

Organic Citrus: Challenges in Production and Trade

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Organic citrus still is a niche and makes about 1-2% of the global citrus production. However, it is increasing year-by-year in parallel with the increasing demand for organic products. Organic citrus offers creative and circumspect producers and exporters excellent opportunities for success. Key success factors are specific know-how, access to production inputs and to markets. The main production areas of organic citrus – oranges, mandarins, grapefruit, limes and lemons – are Latin America, North America, Europe and Near East. Many tropical countries in the Americas are extending organic citrus production. What are the challenges for organic citrus production and trade?

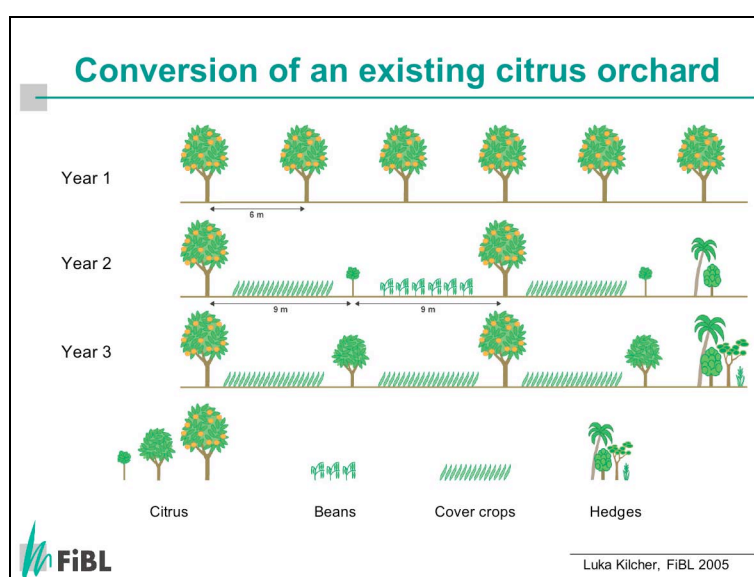
1. Agro-ecological and site challenges

Citrus trees can be grown over a wide range of climatic and edaphic conditions but proper site selection remains the key to successful organic production. An important factor for economically viable yields is the availability of good quality irrigation water, even in the Humid Tropics. Therefore before selecting a site for organic citrus production, not only soil, but also water analysis is essential.

Most organic growers are in the situation of **converting an already existing plantation** into organic production (chart 1). Thus, the first and most important conversion step is the design of the organic orchard based on the following ecological principle: the higher the diversity of species, the higher the stability of the agro-ecosystem. The high degree of biodiversity creates the habitat for natural enemies of pests. One of the most important tasks on the way to organic production is to find strategies on how to increase bio-diversity:

- Create a diverse mosaic of citrus units and other crops from an existing plantation. In case of narrow planting distances it will be necessary to cut down several rows of citrus trees and instead plant hedges or other fruit trees, creating citrus plots of about 1-2 ha size (or smaller).
- Between the rows (in the alley-way) it might be possible to intercrop with pasture (sheep), beans or other crops. However, this might be difficult in case of older plantations where the trees are adapted to a certain management; in this case, a step-by-step procedure is recommended (introduction of new crops and elements year by year), because the root systems of the citrus trees have to adapt to new competition in the soil.
- The density of existing plantations might be decreased to 8 x 8 m (156 trees per ha) if there is a too high density. High-density plantings reduce ventilation and light interception and thus increase disease pressure. Lower density plantings are better adapted to the organic production system.

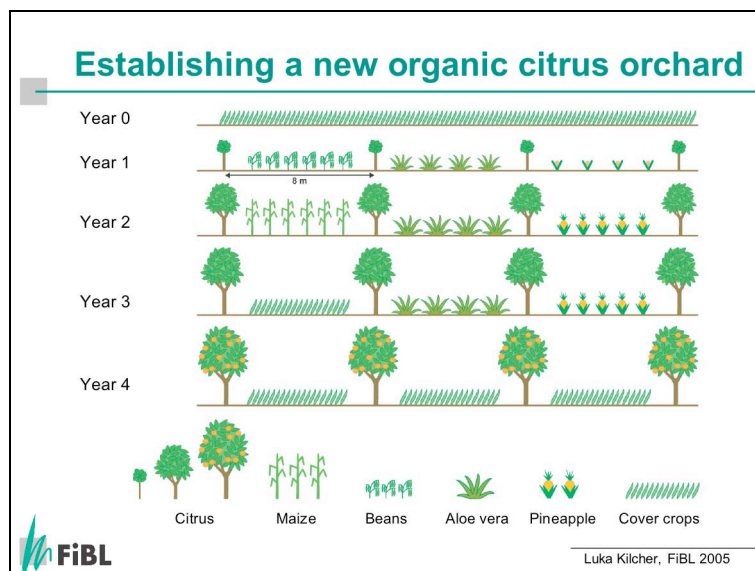
Chart 1: Conversion of an existing citrus orchard



Farmers who can plant a **new citrus orchard** have the advantage that they can right from the start create an optimal organic system, applying the following strategies (chart 2):

- Creating a diverse mosaic of citrus units, mixed with ecological compensation areas such as specific cover crops in the alleyway and under the trees as well as hedges and wild flower fallow plots around and in the orchard;
- Intercropping: For most organic farmers it is useful not to rely on the citrus production alone. The space to grow additional crops like beans, maize or Aloe vera is limited to the alleyway. Aloe vera is quite shade tolerant and has been planted among citrus and other fruit trees with success. Intercropping can also be limited for the start-up phase of the citrus trees (e.g. combination with pineapple). Producers who select an intercropping system have to be aware that cultural practices can be considerably affected compared to an orchard with citrus only. Much more manual work is necessary in intercropping systems. However, it increases diversity and provides additional income.
- A plant density, which permits optimal light interception and aeration. Tree spacing for new organic oranges should be around 8 x 8 m (156 trees per ha), for grapefruit even 1 to 2 m more space; for limes and mandarins less space. Organic cultural practices are considerably less troublesome in low-density plantations: organic growers need space to saw in a cover crop and to care for it, to apply compost, to manage pests and diseases.
- Some months before planting citrus trees, organic growers can sow in vigorous legumes (e.g. *Canavalia sp.* or *Cajanas cajan*) and mulch them shortly before planting the citrus trees. Then the soil will be enriched with organic matter and nitrogen both stimulating soil microbial activity. Before planting the irrigation system is laid out, if needed.

Chart 2: Establishing a new organic citrus orchard



As examples in Eastern Cuba or the Mexican peninsula of Yucatan show it is possible to produce organic citrus successfully also in polycultural systems. In agroforestry systems citrus trees are mixed with other fruit trees, leguminous trees, banana, palm trees, coffee and cocoa, beans and other species covering the soil.

2. Agronomic challenges

The building-up and maintenance of a fertile soil is a central goal in organic citrus growing. Careful soil management is especially important in the humid tropics, where heavy rainfall and strong solar radiation accelerate soil degradation, leaching of nutrients and erosion. In the grower's practice there are three main agronomic questions related to soil management and the conversion to organic management of citrus orchards:

1. How to improve soil fertility?
2. How to cover the soil and how to control undesired plants?
3. How to provide sufficient nutrients to the soil and citrus trees?

The basic tools of organic soil management are interdependent and influence tree health, tree development, fruit yield and quality. Organic citrus growers therefore combine these three questions. Relevant soil management techniques for organic citrus orchards include:

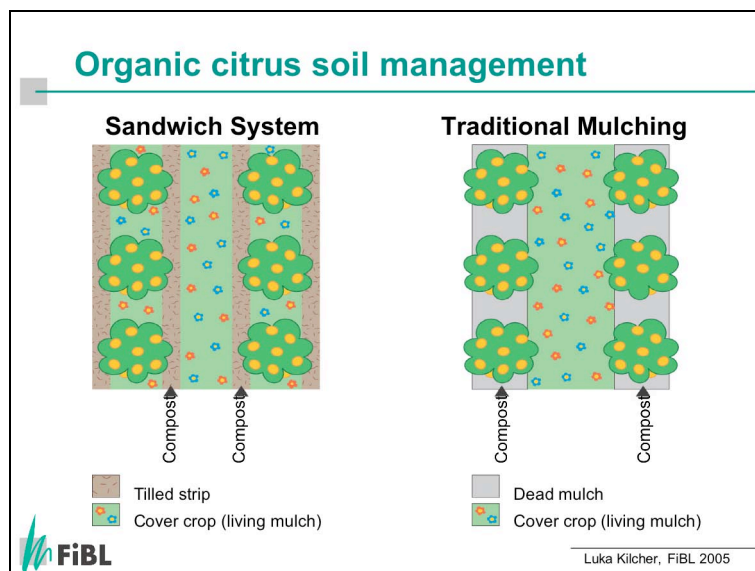
- Use of cover crops (understorey plants) or mulching,
- Agroforestry and intercropping methods;
- Mechanical techniques for weed control.

Soil cover systems

A permanent soil cover is an important component of the organic orchard cultivation system. Locally adapted leguminous crops for the humid tropics, such as *Teranamus labialis*, *Arachis pintoii*, *Neonotonia wightii*, help restore degraded soils very fast, they successfully suppress weed, fix nitrogen and prevent erosion. To avoid strong competition between the cover crop and the citrus suitable management of the cover crop is necessary. Measures are:

- Mulch the cover crops before the dry season to prevent competition e.g. for water.
- Reduce the percentage of living soil coverage to optimally adapt the soil cover system to the soil, the crop and the climate conditions. One possible solution is the sandwich-system (chart 3), which is easy feasible for young plantations and in orchards with deep soils where tree roots are not too close to the soil surface. However, in orchards for-merely established with herbicides and soil erosion "dug out" citrus roots are sometimes present. In this case it would be too harmful for the trees to change to a cultivation system. In these cases systems with cover crops or organic mulches should be used. In such orchards, the traditional cover crop system is the suitable method.

Chart 3: Organic citrus soil management



Weed Control = Soil Cover + Management of Undesired Plants

Organic citrus growers distinguish between desired and undesired cover plants and speak of cover crop management instead of weed control. They do this by sowing competitive cover crops (legumes and other desired plants) to suppress undesired plants like perennial grasses as *Panicum sp.*, *Paspalum sp.*, or *Amaranthus*. There is a large number of plants, which provide worthful habitats for beneficial insects (especially by bearing flowers) or/and improve soil conditions without competing with citrus trees (e.g. *Centrosema pubescens*, *Desmodium*, *Cassina obtusifolia* and *Alysicarpus vaginalis*). Such soil cover plants are enhanced in organic citrus production. However soil cover plants can also be habitat for pests and have to be selected carefully. Undesired plants are best suppressed by:

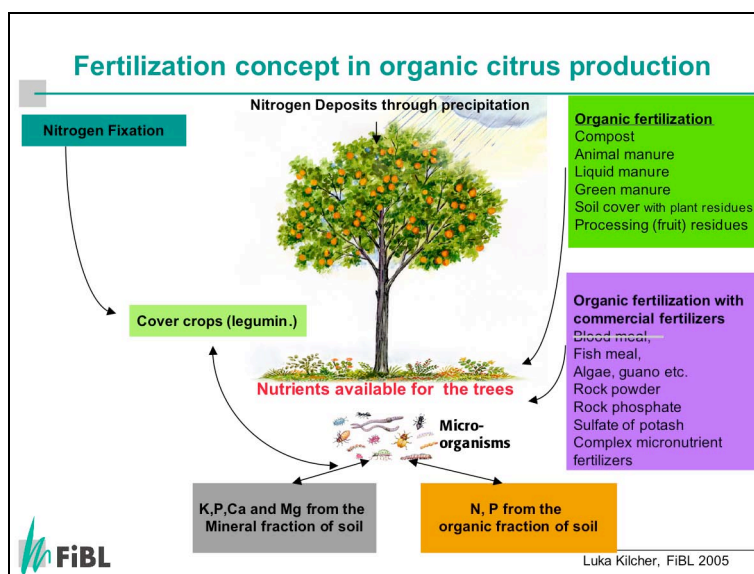
- Regular mowing the (leguminous) cover crops. Different types of mowers are available most of them operated by a power take off from the tractor. Specially constructed mowers for organic orchards permit mowing in the alleyway and under the trees with sensor controlled bat wings.
- Hand weeding if it begins to dominate cover crops or citrus trees.
- Mulching and traditional discing.

Supplying nutrients and organic fertilization

Fertilization in organic citrus growing is based primarily on compost. Only if necessary – on the basis of soil and leaf analysis – additional organic commercial fertilisers are brought in. Suitable strategies have to be planned according to the soil condition e.g. applications have to be applied 2-4 weeks before the

expected nitrogen demand of the trees (2-4 weeks before flowering) because mineralisation of nitrogen from compost is slow. If nitrogen demand is important (> 50 kg /ha) nitrogen supply cannot be given with compost only (chart 4).

Chart 4: Fertilization concept in organic citrus production



Pest and Disease Management

Most mites, insects and nematodes, that attack citrus cause economic damage only occasionally. Many pest problems in conventional citrus production are related to the almost complete elimination of natural enemies by the excessive use of synthetic pesticides. Organic growers make use of natural control agents to a maximum possible. Many pest problems can be controlled effectively with biological control methods. Generally, bio-control methods and agents help to decrease the level of pests rather than to eradicate them. Pest and disease management in organic citrus production relies with priority on indirect control methods.

The pressure of pests and diseases in organic citrus groves depends very much on local conditions and indirect management methods. Favourable conditions are:

- Ideal design of orchard (wide distances for good ventilation; see above);
- Mosaic of production units;
- Diversity of crops and diverse habitat;
- Resistant varieties;
- Know how and experience of farmer;
- Local availability of bio-control agents etc.

Water Management and Irrigation

Citrus trees are water-conserving plants and thus capable of withstanding long periods of drought as they have leaves covered with epicuticular wax. However, even in humid subtropical and tropical regions with sufficient total rainfall, irrigation is important during the dry periods to achieve good yields. Regular, moderate irrigation reduces physiological fruit drop, improves flowering, fruit set, fruit size and juice content. On the other hand excessive irrigation can affect fruit quality negatively as the contents of soluble solids and acidity decrease due to a dilution effect.

High water quality (filtered preferably) with absence of chemicals, heavy metals, toxic bacteria and with low salinity levels is essential. Regular water analysis is compulsory for organic certification.

Pruning

As the trees grow, the inner and lower branches become shaded. Most of the fruiting occurs in the outer periphery of the canopy whereas the inner parts suffer from shading having bad or no fruit set and quality. This problem can become especially severe in high-density plantings. Therefore, a yearly pruning is essential to maintain light and air penetration because a good aeration also contributes to the prevention of pests and diseases. It is advisable to maintain the tree height at no more than twice the planting distance in the row.

3. Economic and marketing challenges

Economic and commercial considerations are for the majority of citrus producers the most important factor for a decision in favour of organic production. The decision for conversion to organic production is always related to future development of a farm and to increasing the farmer's income.

Economic challenges

- **Additional labour:** Find additional labour for intensive organic management practices (e.g. compost production and application, establishment and care of cover crops). The fact, that organic production needs additional labour has a socio-economic advantage: organic farming provides more incomes.
- **Investments:** Especially for larger farms (more than 10 ha), significant investments in compost production (compost mixer etc.), compost application (manure distributor) and soil management (seeds for leguminous cover crops, mover) may be necessary. A solution might be the cooperation with other organic farmers in the area for sharing of equipment.
- **Production inputs:** In some countries organic farming still does not yet get enough support from research and extension. The access for organic production inputs in such countries often is very limited. Producers have to find ways how to substitute expensive imported inputs by low-cost alternatives (e.g. own production of seeds for cover crops).
- **Production costs:** There are factors that increase (e.g. compost) and factors that decrease (e.g. plant protection) production costs.
- **Yields:** During the conversion process, yields may be lower and investment costs higher. The more intensive the farmers produce before conversion, the higher will be the yield-depression. In many cases, yields in organic production recover after a period of 2-5 years. Organic production, however, also may lead to higher yields compared to conventional production due to a more efficient use of local available resources.
- **Know-how and motivation:** It includes the planning of the conversion, the selection of suitable planting material and seeds for cover crops, the management of the cover crops, pests and diseases, the planning of investments and the marketing of organic citrus as well as possible associated crops. Where there is a motivation to gain additional know how and to test own organic variants for a specific citrus farm and where there is flexibility for additional labour, organic citrus production will be a success.

It is therefore important to plan carefully the conversion and to seek the cooperation with experienced advisors and farmers. It is recommended to start conversion planning at least one year before the conversion and first certification.

Marketing and trade challenges

More and more consumers want to know what they are eating, and want foods to be healthy and produced without harming the environment. For these reasons, the demand for organic products is now growing worldwide. Those wishing to export organic products successfully need accurate information on the potential of the organic market and the conditions for market access. The organic market is highly specific and therefore needs to be studied closely. At the same time it is a market, which offers creative and circumspect producers and exporters excellent opportunities for success. There is a number of questions that producers put themselves before they start an export project.

Chart 5: Organic citrus trade challenges

Organic citrus trade challenges



I would like to have access to the promising organic market.


1. What is my potential on the export market?
2. How can I find clients, what prices do they pay?
3. Which organic regulations do I have to conform?
4. Who is going to certify my farm and my products?
5. How do I have to proceed for exporting my products?
6. What will be my course of conversion?
7. How can I best manage my farm with organic methods?
8. Where do I have to invest?

Producer

Traders?

Label?

Certifier?



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Successful marketing needs **strong partnerships** and fairness though the complete value chain. The producer's commitment to organic production needs investments in know-how and sustainable production techniques. This is only affordable if producers receive the commitment from processors and traders up to the final client. Sometimes in organic production an excellent internal quality of the citrus (or other products) is achieved, while it is not possible to achieve the same external quality as in conventional production (e.g. damages on citrus fruit caused by *acar*). Such phenomena need the understanding of the clients.

Other important challenges of organic trade are:

- **Certification:** Consumers expect extra (internal) quality from organic products and are ready to pay a premium price for it. In order to make this premium quality credible, it has to be certified by an independent organism. Independent certification is a condition for market access. For many farmers in developing countries it is a big challenge to fulfill the quality requirements and to handle the certification issues. Moreover, certification is a considerable cost factor. An internal control system with local inspectors is a valuable solution for a small farmer group.
- **Volumes and continuity:** In many cases, the quantity of a single organic farm is too small for a client. In other cases, the harvest of one organic farm or a farmer group is too big for a small organic client. Cooperation between farmers and though the whole value chain is the answer to this challenge.
- **Distance from production to market:** The processing (juice) and packing (fresh fruit) facilities should be nearby to the citrus fields. This is especially true for fresh fruit production because organic citrus producers don't use post-harvest fungicide applications. Some organic standards do not allow flight transport, which is a challenge for fresh fruit production, considering that post-harvest treatments for fresh organic citrus are not as effective than fungicide applications in conventional production.
- **Marketing of all farm products:** organic farmers promote diversity in production. Consequently, they aim to sell all farm products as organic, not only the main cash crop (e.g. citrus). This needs specific know-how, infrastructure and market access for all products.

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