil conditions on farming practices

Water shortages and vulnerable soils are the most common limiting factors for agriculture in the semi-arid and arid tropics. In regions where irrigation is not feasible, the only production systems that can be sustained are those that improve water efficiency and soil fertility. Effective and efficient water management is therefore of paramount importance.

### 1.2.1 Water management

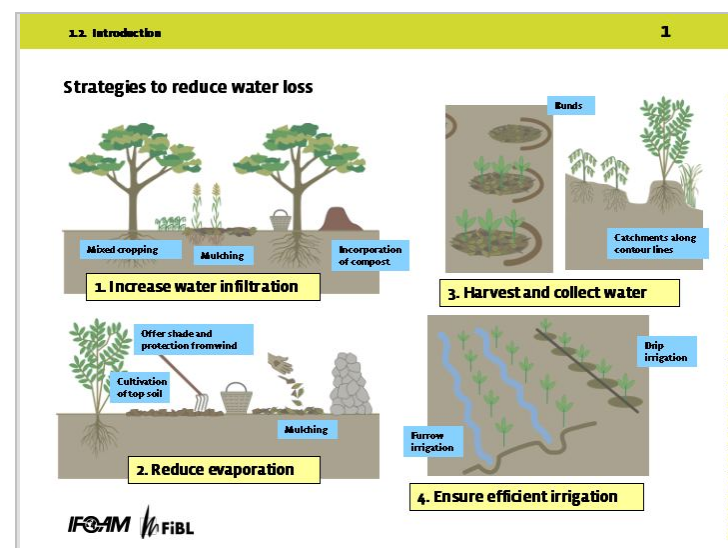
Water collecting, water saving and soil moisture conservation strategies should be given the highest priority in semi-arid and arid regions. As water is the limiting factor for crop yields, every drop of rain or irrigation water should be retained in the agricultural field and losses through evaporation and runoff must be avoided. Even where irrigation water is available, water application should be kept to the minimum, in order to avoid problems of salinity and the over-exploitation of water bodies (especially ground water). To improve water use efficiency the following strategies can be applied:

- 1. Increasing water infiltration:** It is important to achieve maximum infiltration of rainfall water through the soil surface and top layer. Crust formation and clogged soil pores (often a result of soil erosion) promote water runoff, and should be prevented. The application of compost, the incorporation of plant material in agroforestry systems, as well as mixed cropping and mulching are all important means to build up organic matter in the topsoil layer. This will increase infiltration and water conservation. Cover crops and mulches improve soil structure and prevent water from running off too easily.
- 2. Reducing evaporation:** Reduction of water evaporation is essential. Mulches and tree canopies decrease evaporation by shading. Hedges slow down winds and also reduce evaporation. Regular hoeing of the topsoil interrupts the soil capillarity.
- 3. Water harvesting and collection:** To avoid water losses after strong rains, surface runoff should be collected with bunds and brought close to the plant roots. Water runoff from fields, roads or roofs can also be directed into ponds, tanks or wells for storage. To reduce runoff from the field, the water can be retained with dyked furrows, micro-catchments, or through field contouring. Runoff water that has left the fields should be caught by terraces, bunds on contour lines, dams and hedges, and collected if possible.

### Sharing experiences: Applied methods for water management

Invite the participants to speak about their experiences with water management by asking the following questions:

- What effective water collecting systems are used in the participants' home regions?
- Which methods increase the soil infiltration rate?
- Which methods save irrigation water?
- What other methods to avoid soil loss are known?



TRANSPARENCY 1.2 (1): METHODS FOR WATER CONSERVATION

For additional basic information about water conservation see chapter 3.5 of the Basic Manual.