Organic Coffee, Cocoa and Tea

Market, certification and production information for producers and international trading companies

FiBL
Research Institute of Organic Agriculture
(Forschungsinstitut
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Part A:

Market of organic Coffee, Cocoa and Tea

1. Market for organic coffee

1.1 Production of Organic Coffee

1.1.1 World production of coffee

Coffee is grown in over 50 developing countries. Currently the coffee market is suffering from oversupply, with prices at a corresponding historic low. New producers, especially Vietnam, have embarked on major coffee production ventures, which have positively flooded the market. World production in 2001/2 is 114.5 million bags (6.87 million tonnes), whereas consumption stands at only 108 million bags (6.48 million tonnes). Added to this unsold stockpiles remain, which also depress the market.

In recent years coffee has developed from a luxury drink to a mass-market product. Countries with comparative cost disadvantages, especially the traditional small-scale structures of coffee production in Latin America (e.g. Colombia, Mexico) are worse affected by this development than large-scale producers in Vietnam or Brazil. 66% of world production is Arabica and 34% is Robusta.

Table 1: 10 largest exporters of green coffee beans in tonnes (ICO-members)

Country of export	1999	2000
Brazil	385,597	300,412
Vietnam	129,057	193,470
Colombia	166,594	152,923
Côte d'Ivoire	36,635	98,490
Mexico	72,627	88,395
Indonesia	84,410	86,559
Guatemala	78,006	80,771
India	60,211	74,778
Honduras	33,110	47,986
El Salvador	31,497	42,273
Rest of world	342,480	312,620
World total	**1,420,225**	**1,478,677**

Sources: ICO

1.1.2 World production of organic coffee

Coffee is one of the most important organic products exported by developing countries. It is produced mainly in Latin America. Countries already producing organic coffee are:

- Latin America: Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Peru, Trinidad and Tobago, Venezuela.
- Africa: Ethiopia, Kenya, Madagascar, Malawi, Tanzania, Togo, Uganda
- Asia: India, Indonesia, Papua New Guinea, Philippines, Sri Lanka

Organic coffee production first took off in those countries where producers lacked the resources to purchase agricultural inputs (fertilizers, pesticides). This applies most of all to places where small farmers are organized in cooperatives (Mexico, Colombia, etc.). For some long time large-scale intensive producers in Brazil, for example, showed no interest in organic production. Today this has changed: the high premiums for organic coffee are nudging increasing numbers of large-scale producers towards conversion.

Today, organic coffee is an important export for Mexico, Bolivia, Guatemala, Peru, Nicaragua, Tanzania, Brazil, Ethiopia, India and Madagascar. Production is mostly under an ecological agroforestry management system that creates a valuable alternative to deforestation. Several African countries, for example Uganda and Ethiopia, recently started organic coffee programmes.

Table 2 shows the global production capacity of organic coffee for export. For 2000, experts estimate this to be about 12,000 tonnes, and for 2001, about 30,000 tonnes. Roughly 50% of the world supply of organic coffee is produced by small farmers' organizations which are members of FLO-International (Fair Trade Labelling Organization). The other half of the world production is supplied by small farmers' organizations which are not FLO-registered although some are members of Fair Trade programmes, and by private small, medium and large-scale farmers not belonging to Fair Trade programmes.

Table 2: World production capacity of organic coffee in tonnes, 2001 (estimations)

	Total Organic	Other Fair Trade and non Fair Trade	FLO-registered Fair Trade Organic
Total	**30,000**	**15,000**	**15,000**

Source: FiBL

Unfortunately there are no global production statistics other than for FLO-registered production and a certain amount of data from organic certification companies. Therefore the figures in Table 2 are incomplete: they do not include figures for non-FLO-registered Fair Trade or for non-Fair-Trade organic coffee.

Moreover it should be pointed out that the production capacity of organic coffee does not correlate to the quantity of organic coffee actually exported, because the producers cannot necessarily sell the entire organic coffee harvest as organic, and instead market part of it conventionally.

Naturland Association is one of the most important promoters of organic coffee production in Latin America and its export to Europe. Naturland supports and certifies cooperatives and commercial farmers. More than 80% of certified Naturland coffee is produced by small-scale farmers

Table 3: FLO-registered Fair Trade Organic Coffee, in tonnes 2001

Country of export	FLO-registered Fair Trade Organic
Bolivia	780
Brazil	0
Cameroon	40
Colombia	445
Congo (Zaire)	0
Costa Rica	0
Cuba	0
Dominican Republic	25
Ecuador	175
El Salvador	515
Ethiopia	0
Guatemala	2,115
Haiti	0
Honduras	295
India	0
Indonesia	300
Madagascar	0
Malawi	0
Mexico	7,380
Nicaragua	250
Papua New Guinea	225
Peru	2,430
Philippines	0
Sri Lanka	0
Sumatra	0
Tanzania	0
Thailand	5
Togo	0
Trinidad and Tobago	0 0
Uganda	
Venezuela	20
Total	**15,000**

Source: FLO-International

Mexico is the largest producer of organic coffee

Mexico is one of the largest organic coffee producers in the world, with a total output of 86,250 60-kilo sacks for the two-year period 2000/2001. And in terms of acreage, coffee is Mexico's main organic product, which represents 66% of the total area under organic management. Organic coffee in Mexico is mostly harvested by small indigenous farmers and sold in the world's biggest supermarkets and coffee shops. Organic certification for Mexican coffee began in 1962 and organic Mexican coffee is consumed today in the United States, Germany, Switzerland, Japan, Italy, Denmark, Spain, France and Britain. According to the Mexican Coffee Council, the organic coffee growers are mostly indigenous farmers in Chiapas, Oaxaca, Veracruz and Guerrero states. Though the organic coffee trade represents just one percent of global sales of coffee beans, for the Mexican growers it returns healthy profits. Some 20,000 small farmers and their families benefit from the higher price commanded by their organic product.

Table 4: Naturland Association: Hectarage of organic coffee and number of Naturland coffee growers (2001)

Country	Area organic coffee	Number of Naturland producers
Bolivia	2,785	1,435
Brazil	685	1
Ecuador	805	90
El Salvador	240	1
Guatemala	1,400	990
Mexico	30,560	11,545
Nicaragua	610	175
Peru	19,205	6,165
Total	56,290	20,402

Source: Naturland

organized in cooperatives. The requirements with regard to inspection and certification of organic production of small-scale farmer cooperatives have risen drastically during the last few years. In order to meet these requirements Naturland cooperated with IMO Switzerland to publish a manual on how to set up an internal control system. The amount of organic green coffee certified by Naturland in 2000 is 18,500 tonnes (1997: 900 tonnes). Naturland would like its projects to contribute to enhancing the competitiveness of small farmers' associations in order to ensure the continuity of their production.

1.1.3 Organic and Fair Trade

Most organic coffee producers are organized in producer groups (cooperatives and other forms of organization), and most organic coffee producers are connected to a Fair Trade programme. There is more Fair Trade coffee than organic coffee on the European market. In the USA, organic coffee is more important than Fair Trade coffee. The international Fair Trade register compiled by FLO-International contained 177 producer groups in November 2001. Sixty-eight producer groups or 38% produce organic coffee, and ten producer groups are in conversion.

The amount of coffee a group can supply is not necessarily the amount available for the Fair Trade and/or organic market in Europe for a variety of reasons such as deficiencies in quality, taste and certification or disagreements with clients. For coffee with a Fair Trade label, one of the most important reasons is lack of demand on the market. The Fair Trade market is still very small, and all producer groups produce much more than that they can sell under Fair Trade conditions.

1.2 Market for Fair Trade and organic coffee

North America and Europe are the largest markets for organic coffee. In both continents, organic coffee – unlike the conventional coffee industry – has experienced notable growth in recent years.

Table 5: Availability of organic and Fair Trade green coffee in exportable* quality (tonnes)

	1999	2000	2001
Fair Trade coffee	63,700	111,500	97,000
Organic Fair Trade coffee	8,900	10,300	15,300
Percentage of organic grown coffee	14%	9%	16%

Source: Naturland

* The definition of 'exportable' has been diluted in recent years: for low-priced coffee, standards have been lowered. For AA-quality coffee, on the other hand, the same high standards have been retained.

1.2.1 Export and retail value

Global certified **organic coffee** exports amounted to 15-18 million pounds for the year 1999/2000. The global retail value of organic coffee is approximately USD 223 million. Organic coffee retail value has demonstrated steady 20% annual growth rates in the last few years.

Globally, **Fair Trade coffee** exports were approximately 29 million pounds for the year 1999/2000. The global retail value of Fair Trade coffee is approximately USD 393 million. Organic certification is steadily gaining in popularity among Fair Trade coffees, rising from 1% of total sales in 1996 to 36% in 2000.

Table 6: Organic and Fair trade coffee sold in Europe (tonnes)

	Fair Trade	Fair Trade organic
1999	11,800	2360
2000	12,300	2460

Sources: Agro-Eco, FiBL

US Market volumes

The US handles about one-quarter of global coffee imports = GBP 2.45 billion or USD 18.5 billion (Sustainable Coffee Survey of the North American Speciality Coffee Industry, July 2001). Compared to 1999, gross sales of organic coffees for 2000 increased by nearly 50% in the USA. North American coffee importers sold approximately 4.9 million pounds of organic green coffee with a total value of USD 184,000. The majority of these coffees are sold through grocery outlets (health food stores) rather than through speciality coffee stores. A rough estimate of the total North American retail market for certified organic coffee is USD 122 million.

A certain amount of Fair Trade coffee is still sold without a label (in World Shops, etc). The overview in Table 7 includes only labelled sales.

Table 7: Estimated total Fair Trade labelled organic sales per country in 2000

Country	Fair Trade roasted (tonnes)	Total green roasted (tonnes) (1.2)*	Organic green direct import (tonnes)	Total green direct import (tonnes)	Percentage organic on direct Fair Trade import
Austria	300	360	70	290	24
Belgium	550	660	80	330	23
Canada	150	190	20	70	34
Denmark	740	890	610	1250	49
Finland	90	110	0	0	0
France	500	600	0	90	0
Germany	3070	3690	1860	2930	63
Great Britain	1330	1600	120	1250	10
Ireland	60	70	0	0	0
Italy	400	480	130	390	33
Japan	10	10	40	40	84
Luxembourg	60	80	0	0	0
Netherlands	3100	3730	1270	4520	28
Norway	130	150	20	30	67
Sweden	220	260	40	70	63
Switzerland	1400	1660	130	220	24
USA	220	260	970	1030	94
Total sales roasted coffee	**12,330**	**14,800**	**5,360**	**12,510**	

* Conversion ratio green coffee to roasted coffee is 1.2 : 1

Sources: FLO-International

1.2.2 Market shares

Globally, about 0.5% of all coffee produced is sold as organic. In Europe, where organic food has a market share of 2-3%, organic coffee accounts for 0.5% of total coffee sales. Market share is highest in Switzerland (more than 1%), due to the generally high interest of consumers in organic food and due to the fact that the two main supermarket chains both sell organic coffee.

In Europe, about 25% of Fair Trade coffees are sold as organic. The proportion of organic coffee is steadily growing, because the price differential over conventional coffee is so great that the organic premium barely registers. In the EU, Fair Trade markets are considerably larger than those in the US, and organic coffee is a strong seller. In the US shade coffee is a strong seller, whereas in Europe and Japan it is still relatively novel. Shade coffee is not organic; it means simply 'grown in shaded forest settings'. Shade coffee is mainly sold under the Eco-OK label.

1.2.3 Distribution channels

The main distributors of organic coffee in Europe are natural food stores and World Shops. There are still only a few countries where organic coffee is sold in supermarkets: This is true for example of Germany, the Netherlands and Switzerland, where the two big supermarket outlets Coop and Migros are selling their own organic coffee. The reason for the weak interest of European supermarkets is the high price differential between organic and conventional coffee. This is even more problematic for organic Fair Trade coffee, because price differentials are higher still (see Chapter 1.3).

More than 80% of organic coffee is sold directly to households (end-consumers), and less than 20% to restaurants and canteens. Growth potential is larger for sales to households than to restaurants, where a very small percentage of the coffee sold is organic, as yet. The reason for the weak interest of restaurants in organic coffee might be the extremely low price of conventional coffee; organic coffee appears to be expensive compared to conventional. Where canteens are concerned, their reservations about selling organic coffee are also fairly strong because offering organic coffee would compel them to offer other organic items, which would be at odds with the tight constraints on canteen menu budgets.

1.2.4 Organic coffee imports

In table 8 an overview is given of organic coffee imports per country. The countries are arranged in order of import volumes. Imports are stated in tonnes.

Table 8: Green organic coffee imports per country in Europe in tonnes (year 2000)

Country	Arabica	Robusta
Germany	3,200	320
Sweden	3,200 – 3,500	0
The Netherlands	2,300 – 2,900	85
Denmark	1,700	100
France	200	500
The UK	434 – 454	50
Belgium	295	0
Austria	150	0
Italy	150	0
Switzerland	120	18
Norway	62	0
Spain	17	0
Europe total	**12,000***	**1,000***

* Rounded

Sources: Agro-Eco, FiBL

Among the top importing countries, Sweden and Denmark stand out. Scandinavians drink a lot of coffee, but these markets are small and therefore more difficult to penetrate. The Netherlands is in the upper part of the list, due to its important function as the port of access to Europe. About 80% of imports in The Netherlands are transported to other countries in Europe. Another remarkable thing is that France is by far the most significant importer of Robusta coffee. The market for Robusta coffee in many European countries is increasing due to growing consumer demand for espresso coffee. The rising imports of Robusta into Europe can be attributed to the fact that there is higher overall demand for cheap coffee; Robusta is increasingly blended into cheap coffees.

FLO-International only has information about Fair Trade labelled organic green coffee, which is less than the total organic green coffee supplied to Europe. A source of non-Fair-Trade organic coffee is, for example, Venezuela.

1.3 Prices of organic coffee

The market reality and various studies show that consumers are indeed interested in organic coffee and are prepared to pay a premium. Coffee-drinkers pay an average of 15 to 25 percent more for organic and 20 to 50 percent more for Fair Trade organic coffee than they would for conventionally grown coffee.

Table 9: European Organic and Fair Trade Coffee import in tonnes 1996-2000

Year	Total purchased Fair Trade coffee	Purchased organic Fair Trade coffee	Percentage purchased organic
1996	8,500	90	1%
1997	13,100	1,900	14%
1998	10,800	2,000	19%
1999	12,400	3,400	28%
2000	14,400	5,600	39%

Source: FLO-International

Table 10: Sources of Fair Trade organic green coffee for Europe 1998 – 2000 in tonnes

Country	2000	1999	1998
Bolivia	203	181	17
Cameroon	36	72	0
Colombia	38	0	14
Costa Rica	13	17	0
Dominican Republic	7	0	0
Guatemala	583	174	110
Honduras	12	55	0
Indonesia	424	0	0
Mexico	2,551	2,646	1,662
Nicaragua	615	173	63
Peru	1,074	289	138
Tanzania	36	17	0
Total	**5,592**	**3,624**	**2,004**

Source: FLO-International

FOB prices depend only partly on consumer willingness (FOB = Free On Board: price paid for coffee excluding transport costs from the port in the producing country to the final destination). Price setting on the organic market is not regulated as it is on the Fair Trade market. Prices are set as a result of negotiations between the seller and the buyer. They roughly follow world market prices.

1.3.1 Conventional coffee prices: extremely low

As at the end of 2001, prices for conventional coffee have reached their lowest level for 40 years. International prices for green coffee have more than halved from January 1999 to January 2002. Governments in coffee producing countries are witnessing dramatically reduced foreign exchange earnings. One of the factors behind the crisis has been oversupply in the global coffee market: supply has outstripped demand in the last three seasons. Yet, it is often forgotten that one cause of oversupply was the push to promote export earnings under market reforms.

Vietnam, for example, produced less than 4 million 60-kg bags of coffee in 1995/96. In 2000/01, it produced over 11 million. Furthermore, the crisis is not simply a matter of oversupply but also of deregulation of international and domestic markets and of shifting power balances within the global coffee chain.

For conventional green Arabica coffee beans, the world market price at the beginning of 2002 is about 45–50 US cents per pound FOB. For the Robusta coffee the world market price is about 30–35 US cents per pound FOB (depending on commodity market values plus country bonus).

Most sources in both producing and importing countries do not foresee significant price improvements in the short and medium term. Colombia, Mexico and Central America started a regional plan to cut production of low-quality coffees and to remove low-quality coffee from the market. But this has not yet impacted on prices. With current prices already close to or even below the cost of production in many countries, sustainable coffees and the premiums they fetch in the marketplace are one of the few bright spots in an otherwise dismal socio-economic situation for coffee producers. The law of the market will force many producers to give up coffee production – or to look for alternatives such as organic and Fair Trade coffee or other crops than coffee. The speciality coffee market certainly offers new openings for some producers. However, any long-term solution to the historic slide in coffee prices needs to target the 'mainstream market' as well.

1.3.2 Fair Trade and organic prices: high premiums

The organic price-mechanism is generally a premium of around 20–40% on the commodity market value. The premium is even higher if the market price falls below the cost of production.

The Fair Trade-mechanism of FLO works as follows (FLO-International established conditions for the purchase of fair trade coffee): It guarantees small farmers a fair price for their coffee (but there is no guarantee that the cooperative will be able to sell the coffee under FLO conditions, even if the cooperative is entered in the register). It provides access to affordable credit facilities and helps them to stay out of debt to local lenders. It creates direct trade links between farmers and their cooperatives and importers. It promotes a new relationship that links consumers and buyers with farmers. Buyers and sellers will endeavour to establish a long-term and stable relationship in which the rights and interests of both are mutually respected. All other customary conditions applicable to any international transaction will apply, such as the conditions of the European Contract of Coffee.

Table 11: Fair Trade and organic FOB price for coffee beans in US cents per pound (lb), as in January 2002

	Conventional price (commodity market)	Organic price (commodity market plus 20–50%)	Fair Trade price ('fix' price)	Organic + Fair Trade price ('fix' price)
Arabica coffee beans	45–50	70–95	120–126	135–141
Robusta coffee beans	30–35	60–70	106–110	121–125

Source: FLO-International, FiBL

Table 12: FLO-International premium prices in US cents per pound (lb) FOB in 2001

Type of coffee	Regular Fair Trade		Fair Trade + certified organic	
	Central America, Mexico, Africa, Asia	South America, Caribbean, Area	Central America, Mexico, Africa, Asia	South America, Caribbean Area
Washed Arabica	126	124	141	139
Non-washed Arabica	120	120	135	135
Washed Robusta	110	110	125	125
Non-washed Robusta	106	106	121	121

Source: FLO-International

In Table 11 an overview is given of prices set for Fair Trade / organic coffee. The minimum Fair Trade price is the minimum floor price, below which the coffee cannot be bought (FLO sees this as the minimum price necessary to cover costs of production). For Fair Trade plus organic coffee a standard extra premium is paid.

For Arabicas the New York 'C' contract is the basis of calculation (US cents per pound, plus or minus the prevailing differential for the relevant quality, basis FOB). For Robustas, the London 'LCE' contract is the basis of calculation (US dollars per metric tonne, plus or minus the prevailing differential for the relevant quality, basis FOB). Over these prices, there shall be a fixed premium of 5 US cents per pound (pounds=lbs; 100 lbs = 45.36 kg). For certified organic coffee, an additional premium of 15 US cents per pound of green coffee will be due. To protect the producers, minimum prices have been defined which vary according to the type and origin of the coffee.

In general premiums paid for organic coffee increase as the world market price decreases. Most coffee experts expect price premiums to remain at this level for at least a few years.

The minimum prices for Fair Trade organic coffee are as follows: Washed Arabica organic: 141 US cents per pound FOB port of origin. Non washed Robusta organic: 121 US cents per pound FOB port of origin.

1.4 Market potential

Future development of the organic coffee market is closely related to the conventional coffee market and price development. Global overproduction will continue to depress conventional coffee prices unless production capacity decreases considerably. As a consequence, the price differential between organic and conventional will stay much higher than for other organic products. However in most Latin American countries (except Brazil), price premiums for organic coffee which is not sold as Fair Trade coffee do not currently (beginning of 2002) cover the production

costs of organic coffee. It is mainly commercial organic coffee growers dependent on off-farm labour which face great problems if the harvested crops fail to pay off the expenses. Small-scale farmers who depend mainly on family labour may have more flexibility to endure this coffee crisis.

Another trend in the coffee market is the division into a cheap segment for mass-market products and an AA-quality segment for top quality. A consequence of this trend may be that countries with comparative cost disadvantages (mountain regions, small-scale farming structures) will mainly produce quality coffee whereas larger producers will gear up for cheap mass-market production.

High price-differentials will be the main limiting factor for development of the organic coffee market in the coming years, as far as organic Fair Trade and conventional Fair Trade coffee are concerned; the extremely high price differential is turning consumer opinion back towards conventional or 'just' organic coffee (turnover of non-organic Fair Trade decreased by about 10% in 2001!). The second big limiting factor is the inefficient distribution of organic coffee in Europe: as ever, the bulk of this is still sold in natural food stores. This results in smaller cargoes and more costly structures.

However, market-shares of organic coffee are expected to grow slowly in parallel with the growing organic food market. Generally, growth is expected, but not at such a rapid pace as in the general organic food market. Organic and Fair Trade coffees fill a market niche that is rewarded with a premium price and can provide superior environmental, economic and social benefits to producers. Producers, traders and industry are already benefiting, in terms of increasing sales and higher prices, from the product differentiation, improved quality and price premiums of sustainable coffees. The organic coffee segment is growing steady. There are good reasons to be optimistic about the future of organic coffee:

- Consumers have responded favourably when considering the growth trends for organic coffee.
- Consumer demand may not currently be the primary driving force behind the sustainable coffee market. Producer groups and development projects of NGOs and industry play a key role in developing organic coffee markets.
- A number of coffee traders not currently selling organic coffee expect to begin selling it. Not surprisingly, some of the largest European and North American retailers are exploring these markets as well. This represents a considerable opportunity for new business.
- Possibilities also exist for consumption in the domestic markets of some producer countries. Mexico, Jamaica, and Brazil, among others, are already successfully demonstrating this with higher quality domestic sales.
- Organic coffee will show overall growth and become well established within the expanding speciality coffee supply and sales market. But whether Fair Trade coffee will continue to play the same role must be a matter of doubt as long as the price setting is handled so rigidly. This problem will be further intensified by the fact that countries such as Vietnam will also move into organic coffee. The oversupply will work to the detriment of Fair Trade coffee, as long as the world market price fails to rise and the pricing policy is not handled more flexibly. Even now,

Fair Trade coffees have long been sold below their regulation price. All legal possibilities for devaluation have been exploited. This alone is sufficient evidence that changes are inevitable.

From the perspective of producers, organic and Fair Trade coffees provide many advantages and help to improve smallholders' risk management strategies:

- Diversification of production (multi-cropping) on a sustainable coffee farm offers several advantages to a farmer.
- Coffee certification can be an excellent hedge against market price downturns since most forms of certification can generate premiums although there are no guarantees.
- Reducing or eliminating the use of purchased inputs limits the farmer's expenses and therefore his subsequent market exposure.

However, for many producers, conversion time, preparation, and certification are costly and sometimes difficult. It is clear that professionally organized producer groups and producers with a clear strategy for quality production and a flair for coffee specialities have the best potential for the future. One of the biggest challenges for organic coffee producers is to reduce the price differential between conventional and organic to a competitive level. An important contribution of the producers in order to achieve this goal is to reduce production costs – and to accept long-term contracts with reasonable price differentials.

Is there overproduction of organic coffee?
A considerable number of producers have been unable to find a market for their certified organic coffee in the last few years. Since then, rumours of overproduction of organic coffee have run around the globe. The facts are:

- A strong demand exists for high quality organic and organic Fair Trade coffee.
- There is a danger of overproduction of Fair Trade coffee.
- There is a trend for innovations and new speciality products in the organic coffee market: Cappuccino, expresso

(increases the demand of Robusta), new blends, single variety coffees, single provenance coffees, etc.
- Low level organic certification (e.g. EU-certification without additional label) and coffee certified only as organic (not Fair Trade) might considerably limit the number of interested clients.
- Organic certification companies earn their living from their customers, which are farmers. Specifically in the coffee sector there have been cases of organic certifiers quoting an unrealistically high market potential in order to obtain orders. More responsibility on the part of organic certifiers is called for in this respect.
- The risk of overproduction is greatest when conversion is based on superficial kinds of market research. Often producers, NGOs and project coordinators fail to realize that although potential demand may appear to multiply as a range of buyers are interviewed, its true level is nowhere near as high.

- Generally: compared to the share of organic products in the total food market (2%), the share of organic coffee in the total coffee market (0,5%) is low. There is no indication that organic coffee is less attractive to consumers than organic products on average. Therefore, there are no grounds for generalized statements about overproduction of organic coffee.

Another fact is that there really are producers who sell organic coffee in the conventional market or for reduced organic premiums. What are their motivations?

- The premium for organic and Fair Trade coffee is currently very high, due to the extremely low prices being paid for conventional coffee. For some producers it might seem to be good business even if they sell their coffee for a lower-than-usual organic premium. This, of course, puts the premium for all organic coffee producers under pressure.
- A number of non-governmental organizations (NGOs) and donors are supporting producers in developing countries to set up organic coffee projects (e.g. in Nicaragua, Guatemala and Ethiopia). Such projects opened the doors for certified organic coffee production to a large number of small producer groups. However, some of these projects focused mainly on the production side and did not fully consider the marketing of organic coffee.

Growth prospects for the organic food market are excellent for the next five years. In parallel, the organic coffee market will grow. Consequently, there will be a demand for future new organic coffee projects. However, there is a danger of overproduction in the future: The growth potential for organic coffee is a temptation for several producer countries to vastly increase their organic coffee production. If production increases too rapidly, then of course prices could fall considerably. Two considerations are necessary:

1. Public or private programmes and initiatives to support organic coffee production should always consider sustainable development of the market and prepare the producers to market their organic coffee successfully.
2. If, in the rush for new business, quality and consistency are not maintained then consumers will reject organic coffee.

1.5 Obstacles and wishes expressed by market operators

One important question for organic coffee producers is: "How do I meet the requirements of the international market and importers?" Recent interviews by FiBL with coffee importers show a number of criteria for purchasing organic coffee (Table 13). Coffee quality and consistency of supply are the two most important attributes in the organic coffee trade. Producers who seek to be competitive must consider how well they can fulfil these two expectations in the future.

Table 13: 10 Major criteria for purchasing decisions mentioned by European importers (by priority)

Major criteria for purchasing decisions	Improvement measures for production and trade
1. Coffee quality and taste	Quality of coffee production, fermentation, prevention of high acid content, optimum taste, optimum varieties, new blends, good assortment and consistent coffee etc.
2. Reliability of partners	Marketing and communication, management of producer groups and producers, establish personal contacts with buyers; win-win-cooperation between producers and buyers guarantee sustainable success of a project.
3. Consistency of supply	Steady and predictable suppliers (quality and quantity)
4. Stable and fair prices for farmers, processors, traders and retailers	The current low conventional prices lead to the question: How long will it be possible to pay constantly increasing price differentials for organic as opposed to conventional? A solution would be long-term contracts between producers and buyers with semi-fixed prices (moving within a defined band, parallel to commodity market).
5. Experience of export business	Know-how, efficient export structures
6. Demand: customers are asking for it	Create unique or different product line
7. Desire to have simpler sourcing criteria and clearer marketing messages; Label confusion	Many producers, coffee traders and manufacturers are in favour of a simpler way of communicating sustainability in the marketplace, in effect a super-seal which combines organic and Fair Trade
8. Distribution and availability for consumers	The other two most plausible reasons for the lower-than-expected market responses are product availability and consumer education. Many supermarkets either do not stock sustainable coffees or offer only one, often as a single origin organic coffee.
9. Quality of the organic certification	Set up local certification systems, improve certification trust and quality
10. Authorities	Reduce bureaucracy and paper workload in the country of origin and in the import country

Source: FiBL

1.6 Web information corner

Organizations

www.ico.org
International Coffee Organization:
The International Coffee Organization is an intergovernmental body whose Members are coffee exporting and importing countries. It administers the International Coffee Agreement and is committed to improving conditions in the world coffee economy through international cooperation, helping price equilibrium by developing demand for coffee in emerging markets and through projects to reduce damage from pests and improve marketing and quality, enhancing coffee growers' long-term competitiveness and contributing to the fight against poverty.

www.fo-licht.com
This website provides information about international reports on coffee and tea and gives details about the conferences going on in this field.

www.Fair Trade.net
Fairtrade Labelling Organizations International (FLO): In order to co-ordinate the work of the national initiatives and more efficiently run the monitoring programmes, an umbrella organization, FLO was set up in April 1997. A central responsibility for FLO is to collect data and ensure the audit of all Fairtrade labelled products from the producer to the supermarket shelf.

www.kaffeeverband.de:
The website of the "Deutscher Kaffee Verband" provides general information about the history, facts and news of coffee. A serie of pictures can be found from the plant to the final coffee products and processing

www.naturland.de
The website Naturland- an association for organic agriculture provides detailed information on:

- Standards relating to farming and processing
- Approval procedures for the Naturland label
- The different projects by Naturland
- Markets

Coffee traders and importers

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D-49356 Diepholz
Tel.: +49 5441/9856-100
Fax: +49 5441/9856-101
www.lebensbaum.de

Deals in Spices, Teas, Coffee, Herbs

Gepa GmbH
Bruch 4
D-42279 Wuppertal
Tel: +49 202 266 830
Fax: +49 202 266 8310

Deals in Coffee, tea, cocoa, nuts and other products

Rapunzel Pure Organics, Inc.
2424 SR-203
Valatie, NY 12186
toll free +1 (800) 207-2814
Tel: +1 (518) 392-8620
Fax:+1 (518) 392-8630
www.rapunzel.com

Deals in Chocolate, Coffee, Juices, Sugar, Seasonings, Soups and Snacks

Fritz Bertschi AG Kaffee-Rösterei
Rührbergstrasse 13
CH- 4127 Birsfelden
Tel: +41 61 / 313'22'00
Fax: +41 61 / 311'19'49
www.bertschi-cafe.ch

Deals in organic and conventional coffee

Blaser Café AG
Güterstr. 4
CH-3001 Bern
Tel: +41 31 380 55 55
Fax: +41 31 380 55 40

Deals in Coffee and Tea

Claro fair trade AG
Fairer Handel
Byfangstr. 19
CH-2552 Orpund BE
Tel: +41 32 356 07 00
e-mail: *Claro.fairtrade@bluewin.ch*

Deals in tea, coffee, sugar and sweets and other fair trade products

Cretti & Co. Inh. Fritz von Allmen
Kaffee-Surrogate-Fabrik
Hauptstr. 1
CH-9434 Au SG
Tel: +41 71 744 05 05
Fax: 071 744 05 07

Deals in coffee and cereals

Eichberg Bio AG
Eichberg 32
CH-5707 Seengen AG
Tel: +41 62 777 34 02
Fax: +41 62 777 39 48

Deals in coffee, tea, cocoa, sugar, cereals, fruits, juices, vegetables, dried nuts and fruits, honey, wine

Henauer Kaffee und Tee
Kaffeerösterei
Hofstr. 9
CH-8181 Höri ZH
Tel: +41 1 861 17 88
Fax: +411 860 37 80
E-Mail: *g.henauer@bluewin.ch*

Deals in coffee and tea

Bernhard Rothfos Intercafé AG
Rohkaffeehandel
Bahnhofstr. 22
CH-6300 Zug ZG
Tel: +41 41 728 72 60
Fax:+41 41 728 72 79

Deals with coffee

Traeubler Alois AG
Rohkaffee-Import
Industriestr. 28
CH-8304 Wallisellen ZH
Tel: +41 1 877 60 60
Fax: +411 877 60 66

Deals with coffee

2. Market for organic cocoa

2.1 Production of organic cocoa

The annual world production of cocoa has been around 3 million tonnes in recent years. This is a significant change from around 1.5 million tonnes per year in the 1970s and early 1980s. No less than two-thirds comes from West Africa. According to statistics from the International Cocoa Organization (ICCO), eight countries produced more than 90% of the entire world production in the cocoa year 1999/2000:

Table 14: World production of cocoa beans by country (tonnes and percentage)

Country	Annual production (1999/2000) in tonnes	Percentage
Côte d'Ivoire	1,325,000	44
Ghana	440,000	15
Indonesia	410,000	14
Nigeria	165,000	5
Brazil	125,000	4
Cameroon	120,000	4
Ecuador	95,000	3
Malaysia	60,000	2
Others	263,000	9
Total	**3,003,000**	**100**

Sources: ICCO, ITC

Table 15: Production of certified organic cocoa beans by country 1999/2000 (tonnes)

Country	Annual production 1999/2000 organic certified cocoa (tonnes)	Project/ Comments
Africa		
Madagascar	1,200	Arco Océan Indien – quantity not confirmed
Tanzania	1,000	Biolands/Kyela Co-op Union (EPOPA)
Uganda	600	Bundibugyo (EPOPA) + Rwenzori – reported to be suspended, conflict in the region
Americas		
Belize	30	TCGA
Bolivia	600	El Ceibo (336 co-ops)
Costa Rica	200	APPTA
Dominican Republic	6000	CONACADO, YACAO
Mexico	300	Several small groups
Nicaragua	300	La Campesina, CACAONICA
Panama	500	COCABO
Peru	100	USAID project
Asia and Oceania		
Fiji	50	Estimate
Vanuatu	500	Estimate
Total	**11,680**	**Estimate**

Sources: FLO-International, ITC, FiBL

Table 15 is based on information gathered from producing countries, cocoa importers, certifiers, consultants, articles in magazines and various sources traced on the Internet.

Several countries are reported to have production in conversion or are preparing themselves otherwise for certification. Among these are Brazil, Cameroon, Côte d'Ivoire, Cuba, Ecuador, Ghana, Guyana, Haiti, Honduras, Indonesia, Panama, Peru, the Philippines, Sao Tomé and Togo. Some might already have commenced production and export.

2.2 European import of organic cocoa

Table 16: European import of certified organic cocoa beans by country in 2000 (number of importers and tonnes)

Country	Number of importers and/or dealers	Import, tonnes in the year 2000	Comments
Germany	3	3,600 – 4,675	Some re-export
Netherlands	2	3,100 – 4,100	80% is re-exported to European countries
Switzerland	4	2,200	Does not include Barry Callebaut
Italy	2	850 – 870	Some import from Germany
Belgium	(3)	Limited direct import, if any	A large proportion reported to be imported from Barry Callebaut, CH
United Kingdom	(5) 1	Limited direct import, if any	Most beans bought elsewhere in Europe
France		1,200	Possibly 2 – 3 importers
Spain	1	200	Some import from Switzerland
Total		**11,000 - 14,000**	**Estimate**

Sources: FLO-International, ITC, FiBL

2.3 Market development and potential

2.3.1 Current situation

The market for chocolate consumes around 90% of the world production of cocoa beans, the balance being used for beverages, flavours, cosmetics and other purposes.

As for other organic food products, the market for organic chocolate has also increased significantly during the 1990s and the beginning of the 21st century. Production and trade figures for both the European and the North American market differ to an extent that makes it difficult to be specific.

In the early days of the organic movement (1990–1995), certified organic chocolate was produced by small and sometimes new companies focussing on a niche, and the products were sold primarily in health-food stores or specialty shops. Today, supermarkets also sell these specialized products, but production is still dominated by relatively small and medium-sized chocolate manufacturers with unique brands. Some of them have added other labels to their products as they comply with other sustainability criteria – e.g. Fair Trade. Most of the large and traditional manufacturers of well-known branded products in Europe (e.g. Cadbury and Nestlé, just to mention a few) are not yet in the organic niche or are only just about to make their entry.

In cocoa the processing industry plays an important role. The bulk of imported cocoa goes from processing firms via wholesalers to the organic food trade and World shops. Although supermarkets have sold little organic chocolate so far, there is considerable interest. The market for organic cocoa has developed very well to date. Annual market growth in the last three years reached 10–15%. Since Swiss organic chocolate can be exported, and the interest of the large supermarkets in organic chocolate is also set to increase, significant sales growth is also likely in the future (by 5–10% annually).

The North American retail market for certified organic chocolate is not quite as big as the European but growing fast. Some of the certified organic cocoa beans processed in Europe end up with chocolate manufacturers in North America. The large branded groups, e.g. Mars and Hershey's, are not in this niche – or at least not yet in any significant way.

2.3.2 Organic, Fair Trade and other labels

Throughout the 1990s much interest was generated and many initiatives were taken in the context of "sustainability" within the cocoa sector. Organic production is just one of them. Another important element is the Fair Trade movement composed of organizations which guarantee the small farmers a fair price for their produce. Fair Trade organizations have separate programmes for different crops. In Europe, the most frequently seen Fair Trade labels are those of Max Havelaar and Transfair. In 2000, the Fair Trade sale of cocoa products in Europe was approximately 1,400 tonnes. The market growth of Fair Trade chocolate in the last three years was also between 10 and 15%. The interest in organic Fair Trade chocolate is increasing.

2.3.3 Prices

The Fair Trade cocoa prices are calculated on the basis of world market prices plus Fair Trade (FT) premiums. The Fair Trade premium is USD 150 per tonne. The minimum price for FT standard quality cocoa, including premium, is USD 1,750 per

tonne. If the world market price of the standard qualities rises above USD 1,600 per tonne, the Fair Trade price will be the world market price + USD 150 per tonne.

For Fair Trade cocoa which is also certified organic, there is an additional organic premium of USD 200 per tonne. Fair Trade organic cocoa beans cost a minimum of USD 1,950 per tonne.

A premium of USD 200 per tonne on top of USD 1,600 corresponds to an additional 12–13%. However, if the product is not part of a Fair Trade arrangement, there is no secured premium or bonus for certified organic alone. It fluctuates with market conditions. Prices for certified organic cocoa fluctuated in 2001 between 1300 and 1500 USD/t (FOB port of origin).

In the long-term, it is generally hard to get too excited about conventional cocoa prices unless there is a natural disaster or these low prices lead to more crop neglect. A possible problem looming for cocoa is the increasing focus on child labour in the cocoa harvest. Fair Trade initiatives state that the world market structure and the abject poverty that results from this are rather to be pointed at as the cause of abuse of child labour, and that a boycott will not solve the problem unless other measures are taken to improve the farmers' economic situation.

2.3.4 Market potential

In view of the persistent expectations of expansion of the market for organic cocoa, a shortage in supply was feared, especially after the hurricane George that hit the Dominican Republic, the world largest producer of organic cocoa. Therefore some of the larger operators in the organic cocoa market saw the market opportunity, and bought considerable quantities in the 1999–2000 season to ensure availability. Still, the market is yet waiting for the boom to happen and the organic cocoa harvest of 2000–2001 is waiting in the warehouses to be sold, causing a downward pressure on the price for organic beans. There are only very few traders that deal in larger volumes and also they see themselves cornered now that supply is largely covering current demand. The result is that – if at all – organic cocoa is bought at conventional market prices or just slightly above the New York level, as producers do not see keeping the cocoa in store as an alternative. Only producers with large capital reserves can afford to do so. These large producers have only recently converted to organic production, as it seemed to be a market opportunity.

Table 17: Ten major obstacles mentioned by European importers for the import of organic cocoa (by priority):

Obstacles	Measures
Quality of the products	Improve quality of fermentation, avoid humid stocks, improve selection of beans
Availability/continuity of supply	Diversity of production places and sources
Price	Production shall meet demand, avoid fluctuations
Logistics	Improve transport in local ports
Distribution	Large retailers should enter the market
Reliability of the partners	Improve marketing and communication
Quality of the organic certification	Set up local certification systems, improve certification trust and quality
Authorities in the country of origin	Reduce bureaucracy and paper workload
Authorities in Europe	Reduce bureaucracy and paper workload
Label organizations in Europe	Harmonization and mutual recognition of standards and certificates

Source: FiBL

The large additional volumes suddenly entering the market have the consequence that especially Latin American small farmers' organizations, for whom organic production was a viable alternative, loose their market access completely, as it is just easier and cheaper to buy from larger producers. Latin American cocoa is not the mainstream quality that is used for the production of an 'ordinary' chocolate, as this is generally made from West-African quality.

The reluctance of the big companies and supermarkets to introduce organic chocolate is still rather an issue of availability than of price, although price is used as an argument. Whereas the availability of African organic cocoa stays way behind demand, the technical skill of smaller chocolate manufacturers proves that very good chocolate can be made from beans that used to be rejected by the conventional chocolate industry. The range of the retail price for chocolate – also for organic – is set by the supermarkets before even the raw material is bought or cost calculations can be made. Producers are therefore forced to deliver organic certified cocoa at prices that are way below realistic cost of production and certification.

2.3.5 Obstacles and wishes expressed by market operators

One important question for cocoa producers is: How do I meet the requirements of the international market and the importer? Recent interviews by FiBL with cocoa importers show the following answers to these questions:

- From the European importers' point of view, lack of quality and lack of continuity is the main obstacle. They want the supply to expand. This would also help to even out fluctuations in harvest, such as those resulting from natural disasters as seen recently in the Dominican Republic.
- Producers, traders and European importers mention that it is necessary to reduce the workload for certification and label schemes and to harmonize the standards. Just an example: The situation can arise that the same chocolate that is sold in the EU as a completely organic product can only be certified as produce under conversion in Switzerland. Therefore Swiss importers often bring in the goods via an EU country. By means of this rather senseless diversion, it is possible to circumvent the problem and import the produce into Switzerland as fully organic.
- Government bodies in the countries of export want to see administrative procedures in the importing countries simplified.

2.4 Web information corner

www.icco.org
International Cocoa Organization, London (ICCO)

www.maxhavelaar.org
Max Harvelaar Foundation, fair trade

www.fairtrade.net
Fairtrade Labelling Organizations International (FLO)

www.rainforest-alliance.org
The Rainforest Alliance, USA

www.greenandblack.com
Green and Black's, chocolate, United Kingdom

www.ocpchocolate.com
Organic Commodity Products (OCP), USA

www.intracen.org
International Trade Centre UNCTAD/WTO (ITC)

www.sippo.ch
Swiss Import Promotion Programme (SIPPO)

www.tradinorganic.com
Tradin Organic Agriculture B.V. The Netherlands

www.barry-callebaut.com
Barry Callebaut Sourcing AG, Switzerland

www.gerkenscocoa.com
Gerkens Cacao BV, The Netherlands

www.lasiembra.com
La Siembra Co-operative Inc., Canada

www.cargill.com
Cargill Incorporated, USA

www.edfman.com
ED&F Man Cocoa Ltd., United Kingdom

http://europa.eu.int/eur-lex/de/lif/dat/1991/de_391R2092.html
The EUR-Lex website contains all texts pertaining to EU Regulation No. 2092/91 on organic production in all the languages of the EU.

http://www.prolink.de/~hps/
A consolidated (but unofficial) text incorporating all amendments, which is regularly updated.

http://www.ifoam.org/accredit/index.html
This is the accreditation programme of the International Federation of Organic Agriculture Movements.

http://www.blw.admin.ch/
The website of the Swiss Federal Office for Agriculture (Bundesamt für Landwirtschaft) provides detailed information on:
- The Swiss Organic Farming Ordinance
- Forms for attestation of equivalence and individual authorization to import
- Direct payments for organic farms
- Cultivation of organic products.

http://www.blw.admin.ch/nuetzlich/links/d/zertifstellen.htm
A list of European certification bodies can be downloaded from this page maintained by the Swiss Federal Office for Agriculture.

http://www.admin.ch/
Original texts of:
- Swiss legislation
- The Swiss Ordinance on agricultural imports.

http://www.zoll.admin.ch
Customs tariffs of the Swiss Federal Customs Administration.

3. Market for organic tea

3.1 Introduction

The number of organic tea producers and the volume of organic tea traded on the world market has increased substantially over the last few years. This development can be explained by a number of factors. In the first place, tea farmers have become more aware of environmental problems (erosion, pesticide residues in tea plants) and severe health hazards connected with an intensive system of tea production. A further reason for the rise in organic tea can be explained by the fact that the demand for organic tea has grown constantly as a result of increased consumer awareness of pesticide residues and heavy metals in conventional teas. Furthermore, there is much evidence that organically grown teas are generally of better quality due to the avoidance of artificial additives.

Until now, little information or reliable statistical data about the organic tea market has been available. For this reason, this chapter is mainly based on expert knowledge and estimates of international certifiers, traders and producers such as IMO, Kloth & K hnken, Lebensbaum, Oasis, Stassen Natural Foods and Chamong as well as an unpublished report by U. Walter (Lebensbaum, Germany).

This chapter will exclusively focus on the production of traditional tea varieties based on the plant Camellia sinensis. Other varieties based on other plants (African Rooibos tea, South American Yerba Mate tea, Lapacho tea and African Honey Bush) are not considered here, even if some of them are currently fashionable and are increasingly replacing traditional varieties on supermarket shelves and in consumers' shopping baskets.

3.2 Production of organic tea

3.2.1 Classification of tea

The organic tea market is divided into numerous varieties and qualities. Tea can be distinguished roughly according to the following characteristics:

- Origin (e.g. Darjeeling, Assam, Nilgiri, Ceylon),
- Degree of fermentation (black tea, green tea, half fermented tea),

Camellia sinensis

Photo: Clipper Tea

- Production method (orthodox or CTC-production),
- Period of picking (First Flush, Second Flush, Autumnal),
- Type of tea leaf (whole leaf, broken leaf, fanning),
- Special teas (e.g. Souchong, White Tea, Silver Tips, Oolong).

The generic term 'tea' refers to a class of beverages featuring the leaves of the Camellia sinensis plant, herbal components, or a combination of both. All modern tea varieties, green, black as well as oolong are descended from C. sinensis.

3.2.2 Style of processing

Two methods of tea processing can be roughly distinguished, the orthodox method and CTC-production. The **orthodox method** is more comprehensive and time-consuming compared with CTC production. In general, tea is processed in five steps:

1. Wither,
2. Crush, tear & curl,
3. Ferment,
4. Dry,
5. Sort.

Finally, the sorting results in four different types of tea:

- Whole leaf tea,
- Brokens (from broken and smaller leaves),
- Fannings (tea from small leaf pieces for tea bags and mixtures),
- Dust (or fines, finest filtering for tea bags)

The term **CTC** means ‘crushing, tearing, curling’ and can be understood as an efficient processing method, by which the leaves are torn and curled in one step after the withering. Due to the leaves’ larger surface area, the process of fermentation is accelerated. Fannings, dust and to some extent also brokens are mainly processed by the CTC method. In contrast to CTC production, the orthodox processing method leads to higher quality. Tea processed by the CTC method has a stronger taste but not such an excellent flavour. Due to the strong taste this type of tea is mainly used for cheaper tea bags.

The CTC production method is common in some parts of India and Kenya. In Sri Lanka, tea is processed almost entirely by the orthodox method. In the Darjeeling district of India the producers are not allowed to produce CTC tea.

A further important type of processing is the production of ‘green tea’. For this type of tea, leaves are steamed or lightly baked directly after picking, in order to inactivate the enzymes for fermentation. By this technique the tea retains its typical green colour and its typical taste. Later follow the processes of rolling, drying and sorting. Green teas are mainly produced in Asia.

3.2.3 Yields

Tea yields vary according to climatic and topographic conditions from 150 – 750 kg per hectare in the Darjeeling district to up to 2500 kg per hectare in Assam. High yields are also achieved in Sri Lanka, South India and South China. In organic production systems average yields are 30 – 35% lower than in conventional tea production. The extreme differences in potential yields necessitate different minimum prices in order to cover production costs and thereby have an impact on the conversion rate to organic farming.

The harvest period in the Darjeeling district takes nearly nine month and starts in March with the famous ‘First Flush’, which gives an extraordinary aromatic quality. However, only the ‘Second Flush’ (May to June) provides the finest qualities. Tea leaves harvested in autumn have a spicy aroma. Leaves of the so-called ‘In-betweens’ and ‘Rain Teas’ are harvested in the wet periods between spring and autumn and are mainly used for tea blends.

The processing of harvested tea leaves needs special skills and a great deal of experience. On-farm processing is very common in most of the existing production sites.

3.2.4 Countries and regions of origin

The main places of production for organic tea are located in India, China and Sri Lanka (Ceylon). In India and Sri Lanka, organic tea has been grown for more than 15 years. In China the first tea gardens were converted to organic farming in the 1990s. In contrast to coffee production, tea is mainly cultivated in large tea gardens and not on small farms.

The following information, provided by the world’s largest certifier of organic tea gardens, IMO, indicates the area already converted and in conversion which is certified by IMO1. As shown in the table 18 below, 63% of the current area managed organically is still in conversion. This means that in the next few years, the volume of organic tea traded on the market will rise extraordinarily. Consequently, either the demand for organic tea will have to increase as well or the world price will drop drastically.

Table 18: Number of hectares of certified organic and in conversion tea areas world wide (December 2001)

Region	Organic Tea, Area in ha	In-Conversion Tea, Area in ha
India/Sri Lanka	4300	3040
China	1940	1009
Other countries	1025	540
Total	7265	4589

Source: IMO 2001

In the next section, the situation of supply and prices in the most important organic tea regions are discussed briefly.

China
China is one of the major centres for the production of green tea worldwide and a major exporter to Europe. Approximately 650,000 tonnes of tea are produced per year. One of the most important Chinese production centres is located to the south of Peking, along the Pacific coast. 40–50 tea gardens of this region are currently in-conversion or fully converted. In total 4,000–5,000 tonnes of organic green tea are produced in China per year (approx. 0.8% of total production). This enormous amount has led recently to an oversupply situation so that the price decreased. It is estimated that currently just 800–1000 tonnes of organically produced tea can legitimately be exported as organic tea; 300 – 500 tonnes of it to Germany. Currently, there is no domestic demand for organic tea in China.

Due to the existing oversupply situation a drop in prices was observed in China. Whereas the premium price for organic tea in 1999 was 300–400% (USD 8/kg) on top of the price for conventional tea, the premium dropped to 20–30% (USD 2/kg). For most tea producers, this market price is far too low to cover the production costs (USD 6/kg minimum).

India
India is the largest tea producer world wide. In total, 820,000 tonnes of tea are produced. It is estimated that approximately 3,000–3.500 tonnes are produced organically (0.4–0.7%). It can be estimated that currently 1,400–1,800 ha are under organic production. Organic tea production volume per farm varies considerably between 20–1000 tonnes per year. A domestic market for organic tea does not yet exist in India. Therefore most of the tea must be exported. Currently a premium price of 50–100% is paid for organic tea. It is not unlikely that due to the expected increase in organic tea production and the existing oversupply situation on the world market, the price for organic tea will decline to 30–40% in the coming years.

Organic tea production in India is spread over three main areas, the Darjeeling district and Assam in the north of India and Nilgiri in the south of India. The organic tea plantations collectively produce under the umbrella of the 'Indian Bio Organic Tea Association' (http://www.snonline.com/ibota).

Label of the Indian organic tea farmers' association

INDIAN BIO ORGANIC
TEA ASSOCIATION

Darjeeling district
In the Darjeeling district 10,000 tonnes of black tea are produced per year on an area of 20,000 ha. 14 out of 84 tea gardens have converted to organic farming. Most of the tea gardens are managed by international operating companies. It is estimated that 10–15% of the total area of tea has already been converted to organic farming. The organic production volume is estimated at 1,000–2,000 tonnes per year. In total, 500–800 tonnes of it can be exported as organic tea. The price premium is 50–100% higher in relation to conventional prices.

Assam
From among the tea gardens of Assam, three have converted to organic production and two are in conversion. They produce 300 tonnes of organic black tea per year and Germany is one of the main export markets, importing 30–50 tonnes of tea from this region.

Nilgiri
In Nilgiri the highest tea garden world wide is located at an altitude of 2,750 m above sea level In this and another garden in this region 1,500 tonnes of organic tea are produced. Besides these two organic farms, another is still in conversion. The prices paid for organic tea are approximately 80% higher than for conventional teas.

Doars
A small area where ecological tea gardens exist and mainly CTC tea is produced. The quantity of ecological tea produced is aproximately 1000 t.

Table 19: Supply situation for important Indian organic tea gardens

Company (region)	Production figures
Chamong (Darjeeling)	Production volume: approx. 85 t Production area: 140 ha
Pussimbing (Darjeeling)	Production volume: approx. 95 t Production area: 201 ha
Mullootar (Darjeeling)	Production volume: approx. 70 t
Bherjan (Assam)	Production volume: approx. 40 t Production area: 19 ha
Sewpur (Assam)	Production volume: approx. 300 t Production area: 195 ha
Dalgaon (Dooars)	Production volume: approx. 1040 t Production area: 626 ha
Rembeng (Assam)	Production volume: approx. 150 t Production area: 136 ha Land in conversion: 22 ha
Oothu (Tirunelveli))	Production volume: approx. 1000 t

Source: http://www.snonline.com/ibota

Table 20: Situation of Supply in important Organic Tea Gardens in Sri Lanka

Estate (organization)	Production figures
Iddulgashinna Bio Tea Project (Stassen Natural Foods Ltd.)	Production volume: approx. 206 t Production area: 353 ha
Venture Group (Stassen Natural Foods Ltd.)	Production volume: approx. 300 t Production area: 290 ha
Needwood (Needwood Emmag)	Production volume: approx. 70 t Production area: 94 ha
Greenfield (Lanka Organics)	Production volume: approx. 58 t Production area: 70 ha
Koslanda (Maskeliya Plantations Ltd.)	Production volume: approx. 80 t Production area: 160 ha
Smallholder Co-op (Gami Seva Sevana)	Production volume: approx. 7 t Production area: 83 ha
Small Organic Farmers Group (Bio Foods Ltd.)	Production volume: approx. 67 t Production area: 214 ha

Source: Stassen Natural Foods Ltd., 2001

Important producers
Table 19 indicates the production volume of important organic tea producers in India.

It is estimated that Indian organic tea production is mainly sold to the United Kingdom (50%) and Germany (37%). Further smaller volumes are exported to the USA (5%) and Japan (5%).

Ceylon (Sri Lanka)
Ceylon, where coffee was formally a traditional crop, many farmers switched to tea after an outbreak of an epidemic fungal disease. Today Sri Lanka produces approximately 300,000 tonnes of tea (90% for export). Stassen Natural Foods were the first tea company to commence with the cultivation of organic tea in Sri Lanka. In 1985 the project started with seven tea gardens. According to Mr. Gaffar from Stassen Natural Foods, today these gardens are the oldest organic tea gardens in the world. Since 1987 they have been certified by the German organic farming association, Naturland.

Today 10 tea gardens have converted to organic production. The entire 1,300 ha are managed organically (Dec. 2000). Total organic production is estimated at approx. 800 t (0.25% of total production). An increase in the near future to 1,000 t is expected. The price premium for organic tea is approximately 80–150% on top of the conventional price level. Despite a situation of oversupply, the price level for organic tea has remained stable for the last years.

Organic tea from Sri Lanka is mainly exported to Germany, the UK, Australia, France, Italy, Japan and the USA.

Important producers
Table 20 illustrates the known production volume of important organic tea producers in India.

Other organic tea producing countries
Other countries with (very marginal) organic tea production are located in Tanzania, Vietnam, Japan, Argentina and Indonesia. However, these countries do not have a significant influence on the world market for organic tea.

3.2.5 Social aspects

The working conditions and income situation of employees in tea gardens vary strongly from country to country. In general, organic tea production is more labour-intensive (e.g. in most cases organic manure and compost is spread manually onto the fields); thereby organic tea production has a positive impact on the local labour market and improves purchasing power in the region.

In India we find an industrial structure of tea production, strongly influenced by foreign companies. In general, these international companies are interested in ensuring that certain social minimum social standards are fulfilled for the employees. In regions like the Darjeeling district, more than 80% of all people work in tea gardens or in the agri-business surrounding tea production. Many of the international companies work with strong social commitment and are willing in part to accept economic losses in order to stabilize the economic situation of the region, which has an unemployment rate of up to 50%. However, due to the current oversupply situation and the falling market price, a number of companies are being forced to reduce their production costs.

In China, the earned income of farm workers is very low. While in India a minimum salary rate has to be paid by law, no such obligations are imposed in China. Chinese tea is mainly produced on small family farms. Due to the lower degree of organization, farmers get very low prices from traders. The working conditions on farms are very bad in some parts. There is no national legislation (like that in India) that defines minimum social standards.

In contrast to this situation, in India and Sri Lanka organic tea production is combined with projects that aim to improve the social situation of farm workers. Most of the employees working in tea gardens earn an income above the national average. Most of the workers are organized in unions that fight for the interests of their members.

Many tea gardens manage production in accordance with 'Fair Trade' standards. Nevertheless, the Fair Trade system in itself seems unable to guarantee an adequate wage level in situations of oversupply, where there is a worsening market situation and consumers of organic tea become more and more price-conscious.

3.2.6 Quality and safety aspects

In addition to caffeine, tea contains various valuable ingredients like tannic acids, polyphenol, essential oils, fluorine and B-vitamins. Before organic tea is sold, a number of chemical and sensory analyses are undertaken to ensure high quality. The market prices for tea are mainly influenced by sensory tests, where the visual quality of the tea leaves, the aroma, and the taste is evaluated. Besides this, chemical tests are carried out to analyse possible residues of pesticides and heavy metals. In general there are no crucial quality problems in producing organic tea which could negatively influence consumer expectations.

3.3 Market

Most of the organic tea produced is exported to Germany, the United Kingdom and the US. Organic tea consumption (black and green tea) for the main market destinations is estimated at 600 to 800 tonnes per year in Germany, 1,000 –

1,500 tonnes in the UK and 2000 tonnes in the USA. All other European countries consume a maximum of 100 tonnes of green or black tea per year.

It was mentioned before that currently supply and demand are not in balance. Two main reasons can explain this:

- Due to the advice of the international certifying bodies, a huge number of farms converted to organic tea production so that the volume of organic tea increased enormously in recent years. At the same time, demand grew, in line with other product groups, at between 10–20%.
- The second main reason concerns the permanently changing consumer trends and tea variety preferences. Whereas in the late 1990s, green tea was the trendsetter for a healthy lifestyle, today teas, like 'Rooibus' or 'Lapacho' have become more attractive for consumers. After the start of the green tea boom in Europe, countless small farmers in China converted to organic farming. After a time lag

(period of farm consulting and conversion) currently just 20% of all Chinese organic green tea can be sold as organic tea. This situation has led to a drop in prices for producers, while consumer prices for organic tea have remained quite stable. This means, despite the existing oversupply situation international traders can make profits. However more serious traders generally have long-term contracts with their tea producers and guarantee them stable purchase volumes and in

some cases also minimum prices. This has led in the current market situation to enormous price and income differences between farmers producing in the same region, and in some cases to significant differences in consumer prices.

In Germany the bulk of organic tea is sold via organic shops or health food stores, in the UK and the USA via conventional retailers. More recently, organic tea has also been marketed via special tea shops. The sale of excellent and expensive tea specialities is currently less important in Europe. Traders confirm in interviews that even organic tea is affected by a certain consumer price consciousness, which hinders broader sales of high quality organic tea.

However, from the consumer's point of view, it is very difficult to judge the right price for organic tea quality amid the mass of competing brands and varieties. At least in Germany there is no clear visual or terminological indication of different production methods and tea qualities. Most consumers are only able to choose between different origins (e.g. Darjeeling versus Ceylon), varieties (e.g. herbal versus black tea) and partly between different tea gardens. However unfortunately there is no evidence about methods of production and above all methods of processing apart from the general term 'organic production'. Despite the provision of general information material by the suppliers, most consumers are not able to find it easily at the point of sale.

3.4 Price

The price for organic tea strongly follows the market rules and, similar to the price of conventional tea, is closely connected to quality. While on the conventional tea market the price is relatively stable due to a balanced supply and demand situation, the small organic market is characterized by enormous fluctuation. Mainly as a result of the high conversion rate in recent years, the prices for organic tea decreased to a level that is progressively moving closer to the conventional price (China).

The Fair Trade price is orientated to the general price development of the world market. In India, farmers are paid EUR 1 – 1.5 /kg as compensation for compliance with minimum social standards. As the Fair Trade price is linked to the standard price for organic tea, this system is not able to guarantee farmers stable economic development. Currently Fair Trade organizations are concentrated in India and Sri Lanka. In China, where social standards are considered to be lowest, only one pilot project exists.

During the conversion period farmers do normally not obtain any price premium. Due to the expected lowering of yields by between 30 – 35% and higher production costs, the transition to organic production may lead to enormous financial losses within this period.

3.5 Useful Addresses

The following lists provide useful contact addresses of important organic tea players (producers, traders, importers, certifiers, producer associations). We stress that the information provided does not in any way claim to be complete. The listed companies were named by experts or were found by Internet research. If you do not find your company here, please contact us by E-mail (admin@fibl.ch) and send us a short description of your company together with contact details. We will add your company in the next edition of the organic tea study.

www.intteacomm.co.uk/: The International Tea Committee (ITC) is an independent organisation that collates and publishes official world-wide tea statistics.

Important Organic Tea Plantations I

No.	Address	Name of Estate	Location
1	**Bio Tea Estates Ltd.** 2, N. C. Dutta Sarani Sagar Estate, 5th Floor, Unit 1 Calcutta 700 001 Phone : +91-33-243-4979 / 220-3742 Fax : +91-33-2203870 E-mail : chamong@snonline.com	**Pussimbing**	**Darjeeling**
2	**Dooteriah & Kalejvalley Tea Estate Pvt. Ltd.** Camelia House, 4, Gurusaday Road, Calcutta - 700019 Phone: +91-33-2473067/8737/1816/7269/2401536 Fax : +91-33-2472577/4689/7089 E-mail : goodrick@giascl01.vsnl.net.in	**Dooteriah**	**Darjeeling**
3	**Maud Tea & Seed Co. Ltd.** 138, B. R. B. Basu Road Calcutta. Phone : +91-33-243-1734 / 2733 Fax : +91-33-210 1504 E-mail : chamong@snonline.com	**Bherjan**	**Assam**
4	**Maud Tea & Seed Co. Ltd.** 138, B. R. B. Basu Road Calcutta. Phone : +91-33-243-1734 / 2733 Fax : +91-33-210 1504 E-mail : chamong@snonline.com	**Sewpur**	**Assam**
5	**RNT Plantation Ltd.** 1&2 Old Court House Corner Calcutta - 700001 Phone : +91-33-220-8813/31/32 Fax : +91-33-2205450 E-mail : rntdpl@cal.vsnl.net.in	**Dalgaon**	**Dooars**
6	**Sampad Vikas Ltd.** 34A, Metcalfe Street Calcutta - 700013 Phone : +91-33-2250015/2369103 Fax : +91-33-2259511 E-mail : ambootia.tea@smk.sprintrpg.ems.vsnl.net.in	**Ambootia**	**Darjeeling**

No.	Address	Name of Estate	Location
7	**Sycotta Tea Co Ltd.** 2, N. C. Dutta Sarani Sagar Estate, 5th Floor, Unit 1 Calcutta 700 001 Phone : +91-33-243-4979 / 220-3742 Fax : +91-33-2203870 E-mail : chamong@snonline.com	**Chamong**	**Darjeeling**
8	**The Assam Co. Ltd** 52, Chowringee Road Calcutta 700071 Phone : +91-33-2827778 (8 lines) Fax : +91-33-2822616 E-mail : assamco@giascl01.vsnl.net.in	**Rembeng**	**Assam**
9	**The BBTC Ltd.** Wallace Street, Fort, Mumbai - 400001 Phone : +91-22-2079351/6711 Fax : +91-22-2071612/6772 E-mail : bbtcl@bom2.vsnl.net.in	**Oothu**	**Tirunelveli**
10	**The United Nilgiri Tea Estates Co. Ltd.** 3, Savithri Shanmugam Road. Coimbatore - 641018 Phone : +91-422-216566 Fax : +91-422-215865	**Korakundah**	**(Tamil Nadu)** **Nilgiri**
11	**Tiru Tea Ltd.** Camelia House, 14, Gurusaday Road, Calcutta 700019 Phone : +91-33-2477185/1816 Fax : +91-33-2472577 E-mail : goodrick@giascl01.vsnl.net.in	**Mullootar** **Monteviot** **Edenvale**	**Darjeeling**
12	**Stassen Natural Foods** P.O. Box 1919 833 S.B. Mawatha Colombo 14 Tel.: +94-1-522871 / 522925 Fax: +94-1-522913 E-mail: stassen@eureka.lk	**Iddulgashinna** **Bio Tea Project** **Venture Group**	**Sri Lanka**
12	**Tea Promoters (India) Private Limited** 17, Chowringhee Mansions, 30 Jawaharlal Nehru Road Calcutta 700 016 India Tel.: +91-33 229 1660 Fax: +91-33 249 6879 E-mail: teapromoters@vsnl.net	**Selimbong** **Seeyok** **Singell** **Banaspaty** **Putharjhora** **Samabeong**	**4 in Darjeeling** **1 in Doars** **1 in Assam**

Importers and Traders of Organic Tea

No.	Address	Country
1	**Clipper Teas** Beaminster Business Park Broadwindsor Road Beaminster Dorset, DT8 3PR Tel. +44 (0)1308 863344 Fax +44 (0)1308 863847 E-mail: enquiries@clipper-teas.com	**United Kingdom**
2	**Lebensbaum** Postfach 1269 D-49342 Diepholz Tel. +49 (0) 5441-9856-0 E-mail: info@lebensbaum.de	**Germany**
3	**Oasis** Weillindestr. 20 D-72186 Empfingen Tel. +49 (0) 7485 999 073 E-mail: info@oasistee.de	**Germany**
4	**Kloth & Köhnken Teehandel GmbH** D-28209 Bremen Tel.: +49 (0) 421-347 79 31 Fax: +49 (0) 421-347 77 20	**Germany**
5	**Herbaria Kräuterparadies GmbH** Hagnbergstr. 12 D-83730 Fischbachau Tel: +49 (0) 8028/905710 Fax: +49 (0) 8028/905712 E-mail: Joey.Haas@herbaria.de	**Germany**
6	**Heuschrecke** Redcarstr. 50a 53842 Troisdorf-Spich Tel. 0049-(0) 2241-39726-0 Fax 0049-(0) 2241-39726-99 E-mail: bio@heuschrecke.com	**Germany**
7	**Sonnentor (Kräuterhandelsgesellschaft m.b.H.)** Sprögnitz 10 A-3910 Zwettel Tel. +43 (0) 2875 7256 Fax +43 (0) 2875 7257 E-mail: sonnentor@wvnet.at	**Austria**
8	**Golden Temple** P.O. Box 1197 Santa Cruz, NM 87567 1-800-YOGITEA http://www.goldentemple.com	**USA**

Producer Association

No.	Address	Country
1	**IBOTA** Indian Bio Organic Tea Association Goodricke Group Ltd. 14, Gurusaday Road Calcutta – 700 019 Tel. +91 (0) 33–247-3067; +91 (0) 33–247-7395 Fax +91 (0) 33–247-7089; +91 (0) 33–247-2577 E-mail: ajay_j@hotmail.com	**India**

4. Requirements and conditions relating to access for organic cocoa, coffee and tea imports

4.1 General framework

The **European Union (EU)** has a Common Agricultural Policy, a common trade policy and common import and customs regulations for imports from outside the EU. The African/Caribbean/Pacific ACP-EU Partnership Agreement provides for preferential tariffs for the ACP countries. Organic cocoa, coffee and tea is subject to the same customs tariffs as conventional cocoa, coffee and tea.

For the import of cocoa, coffee and tea into **Switzerland**, the general customs tariffs and regulations apply. As in the EU, preferential customs duties may be applied to imports of certain agricultural products from emerging markets and markets in transition in accordance with the Swiss tariff preferences system. Imports from Least Developed Countries are exempted from customs duties for the majority of headings in the customs tariffs. Importers pay a value-added tax of 2.4% on foodstuffs.

4.2 The EU Regulation on Organic Production

Organic production in the Member States of the EU is governed by Regulations No. 2092/91 (plant production) and 1804/99 (animal production). They protect producers from unfair competition and they protect consumers from pseudo-organic products. Plant and animal products, and processed agricultural goods imported into the EU, may only be labelled using terms such as 'organic' in English and 'biologisch' or 'ökologisch' in German, etc., if they conform to the provisions of the EU Regulation.

The EU Regulation lays down minimum rules governing the production, processing and import of organic products, including inspection procedures, labelling and marketing. Each European country is responsible for enforcement and for its own monitoring and inspection system. Applications, supervision and sanctions are dealt with at regional level. At the same time, each country has a certain degree of freedom with regard to how it interprets the Regulation on Organic Production and how it implements the Regulation in its national context.

Importing organic cocoa into the EU

Article 11 of the EU Regulation governs market access for organic products in the countries of the EU. It stipulates that organic foods imported into the EU from third countries must have been produced, processed and certified in accordance with equivalent standards. At the present time there are two ways of authorizing imports into the EU:

- **Access via import permit** in accordance with Art. 11, paragraphs 1–5: In order to be added to this list, the country making the application must

  already have enacted organic farming legislation and a fully functional system of inspection and monitoring must be in place. To date Argentina, Australia, Czech Republic, Hungary, Israel and Switzerland have been included on the list. Goods imported from these countries need only be accompanied by a consignment-specific certificate of inspection.
- Access via import permit in accordance with Art. 11, paragraph 6, for all countries not included on the list of third countries (i.e. the vast majority of imports into the EU). Requirements vary from one EU country to another, but the following are those that generally apply: The exporter applies for inspection by one of the European certification bodies that is approved and accredited in the EU. After the import permit has been issued by the designated inspection body, then either the

exporter must ensure that the organic goods from the third country are accompanied by a certificate of inspection, or the importer must be able to produce a certificate of inspection for each consignment imported from the third country.

Within the EU all organic products may be freely traded. However, procedures relating to the issue of import permits are not the same in all EU countries. It is advisable to seek advice from the relevant authorities before trading commences.

Some countries in Europe had already formulated their own legislation on organic production or private standards and labelling schemes before the EU Regulation came into force, in some cases many years earlier. These quality marks, for example in Denmark, Austria, Sweden and Switzerland, are well trusted by consumers and are one of the reasons for the current boom in the market for organic products in these countries. The importance of such private standards is explained in Chapter 4.4.

Detailed information about import requirements, private logos, the EU logo and issues relating to inspection bodies is available in the handbook "The Organic Market in Switzerland and the European Union" (Kilcher et al, Frick/Zürich 2001; see Annex).

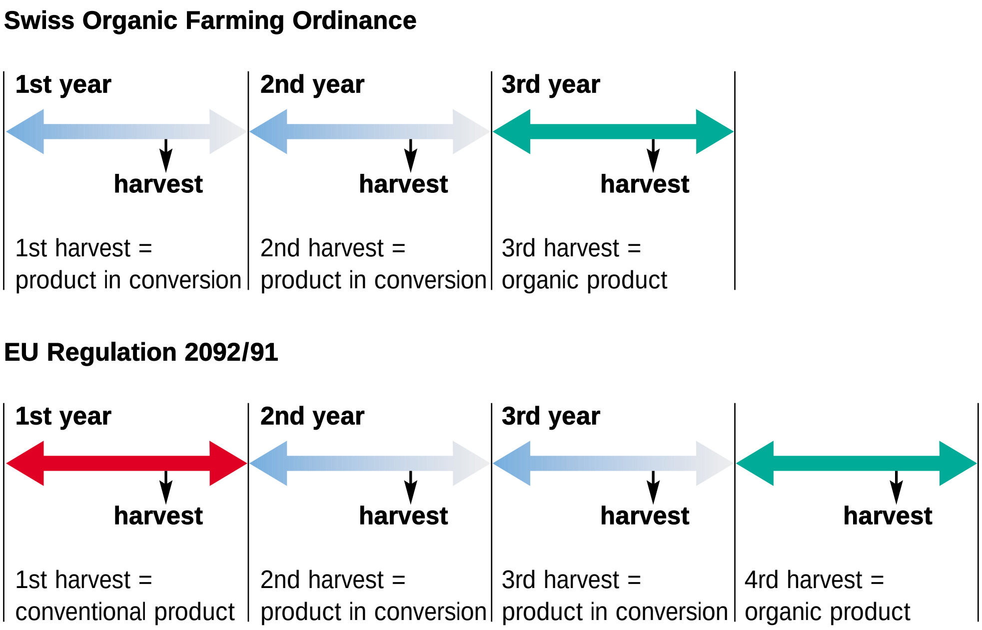
4.3 The Swiss Organic Farming Ordinance

The Swiss Ordinance on organic agriculture and on appropriate labelling of plant products and foodstuffs (termed in the following Organic Farming Ordinance: 910.18 and 910.181) – like the EU Regulation on Organic Production – lays down minimum rules governing the production, processing and import of organic products, including inspection procedures, labelling and marketing, for Switzerland. Agricultural products may only be labelled as organic products if they comply with the provisions of the Organic Farming Ordinance. In Switzerland at present there is no government label for organic products, but there are various private labelling schemes.

The Swiss Organic Farming Ordinance was modelled on the EU Regulation on Organic Production. However, **the Swiss Organic Farming Ordinance is stricter** than the EU Regulation in:

- requiring conversion of the whole farm to organic management: Whole-farm conversion to organic management is not obligatory in the EU, but in Switzerland it is (however, vineyards and orchards are partly exempted).
- requirements relating to the conversion process: in Switzerland up to max. 5 years possible in the case of special crops. Step by step conversion in the EU is not limited to special crops.

Chart 2: Course of the conversion process for organic cocoa, coffee and tea



- **International regulations**
  - IFOAM
  - Codex Alimentarius
- **National and country community regulations**
  - European Union
  - Switzerland
  - United States
- **Private regulations**
  - Bio Suisse
  - Naturland
  - Demeter
  - etc.

Definition of production methods, not product quality
Minimal requirements, not best practice
Permanent development

On the following aspect, the **Swiss Ordinance is less strict** than the EU Regulation:

- in Switzerland there is no 'year zero'. As a result, conversion normally takes two years rather than three as in the EU.

Some points relevant for Swiss importers:

- The exporter in the EU must apply for a Swiss import certificate from his inspection body and ensure that the product bears the code number and name of the inspection body and that it is labelled 'bio' (organic).
- If a product has been approved in accordance with EU Regulation No. 2092/91 on Organic Production, then it can be approved automatically as organic in Switzerland too, and vice versa. An exception is made in the case of products from farms in the process of conversion. When a conversion product from the EU, or another country, is imported into Switzerland, this must be specifically declared.
- In order to comply with the requirements of private labelling schemes, conditions such as whole-farm conversion and other additional conditions may be imposed on imports from abroad, i.e. also on those from the EU.
- Import requirements from countries outside the EU and from countries on the Country List are similar to those of the EU Regulation. In analogy to the EU, Switzerland also operates a system of 'individual authorization'. For direct imports from countries that are not included on the list of third countries, the importer in Switzerland must submit an application for **individual authorization** to the Federal Office for Agriculture (FOAG) together with an **attestation of equivalence** for the relevant product and its producer.

The handbook “The Organic Market in Switzerland and the European Union” (2001) informs about the details of requirements relating to the attestation of equivalence and conditions pertaining to import certificates.

Table 21: Private-sector organic label requirements for organic cocoa, coffee and tea production

Website	BIO Knospe www.bio-suisse.ch	KRAV www.krav.se	Demeter www.demeter.de	Naturland www.naturland.de
Conversion				
Conversion period, possibility of reducing the conversion period	Conversion period 2 years, no reduction possible	Normally 1 year, can sometimes be extended or reduced depending on past land use.	In general, as under EU Regulation on Organic Production. If pre-certified organic, at least 12 months; biodynamic cultivation necessary	3 years
Step by step conversion (possibility, maximum duration)	Conversion in one step. Exception possible for long-term cultivation, conversion plan is compulsory, clear separation of the different products for all the stages, max. 5 years	Yes	Conversion in one step. Exception possible for long-term cultivation, conversion plan is compulsory, clear separation of the different products for all the stages, max. 5 years	For step by step conversion, it must be ensured that different stages of certification are clearly and unambiguously distinguishable. Simultaneous production using plant products of different stages of certification is prohibited unless these can be clearly distinguished.
Conversion of entire farm (or possibility to farm single units conventionally)	Only fully organic farms. One and the same farm manager may not simultaneously operate a conventional and an organic farm. Unitary farm manager: Combination of manager and farm unit. The farm unit is a clearly delimited area under management, subject to specific inspection and documentation.	No. But dependent on the possibility for inspection if it is parallel production	Conversion of the entire farm, not only the cash crops, including minor crops, livestock, etc. Clear internal and external separation. The farmer is not allowed to have another conventional farm in the same region.	The principle of unitary farm management ('Bewirtschaftereinheit') applies; i.e. one and the same farm manager may not simultaneously operate a conventional and an organic farm. Unitary farm manager: Combination of manager and farm unit. The manager is the natural person or legal entity which independently operates and is responsible for a farm. The farm unit is a clearly delimited area under management, subject to specific inspection and documentation.
Inspection and certification				
Standards on internal control systems	Detailed criteria which outline what is needed in an internal control system.	Detailed criteria which outline what is needed in an internal control system.	No regulations of its own. Adaptation of the Bio Suisse and Naturland regulations.	Detailed criteria. See Naturland handbook for control systems.
Frequency of external inspections	At least one per year, < 20% of farms when fully professional internal inspection system.	Depending on the size of the grower group and the risk situation.	Once a year	At least one per year, at least 10% of farms
Records to be made by the single farm units	Yields, all inputs, land changes	Field officers complete the documentation of the farms during registration and contracting and during two visits per year to the farm.	Records must be kept	Farm journal
Licence for labelling subject to charge	1% fees on product value for importer or retailer, none for producer or exporter.	Certified operators can use the Krav-label without extra charge, just the costs for the certification.	2% of turnover of products sold under the Demeter-Brand, minimum fee for yearly certification.	Producer: 1% net sale price for sale within Europe, 0.5% net sale price for sale outside Europe (USA, Japan) 0.1% net sale price for sale on the local market

Website	BIO Knospe www.bio-suisse.ch	KRAV www.krav.se	Demeter www.demeter.de	Naturland www.naturland.de
Production				
Living or dead ground cover	Should endeavour to maintain ground cover and minimize tillage.	Mulching is acceptable	Soil should not be left fallow for the whole year	Should endeavour to maintain ground cover and minimize tillage.
Limitations of plant density	General requirements for appropriate cropping	General requirements for appropriate cropping	General requirements for appropriate cropping	Planting density of cocoa should be between 600 and 1100 trees/ha.
Mixed cultures, shade cultures, agroforestry systems	General requirements for appropriate cropping	Mostly agroforestry	General requirements for appropriate cropping	Mixed culture desirable, endeavour to use shade culture and agroforestry systems (but not a condition of certification).
Qualitative limitation of nutrient input	Nutrient balance must be neutral. Application of trace elements only after submitting soil analysis results and receiving prior approval from Bio Suisse.	Limitation of N and P	Max. 1.2 LU/ha** equivalent on fruit Max. 1.4LU/ha equivalent for all other crops	A total quantity of fertilizer equivalent to 1.4 LU/ha** must not be exceeded, with farm manures spread evenly on the farmed land as part of the crop rotation. Application of trace elements only after submitting soil analysis results and receiving prior approval from Naturland.
Qualitative limitation of nutrient input	Strictly limited, only permitted fertilizers (no chemical-synthetic fertilizers). No meat- or bone- derived products, animal waste must be conditioned. See positive list.	Strictly limited, only permitted fertilizers (no chemical-synthetic fertilizers).	Strictly limited, only permitted fertilizers (no chemical-synthetic fertilizers), see Annex 4 of the standards	No poultry manure, conventional manure only after rotting, commercial green composts only with express prior approval from Naturland, no chemical-synthetic fertilizers, bought-in organic manures subject to restrictions (e.g. no meat meal, no blood or bone meal)
Quantitative and/or qualitative limitation of irrigation	Quality of irrigation water must be proven by means of analyses, where risk of contamination exists. No irrigation water from run-through of flood-irrigated conventional plantations	No	Not explicitly regulated, general requirement to avoid any contamination	Quality of irrigation water must be proven by means of analyses, where risk of contamination exists.
Quantitative limitation of pesticide input	Copper max. 4 kg/ha per year	Not on permitted inputs	E.g. copper input limited to 3kg/ha per year in permanent crops	Copper max. 3 kg/ha per year
Qualitative limitation of pesticide input	Not permitted: chemical-synthetic substances. strictly limited. Permitted: see positive list.	Not permitted: chemical-synthetic substances. strictly limited. Permitted: see positive list.	Not permitted: chemical-synthetic substances. strictly limited. Permitted: see Annex 5.	Not permitted: chemical-synthetic subst. Permitted: smell deterrents; preparations which increase crop resistance; Fungicides: wettable sulphur, copper salts, sodium silicate, lecithin, sodium bicarbonate; Animal pesticides: preparations of Ryania speciosa, Derris elliptica, neem; oil emulsions, soft soap; rock dusts; gelatine; viral, fungal and bacterial preparations. Only with prior approval from Naturland: Pyrethrum extract (no synthetic pyrethroids!), Quassia amare.
Measures to avoid drift	Maintain and document sufficient distance from conventionally cultivated land; if necessary plant hedges and/or rows of trees as protection; if there is nonetheless a risk of contamination _ market products from border rows as conventional produce (evidence of conventional marketing necessary).	Buffer zones	Drift must be avoided/minimized by taking suitable precautions; in certain cases, residue analyses from border rows may be required.	Maintain and document sufficient distance from conventionally cultivated land; if necessary plant hedges and/or rows of trees as protection; if there is nonetheless a risk of contamination _ market products from border rows as conventional produce (evidence of conventional marketing necessary).

** LU = livestock unit, a standard measure used to combine various classes of livestock to define allowable number per hectare of land for application of animal manure

Website	BIO Knospe www.bio-suisse.ch	KRAV www.krav.se	Demeter www.demeter.de	Naturland www.naturland.de
Production				
Bio-dynamic preparations			Application of biodynamic preparations (field spraying preparations and compost preparations) to all land.	
Compensatory ecological habitats	7% of the agricultural area	Not an obligation. The goal is sustainable production.		No conditions imposed
Measures to prevent erosion	Should endeavour to maintain ground cover, damming with living and dead material along contour lines; terraces in extreme situations.	Yes, by production methods	Not explicitly regulated	Should endeavour to maintain ground cover, damming with living and dead material along contour lines; terraces in extreme situations.
Forest conservation (primary / secondary), forest clearing	According to IFOAM Basic Standards	According to IFOAM Basic Standards	Not explicitly regulated	Clearing of virgin forest (primary forest) is prohibited.
Processing				
Limitation of process additives	Yes. See positive list.	Yes		No special regulation, Naturland processing standards apply, according to which no processing aids are permitted except plant oils and fats and separating waxes (beeswax, carnauba wax) as separating agents
Limitation of processing methods	Limited, see processing standards.	Yes	Strictly limited, see Demeter processing standards	No special regulation, Naturland processing standards apply
Quality standards	Free of contamination, food quality.	–	Yes, strictly regulated, see Demeter processing standards	Free of contamination, food quality.
Traceability	Must be 100% at all times.	Must be 100% at all times.	Must be 100% at all times.	Must be 100% at all times; where products of several producers are mixed, producers risk collectively losing their certification as a result of problems that have arisen on an individual holding. As far as possible, labelling must show provenance and organic or conversion quality.

4.4 Private organic labelling schemes

Most of the private labelling schemes both in Switzerland and in the EU go further than the minimum requirements of the Swiss Organic Farming Ordinance and the EU Regulation on Organic Production. Before the latter came into force, the standards that were applied to the production and marketing of organic products were primarily those set out by private organic labelling and certification schemes, e.g. Naturland, Bioland, BIO SUISSE, Ernte für das Leben, Demeter, Soil Association and supermarket labels like the "Migros Bio" label. Some examples are outlined in the following.

4.4.1 Private label requirements for organic cocoa, coffee and tea

There are currently no specific standards for organic cocoa, coffee or tea and their products in any main markets. For organic coffee there do exist some local regulations e.g. in Mexico. Also IFOAM is preparing some standards for organic coffee. However, generally these products must be certified according to the standards applicable to organic food products in general.

4.4.2 IFOAM Standards

The extent and progress of organic agriculture in many countries have been enhanced substantially by the development of a set of principles, requirements, and guidelines for organic farming and processing commonly referred to as Basic Standards. This eventually evolved into the International Federation of Organic Agriculture Movements (IFOAM) Basic Standards. It reflects the collective knowledge and practices of IFOAM members who, in 1972, came from five countries of Europe and now from 115 countries worldwide. It is widely recognized worldwide and, as a "living" document, it is continuously evaluated and constantly improved through a democratic process every two years when IFOAM holds its General Assembly.

The IFOAM Basic Standards seek to clarify the practices and procedures approved in organic agriculture, those that may be accepted, and those that are to be prohibited.

The IFOAM Basic Standards cannot be used for certification on their own. They provide a framework for certification programmes world wide to develop their own national or regional standards. These will take into account local conditions and may well be stricter than the IFOAM Basic Standards. The IFOAM Basic Standards also form the basis from which the IFOAM Accreditation programme operates. The majority of certification programmes used worldwide are accredited by IFOAM.

4.4.3 Relationship to Fair Trade

Smallholders and cooperatives producing cash crops have always been vulnerable to falling world market prices. A number of organizations worldwide try to reduce these risks by ensuring that producers are rewarded fairly for their products. The organizations guarantee the small farmers and producer associations in the South a fair price for their produce and act as intermediaries in marketing the products, which then bear the label of the organization. Fair Trade organizations have separate programmes for different crops, of which the labels for coffee and cocoa are the better known.

In Europe, the most frequently seen Fair Trade labels are those of Max Havelaar, Transfair and World Shops (Weltl den). Further information can be found on the website of Labelling Organizations International (FLO), Max Havelaar and Transfair. Fair Trade labels also appear in the United States and elsewhere, though to a lesser extent than in Europe.

Having a Fair Trade label does not necessarily mean, however, that the products can also be sold as 'organic'. In order to be designated organic, the project must be subject to accredited organic inspection procedures.

Several private organic labelling and certification schemes, e.g. BIO SUISSE, maintain close contacts with Max Havelaar or Transfair, since some projects conform to the standards of both organizations. The combination of 'organic' and 'Fair Trade' labelling can enhance a product's market prospects and is used successfully with organic coffee, tea and cocoa products.

The inspection and certification process

Certification body sends approved/corrected farm documents to producer and inspector

↓

Inspector prepares inspection based on farm documentation

↓

Inspection of the farm/processing plant: Inspector and producer sign inspection documents

↓

Inspector sends report and farm documents to certification staff

↓

Review of the report by certification staff

↓

Decision on certification and possible conditions or sanctions by certification committee

↓

In case the producer does not agree with decision: submitting an appeal?

4.4.4 Relationship to "eco"-labels

The United States has several labels of organizations dedicated to conserving the environment, and rain forests in particular.

Among these, Rainforest Alliance – an international non-profit organization dedicated to the conservation of tropical forests – is one of the most active. Its major efforts include promoting and certifying sustainably managed timber and agricultural production in the tropics.

The certification programme of the Rainforest Alliance, ECO-O.K., was established to promote market incentives that will transform tropical agricultural production so that it is less environmentally damaging. ECO-O.K. has certified bananas, oranges, coffee and set up draft guidelines for ECO-O.K.-cocoa certification.

Having the ECO-O.K. label or other "eco"-labels does not mean, however, that the products can also be sold as 'organic'. In order to be designated organic, the project must be subject to accredited organic inspection procedures.

4.5 Inspection and certification of organic cocoa, coffee and tea

For the products to enter a specific market, they must be certified as having been produced according to the standards applicable in that market. Certification is thus a necessary condition for international trade in organic coffee, tea and cocoa products.

For a product to be certified organic, all operators in the product chain – farmers, exporters, importers, processors, manufacturers, wholesalers and retailers – must be certified as acting in conformity with the regulations and standards of the certification programme concerned. They must be certified by an accredited inspection body at least once per year. For this they must enter into a contract with an accredited inspection and certification body. A list of accredited inspection and certification bodies exists for the EU and for Switzerland (see handbook "The Organic Market in Switzerland and the European Union", 2001).

Requirements relating to inspection bodies
Since January 1988, all inspection and certification bodies accredited in the EU

and Switzerland must satisfy the requirements of the EN 45011 standards (these are identical to ISO Guide 65; both set out general standards for certification bodies), in order for suitable imports of organic goods to be approved by the European and Swiss authorities. Because of the requirement of equivalency, this also applies

Inspection
- On-site visit to verify that the performance of an operation is in accordance with specific standards
- Evaluation and verification of agricultural production, processing and trading
- Inspection requires complete documentation by producers, processors and handlers
- Findings are presented in a report to the certifiers (see Chart 2)

Certification
- Guarantees the fulfillment of the label standards and of legal regulations
- Compares results of inspection with requirements of standards
- Decides about issuing of certificates, conditions and sanctions
- Written assurance that a process or product is in conformity with certain standards

Accreditation
- Guarantees that the certification programme is competent to carry out specific tasks
- Authoritative body checks whether a certification system is operating according to certain standards
- Various accreditation programmes: national, EU (EN 45011), ISO (No. 65), IFOAM

Organic labelling
- Easy recognition of organic quality and certification system
- Monitoring the market for misuse of certification mark or label
- Label-specific standards possible in addition to organic standards

to all inspection bodies in third countries from which certified products are imported into Europe. In other words, it also applies to local inspection bodies in emerging markets and markets in transition. There are three options for going about this (for details see the handbook "The Organic Market in Switzerland and the European Union" 2001; see Annex).

Smallholder group certification
To allow smallholder organisations to participate in the organic market, some certifiers developed a specific inspection procedure, which can be applied in sufficiently warranted individual cases. The concept is mostly based on a combination of an internal control system managed and operated by the smallholder organisation, and an external inspection and certification scheme, which comprises the supervision of the organisations' "in-house" internal control system. Based on a standard inspection programme, an inspection report is produced and does contain details on the above mentioned provisions of the Regulation, bearing in mind the principle of equivalence with the EU regulation.

Producer's documentation duty (according to EU Regulation No. 2092/91 Annex IV)

a) Name and address of producer
b) Maps
c) Field histories
d) Location of premises and, where appropriate, parcels (land register data) where operations are carried out
e) Nature of operations and products
f) Undertaking by the operator to carry out the operations [...]
g) In the case of an agricultural holding, the date on which the producer ceased to apply (banned) products [...]
h) The name of the approved body to which the producer entrusted inspection of his undertaking [...]
i) Documentation of production sites
j) Documenting use of chemicals

Part B:

Production guidelines for organic Coffee, Cocoa and Tea

1 Organic Coffee cultivation

1.1 Introduction

Coffee is the most important raw material traded throughout the world behind crude oil, and has become the most important export article for the nations that grow it.

1.1.1 Botany

The coffee plant belongs to the family of rubiaceae. *Coffea arabica* as a bush, *Coffea canephora* as a bush-like tree. The white, aromatic coffee blossom does not depend on cross fertilisation. The ovaries develop into an oval fruit containing two seeds, and needs 6-8 months to ripen. Ripe coffee cherries have a red or yellow, sweet type of flesh; the actual coffee beans are contained within them, in a membranous pellicle and thin, hard endocarp.

1.1.2 Varieties and countries of origin

Economically, the most important coffee varieties are *Coffea arabica* called "Arabica" and *Coffea canephora* called "Robusta" (see table 1). In comparison with Arabica, 30 % higher yields are gained from Robusta, although the price is around 30% lower. There are also other coffee varieties, and although these play hardly any role in today's coffee trade, they can be important locally (e.g. *Coffea maragohipe*, which has similar site requirements as "Robusta", and is characterised by its extremely large coffee beans).

Successful attempts have been undertaken to scion graft Arabica varieties onto Robusta rootstocks during the past few years. This method seems to be useful to organic coffee cultivation, because Robusta has a more highly developed root system, and is thereby very proficient at acquiring nutrients, and, apparently, also has a higher resistance against pests.

The "modern" varieties currently in use, have all been bred for conventional coffee cultivation (single-form resistances, good nutrient extraction and high yields).

These are of little import to organic coffee cultivation; in general, older local varieties that are adapted to site conditions are used:

Local varieties

Ar bica, T pica Criolla
Very old, original variety with many local types. Well suited to high altitude sites with dense, diversified shade. Grows tall, yet its branches are elastic, and can be bent down to harvest. Easy to trim and cultivate. Is undemanding, does not alternate and is resistant to drought. The variety produces large beans of a good quality. Relatively susceptible to coffee rust (Hemileia vastatrix) and brown spot (Cercospora coffeicola). Very well-suited to extensive organic cultivation.

Table 22: Characteristics of different coffee varieties

Variety characteristics	Coffea arabica (Arabica)	Coffea canephora (Robusta)
Share of world production	ca. 70%	ca. 30%
Site requirements	High sites; fluctuations in annual rainfall and temperature	Low sites; steady high temperatures and rainfall
Main growing areas	Latin America, East Africa	Asia, Africa
Caffeine content	0.6 – 1.5%	2.0 – 2.7%
Diseases/ pests	Susceptible to the berry borer and coffee rust	Resistant against the berry borer and coffee rust

Bourbon
Old variety, from the Caribbean island Bourbon. Widely spread, suited to deep lying sites with intensive shade. Grows tall, easy to trim, undemanding and alternates little. Ripens earlier than Típica, has small beans of an acceptable quality. Susceptible to coffee rust and berry borers (Hypothenemus hampei). Well-suited to organic cultivation in lower regions.

Mundo Novo
Similar variety to Bourbon, bred in Brazil for monocultures. Can withstand high crop densities, only suited to organic cultivation in lower regions under certain conditions.

In practically all of the traditional coffee cultivation areas, local varieties or sorts have been selected that were very well adapted, until new strains of coffee diseases and pests appeared, and which still are to some extent. The following represents a few examples:

Examples of local selections:

Pache (Central America)
Local selection of Típica. Well-adapted to high sites and dense shade. Late ripening, with large beans and excellent quality. Low yield.

Pluma Hidalgo (Mexico, Guatemala)
Excellently adapted to high sites above 1,200 m (cultivation also up to 1850 m). Not alternating and very resistant. Low yield, yet very large beans of excellent quality.

New varieties

Caturra (South America)
Small plant with short internodes and thick, dark green leaves that has been developed for monocultures. Well-suited to intensively cultivated organic plantations. Needs more sun and more intensive trimming than the local varieties, and produces a much higher yield. Coffee plantations only have a short life-span, and must be renewed after 20 years. Beans are of a reasonable size and quality.

Catuai (South America)
Developed in Brazil for monocultures as a cross-selection between Caturra and Mundo Novo. Plant is stronger in growth than Caturra, some lines produce red and yellow cherries. Needs more sun and more intensive trimming than the local varieties, yet produces a much higher yield. Suited under certain conditions to intensively cultivated organic plantations. Beans are of a reasonable size and quality.

Colombia (Columbia)
Developed for monoculture in Columbia, resistant against rost, consists of 12 lines, and therefore not self-proliferating. Poorly developed root system, is demanding and very productive. Unsuitable for shady organic cultivation systems. Large beans of good quality. (In Costa Rica, a similar variety is called Costa Rica 95.)

Yapar 59 (Brazil)
Variety developed for monocultures which lack shade, resistant against rost. High demand of nutrients, little shade tolerance, therefore not well-suited to organic cultivation (in Mexico, variety is called Oro Azteca).

Catimor
Is a cross-selection between Caturra with a hybrid from Timor. Useful due to good resistance against rost, even under dense shade. High demand of nutrients. Certain Catimor lines have problems with organoleptic quality.

Carnica (Mexico)
In Mexico, well-adapted to sites between 1000 m and 1400 m. Good yields, even at low temperatures, good resistance against rost, yet susceptible to Cercospora; medium yields. Not alternating. Low quality.

1.1.3. Uses and contents

Coffee is used almost exclusively in the drinks industry, and is offered to consumers as roasted beans, ground, and also as instant coffee. This also counts for coffee in organic quality. In the most important consumer countries, roasted coffee is almost always sold as a blend of different origins and qualities. Only gourmet coffees are not blended, but are generally one single product. Espresso blends, for example, contain much caffeine-rich Robusta coffee and strongly roasted, unwashed Arabica coffee.

An important constituent of the coffee bean is caffeine. The free caffeine content in a bean is dependant on the coffee type, variety, the site conditions and other factors, and can be more than 2.5%.

1.2. Aspects of plant cultivation

Coffee originates from the subtropical forest eco-system of the Ethiopian high lands, where it grows under the shade of a variety of trees in a summer rain region. Traditional coffee cultivation, which today is practised predominantly by small and medium sized farms, re-creates coffee's original growing conditions on diversified agroforestry systems. These are also the foundations of organic coffee cultivation, which nevertheless differs slightly through its more intensive cultivation.

Coffee can, of course, also be produced in monocultures, with a high input of additional substances. This mostly the case on

plantations in Africa, Brazil, Columbia and Costa Rica. They produce most of the conventional coffee.

In practice, though, organic coffee cultivation has proven that cultivation in monocultures is hardy possible in economical and technical terms, and, in ecological terms, is highly undesirable.

World-wide organic coffee cultivation is quite disparate, and been adapted to suit the site conditions. Nevertheless, two types of systems can be differentiated:

- Extensive systems, with essentially closed nutrient cycles – that are predominantly cultivated by indigenous farmers and smallholdings. (no import of organic fertiliser.)
- Intensive systems, with nutrient imports, that are predominantly cultivated by medium to large holdings. (import of organic fertiliser.)

1.2.1 Site requirements

Coffee plants prefer well-drained and airy soils. They can grow in shallow ground, due to their network of surface roots. Humus-rich, lightly acidic soils are beneficial; the best conditions are those to be found on virgin soils of volcanic origin.

The ideal temperature range for Arabica coffee plants lies between 18°C and 24º C. At higher temperatures, bud formation and growth are stimulated, but the greater proliferation of pests increases the risk of infection, and quality sinks. Coffee plants are susceptible to frost, temperatures below 10º C inhibit growth. Robusta plants can withstand higher temperatures, and are more resistant against infection.

The ideal amount of rainfall lies between 1500 mm and 1900 mm. Coffee plants react positively to a drought period, that should nevertheless not be longer than 3 months. The rainfall should be evenly spread throughout the rest of the year. Irregular rainfall causes uneven blossoms and fruit maturity

Coffee is a half-shade plant, that can only utilise around 1% of the sunlight (ideal is around 1500 hours per year) photosynthetically. At leaf temperatures over 34º C, assimilation is practically zero, meaning that the rate of photosynthesis of a shaded plant is actually higher than that of a plant fully exposed to the sun.

As a rule: In lower regions Robusta and in higher regions Arábica.
The limit is variable, and lies around 600 – 900 m.

The berry borer and coffee rost pests are important indicators as to whether the coffee variety is suited to the site conditions. An Arabica plantation at 600 m, which is heavily infested by coffee rost and berry borer, despite sufficient shade, is an indication that the variety is ill-suited to the site, and should, in time, be replaced with Robusta.

1.2.2. Diversification strategies

Crops of the upperstorey (shade)

The most important functions of shading trees on coffee plantations are:

- Creation of large amounts of organic material and humus. Pumping up of nutrients from the lower soil regions. Leguminous trees fix nitrogen, and palm trees break down phosphorous compounds, making them available to plants.
- Protection of the coffee plants against too much sun, which then regulates the intensity and rhythm of the plants' photosynthesis. The alternation in yield is thereby reduced, and the life-time of the plantation increased.
- Shade also has an immense influence on the quality of the coffee, simultaneously, though, it also reduces the yield (fewer coffee plants per surface unit).
- Reduction of weeds: When an optimum density of coffee and shading trees is reached, tilling weeds is hardly necessary anymore.
- Protection against soil erosion.
- A diversity of micro-climatic effects. By choosing the correct varieties and cultivation method for the shading flora, the micro-climate can be influenced at any point in time, which is of central importance to the regulation of pests.
- Fruit trees offer a diversification for the farmer's diet and economic base.
- Precious woods can provide long-term increase in value of the site: along with other varieties, they can provide wood for construction and fuel.
- More pleasant working temperatures on the plantation.

No figures can be offered for the optimum shadow density, as this depends on the local site conditions and the state of the plantation. A rule of thumb says that the shade should be around 50%.

The higher in altitude the coffee plot lies, the less the distances should be between the coffee bushes and start of the shading roof (the distance is in an inversely proportional ratio to sea level). At the upper growth limits for coffee plants, the shading plants are therefore at around the same height as them.

Care should be taken to trim the shading plants synchronously to the coffee blossoming (6-8 weeks before the blossom). Blossom formation can thereby be assisted and synchronised.

The following examples of "successful" shading trees should only be used as a guideline. Most important is taking varieties found at the site into consideration.

Table 23: Examples of «successful» shading trees for coffee and their caracteristics

Variety	Suitability	Remarks
Inga spp. (I.edulis,I.deniflora, I.spectabilis and others)	• Very well suited to good sites • Requires regular trimming • Foliage forms more slowly than e.g. Erythrina • Edible fruits and good fuel • Excellent N-Fixer	Widely available; many local varieties. Must be combined with other crops, because Inga spp. is susceptible to pests when grown alone.
Erythrina spp. (E.poeppigiana, E.edulis)	• Produces a lot of easily degradable foliage • Excellent N-Fixer	Needs extensive trimming; wood is unusable, can be used as fertiliser and fungi nutrient.
Albizzia spp.	• Tall trees with sparse shade • Very good for lower sites	Difficult to trim.
Alnus spp.	• At very high, humid and cool sites • Large leaves • good for fuel	Not a legume, yet still an N-Fixer.
Leucanena leucocephala	• Unsuitable, because agressive • Must be trimmed often	
Cedrela odorata	• Tall tree with dense crown • Suited to low, not so humid sites • Valuable precious wood	Can be trimmed.
Cordia alliodora	• Tall tree suited to warm sites • Produces little foliage • valuable wood	Cannot be trimmed.

Crops of the middle storey

As with the plants of the upper crops, the combination of varieties used for the middle crop should be adapted to the local site conditions, and the need for fruits and additional products for each individual plantation. Bananas should, if possible, always be integrated as an additional crop. They are well suited to providing temporary shade, and for 'drying out' of the wetter parts of a plantation. Their ability to mobilise potassium reserves in the soil, and to make them available for the coffee plants is very important.

A whole diversity of combinations with other fruit trees can be integrated into the system: Citrus- varieties, planted together with avocado, are especially good for sites which enjoy intensive sunlight. In warmer climates, especially on Robusta plantations, combinations are possible with, for example, mangosteen trees, rambutan and Jackfruit.

Crops of the understorey

On sub-optimum sites (e.g. too dry or poor in nutrients), it makes sense to replace the natural vegetation in the understorey with green manuring plants (legumes). Yet the bottom crops should not be allowed to dominate and completely supplant the natural vegetation.

Many varieties are suitable as bottom crops. They should be selected according to the amount of shade they provide, soil conditions and rainfall. In principle, bottom crops should be sown on new plantations, or when the shading trees and coffee bushes are being trimmed, otherwise there will not be enough light on an organic coffee plantation for the bottom crops. It is very important to sow perennial, non-climbing and not very aggressively growing legumes. Otherwise there is a danger of the coffee plantation becoming overgrown (e.g. with *Pueraria phaseoloides or Mucuna spp*.).

The following lists a few successful varieties:

Table 24: Successful varieties as bottom crops for coffee plantations

Variety	Suitability	Remarks
Arachis pintoi	• Needs much rain and light (but cannot tolerate direct sunlight) • Deep roots, only grows to 30 cm • Covers a large surface area, highly competitive, and prolific foliage production • High N-fixing and good for fodder for small animals and chickens	Seeds very expensive, can be easily self-cultivated; good vegetative growth; once established *Arachis pintoi* is difficult to remove; slow initial growth.
Desmodium ovalifolium	• Fodder plant, needs little rain, yet relatively large amount of light • competitive and prolific foliage production with rapid turnover	Can grow to 80 cm tall and certain lines might begin to climb; slow initial growth
Glycine wighti	• Fodder plant, needs little rain, yet relatively large amount of light • prolific foliage production with rapid turnover • Climber, yet not too aggressive	Slow initial growth up to 80 cm tall
Centrosema macrocarpum	• Grows well with little light • Withstands drought periods • Competitive, stubby growth	Seeds relatively expensive, difficult to cultivate; slow initial growth
Indigofera suffructicosa	• Can tolerate shade • Also grows at wet sites • Little foliage production (with rapid turnover)	Seeds difficult to obtain; slow initial growth; often grows naturally, and can be encouraged through selective weed tilling
Canavalia ensiformis	• Suitable for new plantations	

1.2.3. Supplying nutrients and organic fertilization management

The many reports on requirements of individual nutrients all offer different figures. The following represents average values that have been confirmed in practice:

Table 25: Average nutrient requirements of 800 kg green raw coffee per Hectare

(Represents a good harvest of in organic farming systems)

	Nutrients kg/ha		
	N	P2O5	K2O
Coffee beans	34,0	6,0	8,0
Pellicle membrane	2,5	0,6	2,0
Endocarp	15,0	4,0	27,5
Total	51,5	10,6	37,5

These figures make it obvious that both the endocarp, and also the pellicle membrane, if possible, should be returned and utilised on the plantation. This is best achieved through composting, whereby it may make sense to enrich the compost with wood ash and rock phosphate.

A high-performance coffee eco-system with good site conditions and optimum yield should be capable of fixing the net amounts displaced itself (34 kg N), or to be able to mobilise them from the soil or subsoil (6 kg P_2O_5 and 8 kg K_2O per year).

It is recommended to actively supply fertiliser to help the long-term balance of nutrients when:

- New plantations: Every plant hole should receive a generous amount of fully decomposed compost. In cases of very low phosphorous reserves in the soil, rock phosphate can also be added (no feeding bone meal, as this will draw mice and other animals that may damage the young plants).
- After the coffee bushes have been trimmed, so that the new growth can develop healthily and strong (add compost).
- In times of high coffee prices, when the substantial work of using additional organic fertilizers can be justified. These measures need to be well co-ordinated, so that the coffee eco-system does not suffer in the long-term.

In order to avoid damaging the surface coffee roots, compost and other organic fertilizers are not worked in, but are instead covered over with a thick layer of mulching material.

1.2.4. Biological methods of plant protection

Conventional coffee plantations are generally confronted with a multiplicity of pests and diseases. In practice, on ecological coffee plantations, the following may be of relevance. An infestation of either pests or diseases is always an indication that the coffee eco-system is not balanced, and that the causes must be investigated. Possible causes are:

- Unsuitable site (too low altitude, too warm, too humid, stagnant water, too dry).
- Degenerated and poor soils, lack of organic material.
- Too little diversity and too few shading trees.
- Non-adherence of the correct succession of the forest system, trees too old or wrong variety.
- Varieties too close together, which have an identical status in the system.
- Failure to trim the shading trees (too much shade).

Fungi infections which occur can generally be dealt with by radically tilling weeds, or a bottom crop trim, or by trimming the shading trees (which would regulate the air circulation and humidity).

Should problems with diseases re-occur, possibilities exist to improve the whole system, providing the site is suitable for the coffee variety used. Usually, both the coffee bushes and the shading trees will need to be radically trimmed, or, unwanted shading trees removed and replaced with varieties that are lacking.

Table 26: Possible diseases and vectors, the cause in an ecological system and the possible measures to be taken

Disease/vector	Cause in an ecological system	Possible measures
Coffee rust *Hemileia vasatrix*	Susceptible variety Coffee bushes planted too close together Too much or too little shade Unbalanced nutrient supply	Plant resistant variety, or graft with Robusta rootstocks Change density Regulate shade Trim plants; supply organic fertiliser to young plants; Treatment with Cu preparations[1] makes little sense ecologically and economically; little is known about treatments with *Verticillium spp.* preparations.
Brown Spot *Cercospora coffeicola*	To dense cultivation in tree nursery; wrong irrigation and shade Site too wet/trees to close together Too much shade	Change density Trim, produce more air circulation Change shade
South American Leaf Spot *Mycena citricolor*	Site too cool and wet Too much shade or weeds Distance between coffee bush and tree crown too small	Regulate shade and weeds Plant taller shading trees
Pellicularia koleroga	Warm humid sites with plenty of shade	Regulate shade and 'dry out' site, e.g. with bananas, plant trees with large leaves to provide shade
Coffee Berry Borer *Hypothenemus hampei*	Plantation at too low altitude; Abandoned or infected plantations nearby; Several blossoms, coffee cherries which ripen over long period	Complete harvest and collection of all coffee cherries (harvesting hygiene) Infect the plantation with the entomophageous fungi Bauveria bassiana. Generally, 2-3 settings suffice, then the infection will have taken; Release of chalcid wasps *Cephalonomia stephanoderis*, is very involved, and only makes sense on dry sites where *Bauveria bassiana* does not work well enough.
Coffee Leaf Miner *Leucoptera coffea*	Too much sunlight, and too dry micro-climate	Improve shade

[1] According to the European Regulation for Organic Agriculture (EEC) 2092/91 the use of copper preparations for plant protection (e.g. Bordeaux Mixture) is allowed for a transitional period which will end at the 31st of March 2002. However, any use of copper preparations until 2002 has to be approved by the certification body. In case copper preparations have to be applied it is recommended to use preparations which contain less copper and therefore to reduce the accumulation of copper in soils (e.g. tribasic copper sulphate, copper hydroxide).

1.2.5. Crop cultivation and maintenance

Establishment of new plantations

When starting a new plantation, maize can be sown as a pioneer crop. Depending on the initial conditions (soil fertility, consumer habits, market access), these can then be sown in a mixed crop with, e.g. beans *(Phaseolus sp.),* manioc *(Manihot esculentum),* bush peas *(Cajanus cajan)* or, as a temporary covering for the soil, together with jack beans *(Canavalia ensiformis)*. Before planting the pioneer crop, bananas should have been planted already, whereby the relevant distance between the plants is dictated by the coffee variety, density and type of cultivation. Along with normal coffee varieties, tall-growing and local varieties which can tolerate shade should be integrated within the plantation.

The density and type of cultivation of the coffee bushes should be determined according to local experience and knowledge, according to variety and the amount of cultivation carried out. The density of the coffee bushes should not exceed 1,000-2,500 plants per hectare, in order to leave enough standing room for the shading trees. It is important to cover up the ground as soon as possible.

Nurturing young plants

The seeds should originate from healthy organic plantations, and if possible from the same altitude and region. When selecting and preparing the seeds, general criteria such as choosing only large, ripe fruits from middle-aged plants, only from the middle part of the shoots; shelling and washing them without fermentation occurring, etc.

Seedling nurseries can be established according to well-known methods in shaded nursery beds of pricked polyethylene sacks.

The best method has proven to be the direct sowing of two or more seeds per polyethylene sack, which are then later thinned out to one healthy plant (saves time, no pause in growth through transplanting, many seeds used).

The substrate should compose of at least 30% good quality compost (coffee pulp), with additional fresh forest soil. If necessary, it may be heated up by the sun by covering it with black plastic foil.

Shortly before the plants are transplanted, the amount of shade covering the seedling nursery should be similar to that of the final plot.

Green manure and liquid manures, as well as other intensive cultivation measures, should be identical to those carried out on the future plantation. It makes no sense to provide intense measures to the young coffee plants in the seedling nursery, if the plantation itself will later be extensively cultivated. When transplanting, an application of compost is recommended.

Cultivation measures

The coffee eco-system should always be cultivated at a constant intensity. Yet one of the most important advantages of a diversified system is that during periods when the coffee price is high, the system can be cultivated more intensively to produce higher yields, yet when the price is low, the proceedings can be slowed – without the plantation being harmed. The coffee yield will drop off slightly, yet at the same time, the other crops in the system will gain in importance.

The coffee plants should regularly be trimmed after a harvest, although this varies from site to site, and with local tradition, and is also dependant on the variety. The Típico varieties (Arabica) allow themselves to be bent down quite a way during the harvest, and therefore do not need to be cut back so much. Every 8-16 years, a cure of radical trimming is recommended (down to ca. 40 cm above the soil), yet the precise time depends on the site and condition of the plantation. Care should be taken to always trim whole portions of the plantation (10 % of the plot), so that the positive results of the renewing stage can take effect in the coffee eco-system.

The shading trees must also be regularly trimmed. Old trees should be felled at the same time as the coffee plants are radically trimmed, so that damage caused by falling branches can be minimised, and the new influx of light can effect a new growth dynamic on the plantation. Under no circumstances are trees to be „ringed“ (remove of the bark), in other words killed off gradually by removing their protective layer of bark, because the slowly dying tree will have a negative influence on the entire dynamism of the system.

Weed management

The layer of foliage under the coffee bushes is more or less dense, according to the density of the coffee bushes, and the amount of light that the shading trees let through. In a coffee eco-system with optimum plant and shade density, tilling weeds is barely necessary. A certain number of weeds are always present – especially on young plantations – where they can also offer protection against erosion on steep slopes.

Working the soil to regulate weeds should be avoided to prevent doing damage to the shallow roots of the coffee bushes. Hoes should on no account be used. Grasses and other flora should be ripped out when the soil moisture content allows. Weeds should be cut down to a height of 5 cm with a knife, motor scythe or mulching machine. No deeper, so that the root system helps to hold the soil together. Selective trimming of the accompanying foliage is very important. The desired part of the accompanying flora should be cut back less, and thus encouraged, the unwanted weeds can be radically cut back or pulled out. In addition, some of this accompanying flora should be kept as a food source for insects.

All plant material should remain on the plot as mulching material. The trimming of the accompanying foliage should be timed to coincide with the nutrient requirements of the coffee plants. The frequency of trimming depends largely on local site conditions, especially rainfall (nevertheless, at least twice a year). Only the weeds at the blossoming stage should be cut down.

Soil protection

An agroforestry system which is permanently covered with mulching material provides an ideal protection against erosion. Sites built on steep slopes could need additional measures to protect them. This is especially true on new plantations. Here, stone walls should be erected along the contour lines, in combination with a deliberate cultivation of erosion preventing plants. The shade-tolerant pineapple varieties Annanas comunis and rather light intensive grasses *Vertiveria zizanoides* or *Cymbopogon citratus* (lemon grass).

The erection of terraces on existing coffee plantations is not recommended. Coffee roots run close to the surface, and ground work should be avoided if possible to prevent damage occurring to them. Yet if these measures cannot be avoided, then the construction should take place simultaneously with a radical trimming of the coffee bushes, and a renewing cut back of the shading trees. Cover up any exposed coffee bush roots with mulching material.

1.2.6. Harvesting and post harvest treatment

High quality requirements are placed on organic coffee. The main influences next to the site conditions and type of cultivation are time of harvesting and the post harvest handling.

Harvesting

Only ripe fruits should be harvested, meaning that, depending on the frequency of blossoming, that up to five stages may be necessary. The wet stage of processing must also commence on the same day (Arabica).

Post harvest treatment

Especially when a wet stage of processing (Arabica) is necessary, care should be taken to provide adequate drying places for the coffee beans (concrete drying surfaces; roofed structures to offer protection against rain). Coffee beans stored in a wet state (after insufficient drying), or storage areas that are not well enough protected against the rain, will encourage the growth of fungi. The quality of the coffee can be very strongly affected by this, or even, in extreme cases, become unsellable (creation of the fungus toxin Ochratoxin A).

1.3. Product specifications and quality requirements

1.3.1. Raw coffee

Processing

Raw coffee is made by processing the ripe, red coffee cherries of the bush-like coffee tree, species coffea, and traded on the world's markets. Blending and roasting the raw coffee is mostly carried out in the importing countries.

Two different procedures are used to process coffee cherries, the 'dry and the wet methods'. The requisite stages are listed below:

- *Dry processing*
  During the dry processing procedure, small stones, twigs and leaves etc are removed from the harvest in a type of floating chamber. The remaining coffee cherries are then spread out on a large rack and laid out in the sun to dry out, being turned over occasionally with a rake, in order to prevent mould developing. Depending on the weather, the drying process can take up to eight days. It has been completed when the beans rattle around in their shells when shaken. Under unsuitable weather conditions, the beans may begin to rot, which can result in a drop in quality.
- *Wet processing*
  During the dry processing procedure, the freshly picked coffee cherries are filled into large water containers. The healthy, ripe cherries sink immediately to the bottom of these tanks, which are usually built of raised concrete,

Shading trees on coffee plantations are important.

whilst twigs, leaves and damaged or mouldy coffee cherries float on the surface and can easily be collected. This also means that the harvest is simultaneously washed. The coffee cherries are then fed into a swelling tank via a water channel, where they remain for a maximum of 12 hours. In the next stage, the slightly swollen cherries are fed into a pulper, there, the majority of the fruit pulp is separated from the pellicle membrane of the beans. The remaining, slimy fruit flesh residues are separated from the coffee beans through brief fermentation (12-24 hours, or up to 2-4 days during cool weather). Finally, the coffee beans are washed, and dried out on large racks in the sun, or with hot air in drying drums. In order to correctly store the coffee beans, it is useful to reduce their water content down to 10 %.

- *Shelling*
  The pergamin coffee, which has been dried to a glass-hard finish, is then shelled and polished in the same way after the 'wet and dry procedures', in order to remove the skin and shell.
- *Sorting into trading categories*
  Before the raw coffee can be traded on the world market, it needs to be graded according to established criteria. The coffee is mechanically sorted, by sieving it to obtain beans of the same size. Not the length of the beans, but their width is important for the size of the holes in the sieve (waist). The sieves are graded from size 20 with holes that are around 8 mm across, down to size 10 with 4 mm holes for the beans. Sieve number 17 is viewed as the average size.
- *Cleansing, sorting and filling*
  After sieving, the coffee reaches a large ventilator. All of the foreign particles, such as skins and shells from the polishing process, still remaining are blown off by a stream of air. Then the coffee is selected. This is necessary, because normal sized bad beans cannot be sorted out by the mechanical process. The so-called bad beans (grass beans, frost beans, 'stinker' etc.) are transported via conveyer belt to be manually sorted. The final processing step is to fill and pack the raw coffee into sack units of 48 kg or 60 kg, and then store them.

Raw coffee is traded according to certain quality criteria. Certain individual characteristics have emerged for most of the producing countries, which are used to assess the requisite quality, and for the buyers to choose their wares. The authorities and farmer associations in the producing countries are responsible for establishing the characteristics for each coffee grade. These are then only applicable for one particular variety.

Organic coffee seedling production.

The following aspects need to be heeded when the beans are sorted into grades:

- Processing method (wet or dry)
- Colour of the beans (green, blue-green)
- Growing site (district, altitude)
- Style (outward appearance)
- Number of defects (foreign particles, broken, shells, grass beans etc)

In order that the quality requirements are upheld, and no contamination of the raw coffee occurs, preparation should take place under clean, hygienic and ideal conditions. The following aspects should be adhered to:

- Equipment (tubs, knives etc.), as well as working and drying surfaces (racks, mats etc.) and preparing and storage rooms, should be cleaned regularly.
- Personnel should be healthy, and have the possibility to wash themselves, or at least their hands (washrooms, toilets) and wear clean, washable overgarments.
- Water used for cleansing purposes must be free from faeces and other contaminants.
- Animals or animal faeces must not come into contact with the fruits. If the fruits are to be dried in the open, then fences must be erected to guard the racks against birds and nearby animals.

Task list for the processing of coffee cherries

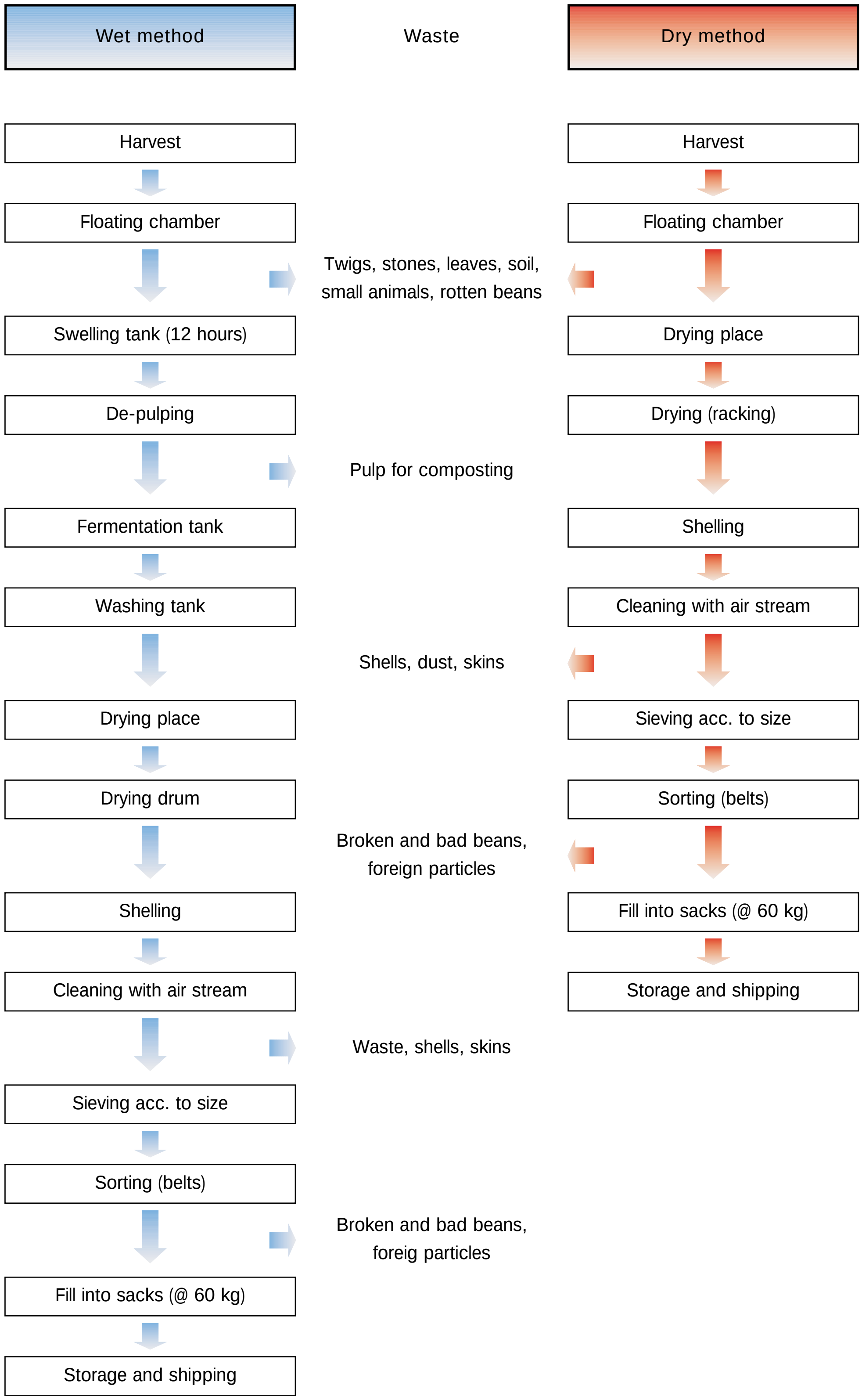


Table 27: Quality characteristics with minimum and maximum values for raw coffee normally required by importers.

Quality characteristics	Minimum and maximum values
Cup quality	• aromatic • clean • free from foreign tastes and smells
Bean shape	homogenous
Water content	max. 13 %
Residues	
Pesticides	Not measurable
Bromide and ethylene oxide	Not measurable
Mycotoxins	
Aflatoxin B1	max. 2 µg/kg
Total aflatoxins B1, B2, G1, G2	max. 4 µg/kg
Ocratoxin A	max. 2 µg/kg (4 – 437)
Patulin	max. 50 µg/kg

Quality requirements

The following is a list of quality characteristics with minimum and maximum values for raw coffee, that are usually required officially or by importers. Different minimum and maximum values can be agreed between importers and exporters, providing these do not clash with official regulations.

Packaging and storage

Bulk packaging
In order to be exported to Europe, the raw coffee is usually packed in sacks in units of 48 kg or 60 kg.

Information printed on the sacks
The sacks should display details of the following:

- Name and address of the manufacturer/packer and country of origin
- Description of the product and its quality class
- Year harvested
- Net weight, number
- Batch number
- Destination, with the trader's/importer's address
- Visible indication of the organic source of the product [2, 3]

Storage

The raw coffee should be stored in dark areas at low temperatures and relative humidity.

Under optimum conditions, dried fruits can be stored for up to 1 year.

If the organic product is being stored in a single warehouse together with conventional coffee mixing of the different qualities must be avoided. This is best achieved using the following methods:

- Training and informing of warehouse personnel
- Explicit signs in the warehouse (silos, pallets, tanks etc.)
- Colour differentiation (e.g. green for the organic product)
- Incoming/dispatched goods separately documented (warehouse logbook)

It is prohibited to carry out chemical storage measures (e.g. gassing with methyl bromide) in mixed storage spaces. Wherever possible, storing both organic and conventional products together in the same warehouse should be avoided.

[2] When products from organic farms are being declared as such, it is necessary to adhere to the requisite government regulations of the importing country. Information concerning this is available from the appropriate certification body. The regulation (EEC) 2092/91 is applicable to organic products being imported into Europe.
[3] For organic products, a contamination with non-ecological products must be prevented at each of the processing stages, during packaging, storage and transport. For this reason, products that originate from certified organic plantations should be labelled as such.

Ecological aspects of coffee processing and quality control

Under ideal conditions, the water which results from the wet process should be cleansed in a sewage treatment plant.

Shade regulation in coffee nurseries is important for the good growth of the plants.

Under no circumstances should the waste water be allowed to enter the settling tank (mechanical cleansing stage which uses sieves and a settling chamber).

Only organically produced coffee is allowed to be processed in a central processing depot for the wet method. Parallel processing (shelling, fermentation and drying) of conventional and organically produced coffee is not permitted.

In some coffee producing regions, malaria – combating methods are often carried out in the villages (e.g. with DDT). Farmers cultivating organically must then take appropriate precautions when this occurs during the time of the coffee harvest (and the coffee is maybe lying around unprotected on the drying places in the village).

Raw coffee is often filled into jute sacks, whereby no sacks that have been treated with pesticides may be used. Otherwise, there is a risk of contaminating the coffees.

It is prohibited to carry out chemical storage measures to help combat storage pests (e.g. gassing with methyl bromide). Special care should be taken when the sacks are to be stored at shipping ports. Because gassing is subscribed by law in some countries, special authorisation will need to be applied for in time.

2. Organic cocoa cultivation

The production guidelines for organic farming can be applied to cocoa production in a number of ways. The minimum requirements are already fulfilled if synthetic aids such as pesticides and chemical fertilizers are no longer used or if they are replaced by organic aids. Based on the production guidelines cocoa grown in such plantations can be certified by most of the certifying organizations. However, it will not fulfil the objective of being sustainable in the ecological sense.

Therefore, general production guidelines are given below which aim to model the natural ecosystem of the cocoa plant as closely as possible, and which should allow for economically efficient organic production.

2.1 Cocoa production

2.1.1 Varieties and environmental requirements

Varieties

Three large groups of cocoa can be distinguished, each with several varieties and strains:

- Due to its high yield the Forastero group which is native to the Amazon region is by far the most widely grown (ca. 80% of total area under cocoa). Its taste, however, is relatively weak. The Amelonados variety also belongs to this group. The latter is the only one that is fully self-compatible.
- With its strong, fine flavour the Criollo group produces the highest cocoa quality. This group has characteristic white cotyledons, and originated mostly in Mexico and Venezuela. Unfortunately its yield is low and hence, this variety is rarely cultivated. Additionally, the white seeded Criollo cocoa (in some Latin American countries the "forastero amazónico" is also called "criollo") is much more demanding in terms of its habitat requirements, and improper production practices thus render it much more susceptible to pests and diseases.
- The Trinitario is a hybrid of the Forastero and Criollo types. Individual clones show a wide range of characters, from Criollo type to Forastero type. Usually hardier and more productive than Criollo, the flavour of the best reaches that of Criollo. Of total world production Trinitario has a share of roughly 10 to 15%. This variety has the capacity to fertilize the species of the other groups which generally face the constraint of being self-incompatible.

From the viewpoint of organic production none of the varieties can be attributed clear advantages over the others. There are clones with resistances to certain pests and diseases. Unfortunately, those clones produce inferior yields or negative flavour. No major breakthrough has so far been achieved in the breeding of resistant and high yielding clones.

Ecological requirements

The natural habitat of cocoa plants is the tropical rainforest where it predominantly occurs in alluvial forests within the sphere of influence of the rivers. Both the annual floods and the increased wind speeds above the water lead to a regular rejuvenation of these ecosystems.

With a height of up to ca. 9 metres the cocoa plant is a small understory tree of

The character of the cocoa plants' natural ecosystem gives the most important pointers for organic cocoa production. (Picture: Lukas Kilcher)

the primary forest and is associated with a vast mixture of tree species providing a stratified forest structure. These systems are characterized by the presence of numerous palm trees. Many of the highest trees which form the forest system's overstory loose their leaves during the season with shorter day lengths or during months with shorter dry periods. The resulting increase in light reaching the lower stories has a positive influence on flower induction of the cocoa plant. The life cycle of a cocoa tree can span well over a hundred years.

Soil requirements

To develop a good root system, cocoa requires a deep soil with sufficient amounts of organic matter (mulch layer), roughly equal proportions of sand and clay and coarser particles retaining a reasonable quantity of nutrients. Below a level of about 1.5 m it is desirable to have no rocks, hardpans or other impermeable material so that excess water can drain away through the profile. Excessive acidity (pH 4.0 and below) or alkalinity (pH 8.0 and above) must be avoided.

Exchangeable bases in the soil should amount to at least 35% of the total cation exchange capacity.

Cocoa is susceptible to longer periods of water logging and poor aeration of soils. Soils under high rainfall are often poor, due to greater amount of leaching.

One of the most important measures for the improvement and maintenance of soil fertility is the continuous addition of woody (ligneous) organic material, of which large amounts become available every year as a result of pruning measures.

Climatic requirements

Originally cocoa developed in the South and Central American rain forest, where the rainfall is high and well distributed, with a short dry season. The optimum temperature is high and relatively stable over the year. The averages range from 25 to 28°C and should not be less than 20°C in the coldest month. Shorter cold spells with temperatures of down to 10°C which can occur occasionally in the more southerly latitudes (Brazil, Bolivia) do not lead to crop losses, but sprouting seedlings are damaged in such extreme situations. Long periods over 30°C affect the physiology of the cocoa trees. The ideal precipitation of 1,500 to 3,000 mm is well distributed throughout the year. However, dry periods are important in restricting the spread of fungal diseases, particularly black pod. Periods of three to four months with a deficit in precipitation are tolerated by the plants under natural site conditions. Where such periods occur the cocoa plants display a more distinct rhythm of flowering and fruiting. Shortage of water leads to leaf fall and dieback.

The optimum humidity is 85%. Such conditions are prevalent in the tropical lowland between 15° north and south of the equator. Only within close range to the equator can cocoa be grown successfully at higher altitudes (Uganda 1,400 m elevation). Strong and steady winds can damage cocoa severely. Areas exposed to such winds are to be avoided.

The optimal climatic conditions for cocoa can be summarized as follows: Humid and calm tropics with well distributed rainfall and stable temperatures at a high level.

Cocoa soil management. Great efforts are necessary to protect the soil against erosion. In organic cocoa production, soil is covered mainly by spontaneous vegetation and cocoa leaves (dead mulch). Living barriers (e.g. Magnolia) protect the soil against erosion. (Picture: Lukas Kilcher)

2.1.2 Organic cocoa in the agroforestry ecosystem

Tropical rainforests are complex and dynamic ecosystems which are optimally adapted to the prevailing site conditions. The vast diversity of species is important for, among other things, the stability of the system. Each individual occupies an appropriate niche and thereby fulfils a particular eco-physiological function within the system. The so-called diseases and "pests" in these systems are nothing but necessary regulation mechanisms which take their turn when there are tensions within the system. The function of the so-called weeds is to occupy niches, since natural systems always strive to cover bare soil as quickly as possible with a plant cover. The more complex we design an agro-ecosystem the fewer interventions are required to regulate diseases and "pests" in the system. Massive problems with pests and diseases point to errors in the system which should not be fought but corrected.

Apart from agronomic considerations, the successful development of sustainable systems incorporating cocoa requires that further principles of forest dynamics be taken into account. Where clearfelling or the collapse of a giant tree has damaged or removed part of the forest canopy this gap will quickly be closed under natural conditions. The forest 'organism' passes through a number of phases in this process which can be compared to the metamorphosis of an insect which only obtains its final form as an adult 'individual' after shedding its skin and changing its exterior form a number of times. Simply speaking, the following phases can be distinguished:

Phase 1 – Pioneer phase: Following the removal of the forest canopy the forest floor is covered by pioneer plants within a few weeks. These pioneer species have a short life cycle of only a few months. The species composition is dependent on site conditions (soil type, slope, solar irradiance, distribution of rainfall etc.).

Phase 2 – Secondary forest phase (up to 10 years): A multitude of tree species with a variety of life cycles and ultimate heights germinates at the same time as the pioneer species. This phase is characterized by fast growing tree species with a life cycle of only a few years. The dynamic of these fast growing species literally drags all the other species in the system along. The resultant high biomass production enhances soil dynamics and thus the cycling of nutrients and matter.

Phases 3 (up to 50 years) and 4 (up to 80 years): Secondary forest phase - medium and long cycle: During these phases the forest formations characteristic of the site develop with tree species which can reach ages of up to 80 years.

Phase 5 - Primary forest: All the preceding phases ultimately lead to the establishment of those tree species which characterize the mature primary forest, with species whose life cycle can span centuries and up to a thousand years.

In many of the world's cocoa producing countries (and the same applies to coffee production) cocoa cultivation has gone into crisis because the basic principles outlined above have not been observed.

Most of the shade trees for cocoa (and also for coffee) which are recommended in the literature and often used in practice belong to the group of secondary forest species with a medium life cycle of between 20 and 50 years (e.g. Ingas spp.). If cocoa is being grown in the understory of such an ageing and not very diverse secondary forest system, the cocoa with its much longer life cycle ages prematurely together with its shade trees and is eliminated by the system's diseases and "pests" because it can no longer fulfill its function in such a system. Only through understanding and implementing these interconnections will it be possible to breed for resistance and pursue alternative approaches to the control of pests and diseases in such a way that real solutions are provided.

Cocoa farmers in the eastern part of Cuba usually use a shade density of around 40% in cocoa plantations. (Picture: Lukas Kilcher)

Generally suitable shade trees are:

- Leguminous trees: Samanea saman (Algarrobo), Gliricidia sepium (Júpiter, Piñon Florido), Erythrina poeppigiana (Búcaro), Guazuma tomentosa (Guasima), Leucaena spp., Spondias mombin (Jobo), Lipi-Lipi
- Palms: Roystonea regia (Palma real)
- Fruit trees: mango, zapote, citrus, avocado, guapén, breadfruit (Fruta de Pan)

Another problem is the selection of shade trees which originate from other ecosystems or which require different site conditions (even if, in some instances, they thrive on sites suitable for cocoa production), such as *e.g. Leucaena, Glyricidia, Cordia aliodora*. Sooner or later problems will occur in the cocoa plantation in these situations. Membership of the family Leguminosae is a lesser consideration in the selection of shade trees since the nitrogen metabolism is mostly ensured by soil fungi and soil bacteria (actinomycetes).

2.1.3 Propagation

Cocoa can be propagated generatively or vegetatively. Due to the easy, safe and cheap methodology it is recommended to give preference to generative propagation in a nursery. Generative propagation is easier and cheaper than any vegetative method.

Generative propagation

With the exception of the uniform type of Amelonado the seed of Forastero types is produced in seed gardens with known parentage and proven performance. There is always some genetic variation in seed of these types but generally this variation is acceptable.

If the conditions for growth are suitable, self-fertile cocoa varieties or mixes of hybrids can be directly sown. Three cocoa beans are placed at the intended position of a future cocoa-tree in a group just under the surface of the soil. After some time the strongest seedling is allowed to develop. While this method can be successful and obviously requires little labour, it has several disadvantages, in particular the high quantity of seed required and the rodent damage.

Most cocoa is planted as seedlings raised in a nursery. A cocoa nursery requires shade, ample water availability and protection from wind. The normal practice is to plant the fresh beans of ripe pods directly into black polythene bags. A fertile, loam topsoil is ideal for filling the bags. Due to the vigorous growth of cocoa, no fertilizer application is required. Pure peat preparations are prohibited in organic farming. Relatively dense initial shade is recommended (> 50%) but can be decreased as the seedlings grow. Apart from watering, the plants do not need much attention in the nursery. Watering should not be overdone, as it may promote attack by fungal diseases (*Phytophtora palmivora* or Anthracnose). In a nursery, pests and diseases do not cause any constraints under regular circumstances. Seedlings can be kept in the nursery for up to 6 months.

To meet the water demand of the nursery it is necessary to have a supply of clean water available throughout the year. A site, large enough and preferably level, is needed for stores and processing equipment.

Organic cocoa seedling production. Shade regulation in cocoa nurseries: Natural shade e.g. with Rhicinus can provide an alternative to palm leaves. (Picture: FiBL)

Vegetative propagation

Vegetative propagation should only be used where very variable progeny is likely, e.g. for Trinitario and other genetically heterogeneous types. Mainly two kinds of propagation material are used: rooted cuttings and buddings. Both are usually taken from fan shoots which result in a spreading bushy growth which requires pruning and training for more convenient farm operations. The planting material is put into pots. Young plants are raised in the nursery as described above.

2.1.4 Establishment of organic cocoa farms

When new plantations are established attention has to be paid to the natural habitat of cocoa (forest structure). This means including many relevant species for the future agro-ecosystem. With the early establishment of this plant association the biological soil activity can be maintained and the cocoa mycorrhiza can develop immediately. As in the forest, in a well established cocoa farm nutrients are moving but overall there is little, if any, gain or loss. This situation is called a state of dynamic equilibrium.

Any site chosen for planting cocoa must meet the ecological, climatic and soil requirements mentioned in Part B, Chapter 2.1.1. Lands suitable for cocoa most probably carry a certain stand of forest trees. The establishment of new cocoa plantations in organic farming is understood as the establishment of "cocoa agroecosystems".
A number of different production systems can be found:

1. Planting into thinned primary or secondary forest
This type of plantation establishment is practised in many Asian and African countries. The disadvantage of this approach is that the structure of a thinned primary forest is damaged to such an extent that it looses much of its dynamics and the cocoa plants do not find optimal production conditions in the understory. This practice can only be recommended for very young secondary forest systems provided the species composition is known (it is important that the various guilds with their respective life cycles are present).

2. New plantations on clear-felled sites
Since cocoa plants are very demanding in terms of soils and ecosystem conditions, one should not establish cocoa plantations on degraded sites. Normally new plantations are set up on sites of clear-felled primary or secondary forest which have been burnt to open them up for cultivation. The burning of the fields can not be recommended.

The following form of cultivation has given good results for permanent crops such as cocoa and citrus fruit in Brazil and Bolivia. In terms of their practical implementation it should be noted that often it will not be possible to establish such complex systems straight away. It is important, however, to note the principles involved and to apply these step by step.

Based on the natural succession, pioneer plants will at first dominate the system following clear-felling. As many of our crop plants (rice, maize, beans, vegetable species) are pioneers these will be sown as monocultures together with all the required guild plants. The options for species compositions and combinations of crops are so varied, and also dependent on site conditions, that we can only give examples of possible approaches here.

Establishing a cocoa plot following fire clearing.
(Picture: Joachim Milz)

Vegetation 90 days after establishment: Maize in the midst of a bush culture.
(Picture: A.Ramos)

After 22 months, the pigeon peas have completed their cycle.
The banana fruit is fully mature. The picture shows in the foreground a young cocoa tree accompanied by various primary and secondary forest tree species.
(Picture: Joachim Milz)

A. Pioneer Guild
(Cycle of a number of months):
Maize (e.g. at 1m x 1m) + beans (0.4m x 0.4m) or *Canavalia ensiformis* + *Hibiscus sabdariffa* instead of beans.

B. Secondary Forest Guild I
(Cycle of up to 10 years):
Cajanus cajan (0.5m x 0.5m) + manioc (1m x 1m) + pineapple (0.4m x 1.80m) + papaya (2m x 2m) + bananas (different varieties at 4m x 4m) + pepper.

C. Secondary Forest Guild II
(Cycle of up to 50 years):
Achiote/Urucú *(Bixa orellana), Ingas ssp* + Pejibaye (Bactris gasipaes - Palmacea) + other tree species of various heights. All tree species are sown as a seed mix between the rows of pineapples with ca. 20 cm distance between seeds.

D. Secondary Forest Guild III
(Cycle of up to 80 years):
Avocado, coconut, Euterpe ssp. (Palmacea), citrus fruit, vanilla, long living banana varieties, Guanabana (Soursop, *Annona muricata*).

E. Primary Forest Guild
(Cycle of >80 to 1500 years):
Cocoa *(Theobroma cacao)*, Rheedia ssp., carambola *(Averrhoa carambola)*, copuazú *(Theobroma grandiflora)*, Ceiba ssp., brazil nut *(Bertholletia excelsa)*, palm species, mango, jackfruit *(Artocarpus heterophyllus)*, caoba *(Swietenia macrophylla)*, sapote *(Manilkara zapota)*, para rubber tree *(Hevea brasiliensis)* and many others.

Apart from the crop plants of economic interest listed above as many constituent tree species of the local ecosystem as possible must also be sown.

The selection of companion crops
When selecting the companion crops and native forest tree species to be planted in a cocoa plantation, it is important to select species from each of the guilds which allow for a multi-tiered vertically diverse forest system. There will only be competition between individual plants if within the same guild more than one species occupies the same stratum (grows to the same height).

The aim is to establish 8 trees per square metre. The more densely planted the system is, the less maintenance work will be required and the more dynamically the system will develop. Such extreme planting densities would appear unrealistic at first glance. The input required for the establishment of such a planting is indeed very high, as a 1,000 m^2 planting of this nature equals 6,000 to 10,000 m^2 of a conventional planting. On newly clear-felled sites the inputs are reduced as a result of natural regeneration. The observation of species compositions and species densities in natural openings in the forest shows that nature also 'works with' such high planting densities.

The continuous thinning of maturing individual plants as well as the harvesting open up the system and at the same time continuously add organic matter and woody material to it.

Harvest periods
1. Beans 60-70 days
2. Maize 90-120 days
3. Pigeon pea 10-24 months
4. Papaya 8-24 months
5. Bananas from 13 months to several years (depends on varieties planted)
6. Pineapple 12-36 months
7. Cocoa and other fruit bearing trees from 60 months to 100 years

Table 28: Example of the progression of a system over time

Year 1	Year 2	Year 3	Years 5 – 10	from Year 11
Maize / Beans				
Pigeon pea *(Cajanus cajan)*	Pigeon pea *(Cajanus cajan)*			
Papaya	Papaya			
Pineapple	Pineapple	Pineapple		
Bananas	Bananas	Bananas	Bananas	
Cocoa	Cocoa	Cocoa	Cocoa	Cocoa
Forest trees / Rubber / Fruit trees	Forest trees / Rubber / Fruit trees	Forest trees / Rubber / Fruit trees	Forest trees / Rubber / Fruit trees	Forest trees / Rubber / Fruit trees
Palms	Palms	Palms	Palms	Palms

Bananas are excellently suited for combination with cocoa.
(Picture: Joachim Milz)

The example shows that with such systems the first harvests can already be taken from the planted crops after only a few months. Cultivation and maintenance measures should always be combined with harvesting operations and can thus be economically supported by the latter.

Combinations consisting of a mix of fruiting trees such as avocado, carambola, mango and jackfruit (higher understory) and a density of 150 trees per hectare enhance cocoa production. Additionally, sapote (overstory) and para rubber trees (Hevea brasiliensis) can be interspersed. For the overstory, particularly trees which shed their leaves should be planted *(e.g. Ceiba pentandra)*.

Spacing and planting patterns

The optimum spacing between cocoa trees is the distance which will give the optimal economic return of cocoa per unit area, always considering the stability of the organic production system. This implies not merely the yield of cocoa and other commercial crops but also other factors such as labour requirements, establishment costs for the plantation and cost of inputs, possible losses due to pests and diseases etc. All of these have to be considered too. In addition, the spacing is determined by factors such as the vigour of the trees, the soil and climate or the selected planting system.

Each country has adopted certain spacings which have become traditional. For shaded and unshaded cocoa plantations spacings between 2.5 m x 2.5 m (1600 plants/ha) and 5 m x 5 m (400 plants/ha) are used:

- Papua New Guinea, Sri Lanka and Samoa: 4.6 m x 4.6 m to 5 m x 5 m, 4 m x 4 m
- Latin America: 3 m x 3 m to 4 m x 4 m
- West Africa: 2.5 m x 2.5 m.

The irregular spacing in West African thinned forest results in surprisingly high densities of usually close to 1,600 trees per hectare.

For cocoa intercropped with other commercial crops, spacing varies greatly. The spacing of cocoa largely depends on companion crops.

There is no doubt that closer spacings usually produce higher yields in the first years after planting, but once the canopy forms and the soil becomes fully exploited the difference between close and wide spacings is reduced. The results of numerous spacing trials point to a spacing between 3.0 m x 3.0 m and 2.3 m x 2.3 m as giving the highest yield. At this spacing the canopy forms fairly quickly, thereby reducing weed growth, and losses from certain pests appear to be appreciably lower.
On the other hand rodent damage to pods is greater in closely spaced cocoa. A three metre row spacing allows easy access to the trees also with a tractor. There have been occasions when cocoa has been planted close and thinned later.

Under highly humid conditions where pod diseases prevail, it is advisable to thin the canopy by increasing the distance between the rows and planting closer within the rows. A suitable spacing might be 3.7m x 2.4m (no trial results available). The wider row spacing allows better aeration of the plantation.

Land preparation and planting

There are two ways to prepare a site for planting: Using fire to clear land, and site preparation without burning.

A) Using fire to clear land

The preparation of the fields to be planted depends on the local situation, e.g. slope and aspect, preceding crop or previous use of the site, existing vegetation and other factors. Many small farmers prepare their fields for crop growing by burning the existing vegetation, and only after the harvesting of these crops do they plant the cocoa plants. While burning is not a recommended procedure it is widely practised. Especially in regions where dry-land rice cultivation is practised the non-burning of fields will meet with resistance.

Approach:

- As a first step the banana rhizomes are planted (planting distances depend on varieties, soils and the planned planting distances for cocoa and generally result in 400 – 800 rhizomes/ha).
- Subsequently rice or maize is sown. Together with the rice seed, seeds of Urucú *(Bixa orellana)* at a ratio of 10 (rice) to 1 (Urucú) should be sown, as well as pigeon peas *(Cajanus cajan)*. In the case of maize, pigeon peas should be supplemented with non-climbing bean varieties or Canavalia ensiformis which should in all cases be sown at the same time as the pigeon peas.
- If pineapple is to be integrated into the system, these will also be planted immediately (at ca. 0.4 x 1.8 m).
- Tree seeds are sown between the pineapple rows. Large amounts of species from the secondary forest guilds II and III (short and medium life cycles) are used here such as e.g. Inga ssp. and Erythrina ssp. which are mostly inexpensive and easily obtained in large numbers. Seeds which are difficult to source or which are only available in small quantities should be started off in nurseries and later planted out together with the cocoa plants.
- If the cocoa is to be sown directly, it should be sown at the same time as all the other plant species, if possible. If the cocoa is started off in nurseries, planting is only carried out when the other sown or planted tree species can shade the cocoa plants. Planting holes should only be of a size that just allows the cocoa seedling to be easily planted.

Fire clearing secondary forest. (Picture: Joachim Milz)

B) Site preparation without burning

On sites with a still relatively young secondary forest cover and in areas where maize cultivation plays an important role, burning should preferably not be carried out. In order to reduce labour intensity the following approach can be taken:

- Opening up of narrow rides (approximately every 3 metres) which allow easy walking access.
- Planting of banana rhizomes.
- Sowing of maize, beans, pigeon peas and those tree seeds which are available in large quantities by scattering the seeds into the existing vegetation.
- Clearing the entire site and chopping or shredding branches and trunks as much as possible.
- Planting of pineapple.
- Sowing of tree seeds which are only available in smaller quantities in between the pineapple rows.
- Sowing of cocoa (if direct sown) preferably at the foot of the banana plants.

Covering the seeds with branches and leaf material does not hinder germination.

2.1.5 Improvement and conversion of established plantations into agroforestry systems

Existing cocoa plantations can be converted into agroforestry systems in a number of ways. The approach taken depends primarily on the existing situation of the plantation.

Clearing primary forest. (Picture: Joachim Milz)

A) Young, already productive plantings (up to ca. 15 years) with shade trees

It is not possible to simply plant extra trees into an existing plantation with established shade trees *(Ingas ssp., Erythrinas ssp.)*. One possibility of improving the system is to create small islands of more complex plantings within the plantation. To this end cocoa trees are identified which are deficient or unproductive, or gaps are identified. The unproductive trees are felled and adjoining cocoa trees are heavily pruned. All the shade trees in the sphere of influence of the 'island' are pruned back to the remaining crown and the prunings are evenly shredded and dispersed on the ground. All the guild members are planted into this gap (if the area is big enough pioneer plants such as maize can also be planted). In this case it is better to use seedlings started off in a nursery. Bananas and palms should definitely not be left out. The plants of the different guilds as well as those of different heights can be planted at distances of 0.5 - 1m. A number of these 'agroforestry islands' will have a positive influence on the dynamics of the entire plantation.

B) Old productive plantations with shade trees of the secondary forest system

As long as such plantations are of good productivity and do not have "pest" or disease problems, no major interventions should be undertaken. Such plantations can be converted to organic cocoa plantations with the normal conversion processes, i.e. by abandoning the use of all chemical-synthetic aids and by correctly carrying out all maintenance operations.

C) Old unproductive plantations and plantations prone to diseases, with shade trees

In the case of plantations which used to be productive and which now display problems such as loss of productivity, diseases and pest infestations the entire plantation should be rejuvenated.

Prior to the felling of trees the same approach should be adopted as has been described above for new cocoa plantings without using fire to clear land.

Once the bananas, the pioneer plants and all the tree species of the various guilds have been planted the old shade trees are felled (if at all possible the material resulting from this operation should remain in the plantation) and the cocoa trees are coppiced to a height of ca. 40cm. All the branches are chopped or shredded and spread on the ground. Now the pineapples are planted and seeds of the various tree species are planted in between in pineapple rows. Papaya grow very well in such plantations. If the planting distances of the old cocoa planting do not require correction, of the suckers (chupones) growing from the coppiced cocoa plant the one is selected that can develop its own root system (at first a number of these can be left to grow). All other suckers are removed.

This planting will again produce cocoa in its third year. Yields from maize, beans, papaya, bananas and pineapples will guarantee positive cash flow from the second year.

If the planting consists of disease-prone material of low productivity, the stock of cocoa plants should be replenished completely either by grafting onto suckers or by replanting.

D) Plantations without shade trees

Plantings without shade trees should definitely be improved as a system. This can also be achieved by introducing 'agroforestry islands'. Depending on the age of the plantation either groups of trees will be severely pruned or, as described above, coppiced and completely rejuvenated from suckers. The relevant guilds are then planted into the resulting clearings.

Once the shade and canopy of cocoa is developed weeds have little chance to develop. Consequently very little weeding is necessary in adult plantations, which is a considerable advantage of organic cocoa production.
(Picture: Joachim Milz)

2.1.6 Maintenance of cocoa

As is the case for all permanent crops, the maintenance of cocoa during the youth stage is decisive for the later yields. During the unproductive years after planting it is thus of utmost importance to create excellent preconditions for the development of the young cocoa plants through adequate shade, careful weeding and soil cultivation as well as plant nutrition.

Weed management – Selective weeding

Under normal conditions maize and rice are weeded two to three times (on primary forest sites intervention is often unnecessary). In the case of the agroforestry parcels described above, one or at most two interventions are required during the growth period of rice or maize. Only Graminea (grasses) and ripening herbs are cut down. Should the pigeon pea have reached the same height as the rice at the rice's flowering time, the pigeon pea should be pruned back by about 30cm. Neither rice nor maize suffer yield reductions if grown under these conditions.

It is important as a general rule to remove ripening or wilting plants in time, as during the ripening process (resorption process) of the individual plants the development dynamics of the system as a whole are reduced.

This also means, for example, that in the case of the pigeon pea (biennial) the plants should be pruned back severely once about 1/3 of the pods have ripened. The resultant increasing light penetration and the subsequent intensive sprouting in turn improves the dynamics of the system as a whole and enhances the growth of all other species.

Flowering cocoa tree in El Jobo, Cuba. (Picture: Lukas Kilcher)

Pruning

The basic aim of pruning cocoa trees is to encourage the characteristic tree structure and to remove old and diseased limbs.

Young plants should develop a jorquette at an appropriate height (1.5 to 2.0 m). However, the jorquette-height varies significantly from tree to tree. It has been found that increasing light intensity decreases the jorquette-height. If a jorquette is considered too low, it can be cut off. The strongest of the regrowing chupons can be selected and all others removed. In due course, this chupon will produce a jorquette at a higher level. Vegetatively propagated plants generally form a jorquette at ground level. It may be possible to remove this after a chupon has grown and a second jorquette has formed at a more convenient height.

There is no convincing evidence to show whether trees with two jorquettes are more or less productive than single-story trees. Removal of fan branches to not less than three allows more light to enter and decreases the humidity within the canopy. Basal chupons should be removed at regular intervals and low branches are to be trimmed, cut back or removed to have better access to the tree. At regular inspections dead, diseased and badly damaged wood should be removed. Whereas diseased prunings should always be removed other prunings are to be left in the field to rot down.

Formation of flowers and pollination

It is a fact that exposure to light positively influences the generative phase of cocoa. Thus, by thoroughly thinning the shade roughly six months before the expected main harvest, flower formation can be stimulated actively.

The output of mature pods is dependent on the degree of pollination of the flowers. Cocoa grown in countries where pollinating midges *(Forcipomyia species)* were not indigenous yielded poorly, due to lack of pollination. Results of experiments have provided evidence that with a light manual pollination (ten flowers per tree on alternate days) the yield can be approximately doubled.

Management of the agroforestry system – Synchronizing the system

All the maintenance work carried out should be in harmony with the developmental rhythms of the entire system. Natural forest systems have an underlying annual rhythm which is determined by, among other things, day length, temperature and precipitation. In the case of cocoa this rhythm is the more pronounced the further its location is from the equator. A number of the standards and overstory trees of the forest system loose their foliage for some weeks or months *(Ceiba pentandra)* during the months with the shortest days. The resultant higher light penetration induces flowering of the understory plants.

In our agroforestry systems shade trees that do not shed their leaves *(e.g. Inga spp.)* are pruned hard back during that season, which increases the light effect and also substantially contributes to the maintenance and enhancement of soil fertility by adding ligneous organic matter resulting from the pruning.

In young systems with pineapples intensive selective weeding and pruning of the short-lived secondary forest plants is carried out to induce flowering.

Management of bananas

Bananas play an important role in the dynamics of cocoa agroforestry systems. The banana substitutes the Heliconia species as well as species of the Musaceae family which occur in the natural ecosystems of the cocoa plant. Bananas in cocoa agroecosystems should be treated as in commercial plantations. This includes the regular removal of old leaves, and the removal of surplus shoots and watersprouts. After the harvest the pseudostem is split lengthwise and placed on the ground which helps to considerably conserve water at times of low rainfall.

Development and yields

Where the climate and soil allow continuous growth cocoa trees will develop rapidly. Under such conditions yields of 500 kg per hectare have been recorded in the third year. However in most cocoa-growing areas growth will be reduced during the dry season, as in West Africa, or possibly by a fall in temperature, as in Brazil. The objective in establishment must be to achieve a profitable position for the farm as soon as possible. Successful establishment depends on the careful selection of planting material, the right spacing and shade and the control of pests, diseases and weeds, in other words good management.

A good cocoa yield ranges from 1 to 1.5 tonnes of dried beans per hectare and year. No considerable yield depression is reported in organic cocoa production. The higher the input of synthetic fertilizer and pesticides before conversion, the bigger the potential yield depression after conversion.

2.1.7 Plant nutrition and manuring

If at all needed, the demand of shaded cocoa for fertilizer applications is considerably lower than that of unshaded cocoa. Hence, in organic agriculture which does not permit the application of synthetic fertilizers the cultivation of cocoa under shade is essential.

By promoting the turnover of organic material within the plantation soil fertility can generally be maintained for successful organic cocoa production. Regular pruning of trees and maintenance of a multi-tiered, diverse and densely populated agroecosystem is generally sufficient for profitable cocoa production. In addition to this and as mentioned above, it is essential to return the (composted) cocoa pods to the plantation after removing the beans.

Bananas play an important role in the dynamics of cocoa agroforestry systems. (Picture: Joachim Milz)

Through mycorrhiza-symbiosis many palm varieties are in a position to actively break down phosphor and other nutrients. In addition mycorrhiza fungi are capable of binding heavy metals in soil, so that their uptake through cocoa is reduced. The latter is important, since in many cases the heavy metal content of cocoa beans reaches critical levels. It is therefore recommended to integrate suitable palms into the cultivation system.

Why are fallen leaves not sufficient?

Where organic manure or compost is available, which is not often the case, its use on cocoa is likely to be beneficial though it might be doubtful in economic terms. The most common is that coming from animal enclosures. The organic material has a beneficial effect on the soil, improving the structure and its capacity to hold water and nutrients. If applied as a mulch with cut vegetation and cocoa pods it also discourages weeds. However, due to the high labour intensity, the use of organic manure is often not viable economically.

The cocoa pods left over after harvest are best broadcast in the plantation. Composting of the pods is recommended only if the pods are cracked outside of the plantation. (Picture: Lukas Kilcher)

In order to maintain and enhance soil fertility it is indispensable to achieve as high an energy turnover in the soil as possible. Ground covers and other often recommended mulching methods are not sufficient or too labour intensive. The lignin composition in the organic material applied is also of major importance. The decisive factor is a balanced ratio of old wood to younger branches, each of which contain different lignin components in their structure. Apart from supplying the required energy to the soil organisms the lignin is primarily a substratum for soil-borne fungi (especially basidiomycetes) which are of elementary importance to the faunal food chain.

How to get lignin into the system?

The quantity of nutrients removed through cocoa beans is relatively low if the (composted) pods are distributed evenly in the plantation and allowed to rot down as a mulch so that the nutrients return to the soil. On average 1,000 kg of cocoa beans contain about 23 kg N, 6 kg P, 20 kg K, 10 kg Ca, and 7 kg of Mg.

The application of trace elements is superfluous in agroforestry systems as outlined above.

2.1.8 Control of pests and diseases

Cocoa is at high risk from many pests and diseases which thrive in the essential warm, humid climate in which it is grown. The proportional loss of crops due to these factors is higher than for any other major crop in the world.

Importance of indirect measures

Obviously in organic agriculture the application of synthetic pesticides is not permitted. Alternatively conditions in the cocoa plantation have to be influenced in such a way that infestations of pests and diseases can be largely prevented. In most cases, such indirect control methods reduce the risk of pests and diseases considerably so that direct interventions are not even necessary. In addition, products allowed in organic farming can be applied if necessary.

A series of relationships have been observed between the supply of the cocoa with light, air, water and nutrients on one hand and the appearance of diseases and pests on the other hand. In other words, plant nutrition and soil management, shade, pruning, availability of water or drainage etc. determine the occurrence of pests and diseases in the cocoa plantation.

Most infestations with pests and diseases have the following causes:

- Ignoring the succession sequences of forest systems. Having originated in the primary forest, cocoa can well endure old primary forest tree species as shade trees but not old secondary trees.
- Cultivation of cocoa monocultures with a small number of shade trees and species (in conventional cocoa production only 25 to 40 trees per hectare of mostly the same species are recommended).

Table 29: Cocoa pests and their control measures

Name of pest	How to recognize / important to know	Control measures	
		Preventive*	Curative**
Mirids or ***capsids*** ***Sahlbergella singularis*** ***Distantiella theobroma*** ***Helopeltis spp.*** ***Monalonium spp.***	• Sap sucking bugs cause severe damage in many countries • Insects suck on young shoots and fruits • Brown or black sap lesions that are later infested by disease	• Shade • Increased humidity	Biocontrol
Thrips ***Heliothrips*** ***Selenothrips***	• Brown spots on dry or silvered leaves	Avoidance of: • nutritional imbalance • poor soil conditions and • sudden change of shade level	Biocontrol
Leaf-cutting ants ***Atta insularis***		• Destruction of nests • Living barriers with Canavalia	• Destruction of nests • Biocontrol (Beauveria bassiana)

* In addition to the general measures mentioned in this chapter
** In spite of the damage that pests can cause, no curative prevention measures are applied in most of the cocoa growing countries.

- Unsuitable locations (waterlogged, too dry, insufficient root layer).
- Degenerated and poor soils, lacking organic matter.
- Too dense spacings of plant species that belong to the same guild in the system.
- Unsuitable shade management.
- Deficiencies in hygiene: diseased pods, branches and leaves must be removed.
- Unsuitable harvest practices: harvesting must be carried out every 15 days.

Avoiding the above constraints means preventing pests and diseases.

Pests

There are numerous pests of cocoa. Table 29 shows are those causing the most economic damage in organic cocoa production.

Diseases

Lack of air, excess moisture as well as physical disorders of the cocoa plant (inadequate nutrition) often cause fungal diseases. In many cases effective and sustainable control can only be achieved through improvement of the entire plantation system, especially shade management. Possibilities for this are either to drastically cut back the trees and to bring in suitable companion plant species or to coppice the trees to about 40 cm and a subsequent new formation in association with selected shade trees, food crops and cover crops.

Numerous diseases affect cocoa. Table 30 shows those causing the most economic damage.

2.2 Harvesting and processing

Substantial quality characteristics of the cocoa depend upon correct processing which starts already with the harvesting process and ends with the storing of the processed product.

The steps of harvesting and processing can be summarized as follows:
Harvesting → grade and open pods (side products: pods, rotten pods, organic waste) → removing beans → fermentation (side product: fermented pulp) → drying → cleaning by sieving → winnowing → bagging → storing and transporting

2.2.1 Harvesting

Depending on the temperature, ripening can take between 4.5 and 7 months. Since the amount of flowering and pods set are higher at periods of high temperature, the main harvest will take place several months after such a period.

Pods must be harvested when fully ripe, which is visible from the orange or yellow shell. Beans from unripe pods produce

Table 30: Diseases causing the most economic damage

Name of disease	How to recognize / important to know	Control measures Preventive*	Curative**
Swollen-shoot virus ***Cola gigantea*** and other species	• Virus is a major problem in Ghana and Nigeria • Swellings on roots, chupon and jorquette shoots • Leaves develop chlorosis; trees look generally yellow • Pods become mottled, smoother and rounded in shape with fewer beans • Virus transmitted by mealybugs	• Inoculating trees with a mild virus strain • Resistant varieties • Control of mealybugs	• Removal of infected plants and of adjacent trees
Black pod disease ***Phytophtora palmivora, P. megakarya, P. capsici***	• Fungus infects seedlings, flower cushions, pods, shoots, leaves and roots • Spots develop into brown patches which spread over the whole pod surface and turn black • White or yellow sporulation over infected areas • Fishy smell • On some varieties cankers are formed; pink-red discoloration below diseased bark • Root infection is important part of annual cycle	• reduction of shade • regular harvesting • removal of infested plant parts, particularly fruits • ground cover can disrupt the annual cycle (preventing spores reaching the soil)	• in emergency cases: spraying copper, sulphur or bentonite compounds before disease builds up • applying epiphytic bacterium (Pseudomonas fluorescens) • cut off infested bark
Moniliasis Moniliophtora pod rot ***Moniliophtora roreri***	• Fungus mainly appears in South America • Infections on young pods • Dark brown spots appear 1 month after infection and gradually cover whole pod • White sporulating mycelium	• reduction of shade • frequent removal and destroying infected pods • use of more resistant varieties • application of lime to stem	• application of copper fungicides • applying epiphytic bacterium (Pseudomonas aureoginosa)
Witches'-broom disease ***Marasmius perniciosus, Crinipellis perniciosa***	• Fungus mainly appears in South America and some West Indian islands • Major symptom being the brooms; thicker branches with short lateral shoots • Abnormally thick stalks of flowers • Distorted young pods; black speckles on old pods • Small pink mushrooms on dead brooms	• regular removal and disposal of diseased material • identification and removal of susceptible trees • using resistant trees	• none
Vascular streak dieback ***O. theobromae***	• Fungus mainly appears in South East Asia • First yellowing leaves • Short shoots grow from leaf axils after fall of leaves • Bundles of black vascular streaks inside diseased stems	• use of Amazon type of cocoa • removal of unwanted branches • site nurseries away from diseased cocoa	• prune diseased branches ca. 30 cm below diseased xylem and remove
Black root disease ***Rosellinia pepo***	• Fungus appears mainly in the West Indies • Infected roots are covered with grey mycelium which later turns purplish black • Trees wilt and leaves die • Root diseases usually arise from residues of felled trees	• none	• removal of the infected tree with all the roots • removal of adjacent trees

* In addition to the general measures mentioned in this chapter

low-quality cocoa. Ripe pods should be removed as soon as possible; once ripe they are more likely to be attacked by fungal diseases or by animal pests. In addition, ripe beans can germinate inside the pod which has a negative effect on the cocoa quality, which is why such beans should be fermented separately. This also applies to disease-infested pods. For these reasons harvesting should be carried out at regular intervals of 1.5 to 3 weeks. Pods must be cut off the tree with knives without damaging the cushion, on which further fruits will form. At each harvesting round, sufficient pods must be cut to completely fill one or more fermentation kegs. Partly filled kegs do not ferment properly. After harvesting pods can be mellowed for a few days between harvesting and opening. Such a delay has even been found advantageous.

Pods then have to be opened for the removal of the beans. Sometimes they are opened in the field and the beans moved for fermentation, or pods are transported and opened near the fermenting kegs. To reduce the risk of damaging beans, pods are cracked on a stone or wood or by hitting them with a piece of wood.

2.2.2 Post-harvest treatment and processing

Fermentation

Beans must be fermented as soon as they are removed from the pod. Fermentation has four objectives:

- To remove the mucilage attached to the beans
- To kill the embryo so that the beans cannot germinate
- To encourage chemical changes within the bean which produce the substances responsible for the chocolate aroma
- To reduce the moisture content of the beans

Fermentation is carried out in one of two ways. Traditionally, the beans are heaped on to and covered by banana leaves or a loam. The other method uses a series of rectangular wooden kegs covered with banana leaves. Kegs arranged like steps simplify turning and transfer of beans from one keg to the next by gravity.

The size of heaps or kegs is determined by the need to have a sufficiently high temperature (40 to 50 °C), to permit liquid to drain out and to let air circulate freely around the beans. Small quantities, below about 70 kg, will not reach the required temperature, while over about 150 kg aeration becomes restricted.

To ensure uniform fermentation, heaps have to be turned at intervals of 2 days. The end of the fermentation process has to be judged by experience. At the right time the fermentation temperature will decrease to about 40 °C and most beans will be brown; if opened the cotyledons will be seen to be pale in the centre, with a brown ring. If 75% of the beans have reached this coloration, the fermentation process is to be stopped. Fermentation usually takes 6 to 8 days for Forastero and 3 to 5 days for Criollo cocoa.

Cocoa is harvested throughout the year. Mice and rats cause considerable losses in the cocoa piles. (Picture: Lukas Kilcher)

Drying

Fermented beans must be dried to prevent deterioration. This is mainly done by spreading them out in the sun on concrete floors or on raised mats. The beans need to be covered overnight and in rain. Sun drying alone will take at least a week. Foreign matter can be picked out from the beans while they are spread out. Sun drying can be supplemented by drying with hot air of various technical devices. The dried beans should have a moisture content of 6 to 7%. Over 8% the beans become mouldy and below 5% they are brittle.

Fermentation of the cocoa in wooden kegs. (Picture: Joachim Milz)

2.2.3 Storing and bagging

Storing

Due to the high temperature and humidity in the moist tropics, stored cocoa is rapidly attacked by store pests and infested by moulds. Cocoa is very hygroscopic. In locations of 80 to 90% humidity it therefore often happens that the moisture content of cocoa increases to more than 10%. As a result, cocoa looses its storage capacity, for which the critical level is 8% moisture content. Good aeration of the store has to be assured. The store temperature should not exceed the external temperature. Organic production allows neither treatment with methyl bromide nor the application of synthetic storage insecticides.

In the production areas the cocoa should only be stored for short periods in bags permeable to air. The bags are to be stored on wooden boards one on top of the other. If jute bags are used, they should not have been treated with pesticides.

Bagging

For the export of cocoa the beans are usually bagged in bags of 60 to 70 kg. The bags should provide the following information:

- Name and address of producer/packer, country of origin
- Designation of product, quality class
- Date of harvesting
- Weight
- Lot number
- Destination with address of trader/importer
- Clear information on organic certification (standards applied, certifier, year of conversion or full organic status).

The bags are to be kept in dark, dry and well ventilated stores at low temperatures. Short term: ca. 16 °C and 55% humidity; long term: ca. 11 °C and 55% humidity.

If the organic cocoa is being stored with conventional cocoa (mixed store), confusion has to be avoided by carrying out suitable measures such as:

a) training of and instructions to storekeepers
b) clear labelling in the store (e.g. green colour for organic)
c) keeping of store book in which arrivals and departures of goods can be clearly distinguished. No chemical storage treatments are allowed in mixed stores; this also applies to conventional products. Where possible, mixed stores should be avoided for organic cocoa.

2.3 Production of organic chocolate and baby food

Compared with conventionally produced cocoa, there is no difference in the procedure for processing organic cocoa to organic chocolate or baby food.

However, due to the usually heterogeneous quality of the organic cocoa the chocolate and baby food producers have to take special care when it comes to ordinary processing. For example, the roasting of cocoa with different sizes of cocoa beans is delicate since there is a tendency to burn small beans.

It is hence a concern of the European cocoa processors to get more homogenous raw material.

Fermented cocoa beans are dried in a special facility for several days, during which they are turned constantly. (Picture: Conocado)

Ingredients other than cocoa also have to be organic (e.g. sugar, milk, cream etc.) or be listed on the positive list of permitted ingredients (e.g. enzymes).

2.4 Services for organic cocoa production

American Cocoa Research Institute (ACRI)

The American Cocoa Research Institute (ACRI) is a non-profit 501(c)6 organization that was founded in 1947. It is the research arm of the Chocolate Manufacturers Association of America (CMA) and is devoted to research in all scientific areas related to cocoa and chocolate. ACRI members include some of the world's largest chocolate manufacturers. ACRI's research network is global and has contacts in most cocoa producing countries. Currently, ACRI sponsors cocoa research in a number of grower countries including Ghana, Côte d'Ivoire, Brazil, Costa Rica, Trinidad, Malaysia, Vietnam, and Indonesia.

ACRI is composed of three Working Groups (WG) that are linked together under an overall Scientific Committee. They are:

- Health and Science Working Group
- Biotechnology Working Group
- Sustainable Cocoa Supply Working Group

The Scientific Committee has the task of improving technical knowledge in scientific areas related to cocoa, including biotechnology, cocoa agronomic research, cocoa processing, health, nutrition, and safety.

Recently, a new programme on 'Sustainable Cocoa Growing' has been developed to help assure a future sustainable supply of cocoa for the industry. The Sustainable Cocoa Program advocates an integrated approach to cocoa growing, and encompasses five key areas:

- Agro-Ecology
- Smallholder Economics
- Integrated Crop Management
- Cocoa Breeding
- New Plantings/Rehabilitation

The programme plans to catalyze action in these areas by working in partnership with international funding agencies, government bodies, and research institutes with common/shared goals.

Cocoa Research Institute of Ghana (CRIG),

The Cocoa Research Institute of Ghana (CRIG), New Tafo (contact Dr. B. Padi), undertakes research on cocoa entomology. Financing is from the Government, national agricultural research funding and donor funding.

The Research Institute of Organic Agriculture (FiBL)

The Research Institute of Organic Agriculture (Forschungsinstitut für biologischen Landbau, FiBL) provides specialized advisory and research services for a variety of crops - inclusive organic cocoa - and target groups.

FiBL designs and implements comprehensive projects with ecological, socio-economic and cultural objectives on behalf of development cooperation agencies. Its goal is to promote sustainable agriculture as a means of alleviating poverty and ensuring food security and healthy social development. These projects include development and implementation of:

- Systems for sustainable and productive use of land
- Strategies for conservation of natural resources and habitats
- Strategies for promoting income and food security and for enhancing the attractiveness of rural areas (including opening up new markets and increasing productivity)
- Strategies for preserving and utilizing local knowledge and local values (establishing and developing training, advisory and certification structures).

Specific services

FiBL provides the following services to farmers, processing and trade companies, institutions and public agencies:

- Feasibility studies
- Support during conversion and preparation for initial inspection
- Operational analysis and planning at firm or branch level
- Operational audits and technical post-conversion support
- Market studies, marketing strategies and sourcing organic products
- Verification of compliance with labelling requirements and preparation of documents relating to application for label certification
- Customized training and education programmes for producers, processors, salespeople and other target groups

- Demonstration trials
- Quality assurance for organic projects and establishing certification systems and systems for internal control.

2.5. Case studies: Organic cocoa

2.5.1 El Ceibo (Bolivia)

The El Ceibo cooperative was the first and is one of the best known organic cocoa producers worldwide. El Ceibo operates in the moist-tropical lowland part of Bolivia, in the Alto Beni region in the north of the Departament La Paz.

In the course of government-sponsored resettlement programmes, upland farmers and unemployed craftsmen and mine labourers settled in these sparsely populated rainforest areas in the 1960s and 1970s to farm there. Due to the ecological conditions, cocoa cultivation was propagated and strongly promoted. Cocoa crops became one of the most important sources of income. The fermented and dried cocoa beans were sold to intermediate dealers, who, due to the lack of information of the farmers, paid very low prices. This finally motivated the farmers to join together; on 5 February 1977 they founded the El Ceibo central cooperative.

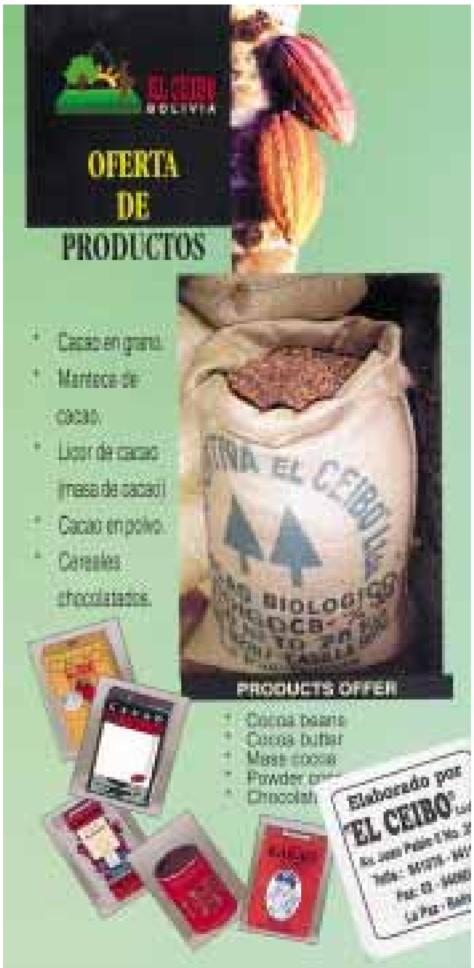
From the outset, the goal was not only to market the cocoa centrally, but also and above all to engage in its further industrial processing. Furthermore, training was to be provided to members, in both farming practices and cooperative management and administration. The aim of this was to remain largely independent of external personnel. Own fermentation facilities were established, and trucks procured for regional and long-distance transport. This had two benefits: Firstly, the quality of the cocoa was improved. Secondly, the cooperative could transport the produce itself; this was important because at that time there was a major dependence upon transport operators who also functioned as dealers.

In El Ceibo's branch in La Paz, the expansion of processing capacities started step-by-step. At first, the cocoa was roasted and peeled using the simplest technology. It was ground using a small V-belt driven mill, and this raw chocolate sold to the mining areas. In 1983, a first cocoa factory was installed. This was equipped with second-hand machines and made it possible to press cocoa butter, too. Thanks to this processing step, 'defatted' cocoa powder was also produced, and was marketed in Europe through the Swiss alternative trade organization OS 3. In 1995, the industrial facilities were again expanded and modernized, permitting the production of further processed chocolate products. From the very outset, the aim was to establish an economic basis within the country, besides the export line.

In cocoa farming, serious difficulties arose in the late 1970s due to witches' broom disease, which caused a collapse of cocoa yields. In response to this, El Ceibo launched an agricultural extension programme of its own, and began to train members intensively in techniques for controlling the disease. Conversion to organic farming practices already began in 1986 - in 1987, the first certified organic cocoa worldwide was marketed. This process was given strong support by both the alternative trade organization OS 3 and the Rapunzel company in Germany, which bought El Ceibo's raw cocoa and its further processed products at very good prices. El Ceibo received further support in the form of human and financial resources in this period from German and Swiss development cooperation organizations.

The El Ceibo cooperative was the first and is one of the best known organic cocoa producers worldwide. (Picture: El Ceibo)

Today, El Ceibo comprises 37 cooperatives, with an overall membership of more than 800 farming families. As an association of cooperatives, El Ceibo is a member of the Bolivian organic producers' federation *(Asociaci n de Organizaciones Productores Ecol gicos de Bolivia, AO-*



PEB), of Naturland (Germany), of Max Havelaar Germany and of the Latin American network for small and medium-sized cocoa producers (*Red latinoamericano de peque os y medianos productores de cacao*, Costa Rica).

EL Ceibo views itself as a traditional cooperative that is at the same time open to new approaches, with modern principles of management and cooperation. The cooperative aims to be a bridge for all members in their regions and with their specific needs. Members organize their cooperation in a democratic manner, just as the 37 cooperatives co-determine their collaboration within the El Ceibo umbrella organization according to democratic principles.

The main tasks of El Ceibo today are:

- Buying up organic cocoa from the producers. The producer prices for the organic cocoa are set by an "Organización Económica" in Alto Beni, and are graded according to the quality of the produce (applying international quality standards).
- Post-harvest processing (fermentation etc.) of the organic cocoa to partly or fully processed cocoa in La Paz (in accordance with customer requirements).
- Marketing organic cocoa: El Ceibo was the first producer worldwide to launch the production and export of organic cocoa, and is known for the high quality of its own processing. The cooperative has received several major awards for this.
- Research, training and advice for producers through a special agricultural extension programme focussing on agroforestry *(PIAF Programa de Investigaci n Agroforestal)* and an extension network *(COOPEAGRO Cooperaci n Educativa Agropecuaria).* The research programme includes two field stations where pilot and demonstration trials are conducted. Agroecology, agroforestry systems and the production of seeds and seedlings are important themes of research and services. El Ceibo collaborates with other state and private-sector providers of training. Education and training programmes address both agronomic and economic issues. El Ceibo also has a commitment to training the trainers.

The results of this pioneering work are remarkable: Since 1996, the farmers of El Ceibo have been cultivating organic cocoa to very high quality standards. 65% of the annual cocoa output of 600 t *(cacao en grano)* is organic. El Ceibo has a range of more than 20 high-quality products, graded according to international guidelines, from raw cocoa over partly to fully processed products. 70% is currently exported, and the remaining 30% sold on the national market.

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2.5.2 Conacado (Dominican Republic)

The CONACADO cocoa cooperative in the Dominican Republic is one of the pioneers producing organically certified cocoa. And what is more: not just the Swiss chocolate consumers benefit from this, but also the 9,000 small-scale producers that make up CONACADO – a win-win situation.

After Haiti, the Dominican Republic is the second poorest country in the Caribbean.

In spite of enormous economic growth of 8.3%, which, among other things, is attributable to above-average efforts by the tourism industry, the land is struggling against poverty. The latest figures show that the proportion of poor people is just below 50% in the districts around the capital, while more than one fourth of the country has a figure of more than 80%. The poverty statistics are clearly higher in rural areas than in the towns, contributing substantially to the migration to the cities that is typically encountered in developing countries.

World market prices ...

In the Dominican Republic, there are approximately 40,000 cocoa growers; 90% of them own less than 10 hectares of usable land. The low income they receive from the sale of their small cocoa harvest is just sufficient to keep their families fed in the main harvesting period between March and June. For the rest of the year, the farmers have to work as day labourers. Many are denied even this opportunity and get into excessive debt with the cocoa buyers in the hope of being able to repay their debts with the next harvest. In this way, they fall into even greater dependency - a continuous vicious circle, which in turn restricts their personal development and prevents any further progress.

Conocado's cocoa farmers receive detailled training in the internal quality control system. (Picture: Conocado)

The current situation has been caused by the extremely low cocoa prices on the world market. These reached a record low at the end of last year with USD 640/tonne while only one year before the price paid had been USD 1,300/tonne. A "fair" price for this product that would cover production costs and guarantee small-scale producers a modest profit would be USD 1,750 for conventional cocoa and USD 1,950 per tonne of organic cocoa according to the Fair Labelling Organization (FLO), yet less than 10% of cocoa is traded under these conditions by CONACADO.

... and their consequences

Given these poor preconditions, living, working or even investing in the country is simply not worth it and leads to a lack of further development both of the necessary specialist skills for cocoa production and processing and of the infrastructure required (fermentation centres and drying plants). This is reflected in the negative quality of the cocoa produced and, in the final analysis, in sales prices and the country's ability to compete. The result is a migration to the cities: country people are leaving their cocoa smallholdings and moving to the city in an attempt to escape their plight. Some actually manage it, finding jobs as taxi-drivers or construction labourers. The rest eke out an inhumane existence in the growing slums around the cities.

CONACADO: Breaking the vicious circle with organic cocoa

With the primary aim of decisively improving the income and thus the living conditions of its members and their families, the national umbrella organization of Dominican cocoa producers CONACADO *(Confederaci n Nacional de Cacaocultores Dominicanos)* was formed in 1988 as a 'grassroots democratic' farming organization. The small-scale farmers in CONACADO intend to achieve this goal, firstly by means of an organic and sustainable cultivation of their cocoa plantations and, secondly, by improving product quality through marketing their crops jointly.

In the difficult start-up phase, these motivated farmers gained the support of Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ, the German technical cooperation agency), which primarily focused on the introduction of new post-harvesting techniques. The farmers learned how to correctly ferment their harvested cocoa to meet international quality standards, using a method of cocoa handling hitherto unknown in the country.

Sustained organic cocoa production

The organic production of their cocoa was a particular concern of the farmers. Firstly, they wanted to keep their production facilities free of any agrochemicals for health reasons and, secondly, they saw this as a further opportunity to rid themselves of financial dependency. By using the correct cultivation methods, they could dispense with all agrochemicals and thus save cash. The climate that is exceptionally favourable to cocoa cultivation in this island nation results in a low infection pressure caused by disease and pests, a further important prerequisite that has contributed to the success of this plan. The Dominican Republic has thus been spared the dreaded cocoa disease, witches' broom so far.

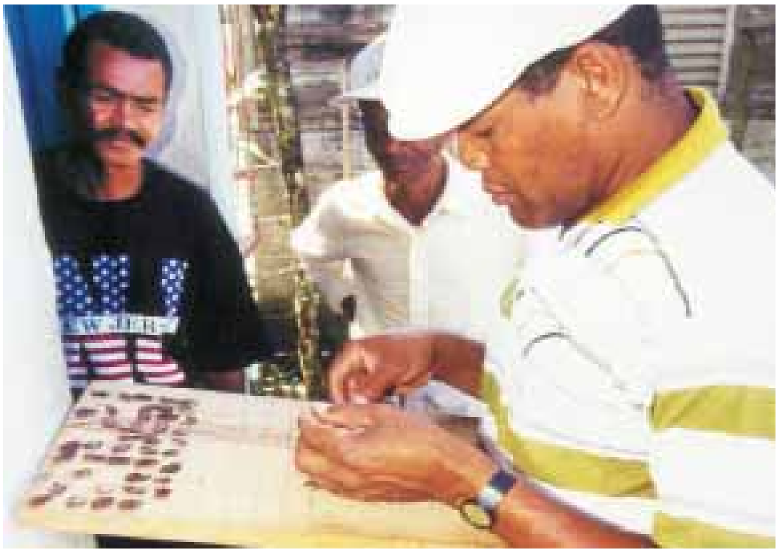
While the cocoa plantings tended to be set among other crops in the past, this was more a matter of chance. Now the farmers have learned to intentionally combine cocoa with other plantation and farm crops. The natural balance created similarly contributes towards reducing diseases and pests to a minimum. Between the cocoa trees, there are orange, grapefruit, guava and avocado trees with a variety of plants and palms (including banana plants and coconut palms) and other wood and farming plants. In bare patches, the ground is planted with root vegetables (yucca, manioc, etc.) Harvesting and trimming residues remain on the cultivated site and thus protect the soil from erosion while providing organic fertilization.

A cocoa plantation organized and tended in this way fulfils all the aspects of sustainability. Alongside the "cash crop" cocoa, it serves as a valuable enrichment of the families' daily diet and offers additional sources of income.

Joint marketing: The key to success for small-scale producers

A small-scale cocoa producer has no opportunity on his own to develop interesting sales markets himself due to his low production volume. He is dependent on the buyers for the major cocoa exporters, who mainly pay a poor price for his product. The situation is quite different when the small producer is part of the CONACADO organization. Here the cocoa from more than 9,000 small producers is marketed jointly - and directly, without any intermediaries. However, the farmers must supply top-quality cocoa, which means fermented.

Instead of supplying the buyers of major cocoa exporters or intermediaries, the CONACADO farmer delivers directly to a CONACADO buying centre (bloque). There he receives a better price for his fermented cocoa, and an even higher one for fermented organic cocoa. At the end of the year, when CONACADO has sold the cocoa, the farmer is paid again. He actually shares in the profit made by his organization, with the amount being calculated from the actual revenues from the sales of cocoa.



Quality control upon full completion of processing: Prior to sale, 100–300 beans are cut open in order to determine the proportion of rejects: poorly fermented, mouldy or pest-consumed beans. (Picture: Conocado)

Put into current figures, this results in the following picture: A buyer or intermediary would currently pay a cocoa producer 420 Dominican pesos, or approx. USD 25, for a 50 kg sack of dried cocoa. CONACADO is able to pay its members a total of approx. USD 43 per sack for the more involved processing of fermented organic cocoa. Alongside the share in the profits, the members also benefit significantly from the higher sales price of organic cocoa, which is around 50% higher than the global market price.

Cocoa fermentation: An important quality feature

In contrast to the standard local method of producing "Sanchez" quality, i.e. simply drying the cocoa after harvesting, the cocoa produced by the CONACADO farmers is subjected to the fermentation process used in other countries. To produce these superior quality "Hispaniola" beans, the fresh cocoa beans are fermented for several days in wooden crates prior to drying. Microbial processes ensure that the sugar contained in the sweetish pulp surrounding the bean is broken down. Only when this takes place does the cocoa bean develop its typical chocolate aroma that later contributes to chocolate's good taste. This aroma is intensified again through subsequent drying. Afterwards, packed in sacks the cocoa is exported to Europe where it is further processed into delicious organic chocolate, for example.

Quality assurance: A challenge for CONACADO

There are many stages between the organic cultivation of cocoa through to the beans being ready for export. Alongside the high requirements of product quality, all the aspects required by organic certification must be fulfilled. An internal CONACADO quality assurance system ensures that CONACADO meets the high demands of the world market and particularly those of its European organic customers and simultaneously that all members and their individual forms of cocoa production and processing are taken into account.

One important pillar of this system is the training and further education of all persons involved in quality assurance. Technicians are introduced to the principles of organic cultivation so that they can pass on what they have learned to farming leaders who in turn pass on this information in their communities to each individual producer. Training is also given to internal inspectors who will visit all organic cocoa plantations regularly and check that the organic standards are being adhered to. For this purpose, CONACADO has developed its own internal set of regulations that are available to every organic producer. If the internal checks have been conducted for each organic producer, the approved list of current organic producers must be distributed on time before the next harvest to all CONACADO buying centres (bloques). In this way, CONACADO buyers know which farmer is entitled to deliver his organic-quality cocoa and which may only supply cocoa in transition status because he is new to the programme. They also have to be prepared for all eventualities, in cases where the farmers have failed to comply with the guidelines and thus the cocoa can only be bought as conventional produce - something that rarely happens, fortunately. The warehouses must be clearly separated according to the different cocoa qualities (organic, transitional produce or conventional). Continuous sampling and checks with comprehensive data collection and evaluations provide a picture of the current cocoa quality in the various production centres and show where work is still needed and what can still be improved.

Fermented cocoa beans, fresh cocoa pods, opened cocoa pod with fresh beans. (Picture: Conocado)

In order to take product quality improvement a step further, the construction of expensive new fermentation centres and drying plants is scheduled, an investment for the future.

Conclusions

Last year, the organization sold more than 4,000 tonnes of organically produced cocoa to Europe, a record result. Among the Dominican cocoa exporters, CONACADO, the only 'grassroots democratically' managed small farmers organization, has achieved an impressive third place with 17% of the total export volume and more than 5,000 tonnes of cocoa beans exported.

CONACADO now has more than 9,000 members and thus represents almost one quarter of the country's cocoa producers. Alongside regular training courses on organic farming and product quality improvement held on behalf of its members, CONACADO has a comprehensive credit programme that provides CONACADO producers with access to credit at favourable rates.

The CONACADO farmers have indeed been able to improve their standard of living in the last few years and many are free of debt. Sometimes, however, they still lack the right equipment for proper cocoa fermentation. A lot of the women would like a washing machine or other useful household appliances. This would make their daily chores somewhat easier. The higher and regular income from the sale of cocoa still does not suffice to cover this.

Other sources of income are slowly being discovered by the producers and their families, e.g. regional sales of crops planted together with the cocoa or the chocolate produced by the women's groups themselves. Consideration is currently being given, among other things, to an organic market stall in the capital, selling these products as quality organic products.

Work, investment and rural life are starting to have a slightly greater meaning for these people. Rural and community development has become possible. Although

Freshly harvested cocoa pods. (Picture: Conocado)

the price for organic cocoa is currently still much too low, nobody is thinking of leaving their plot of land and trying their luck elsewhere or in another line of work. An additional benefit is that an enormous contribution is being made to the protection of resources. A total of more than 27,000 hectares of cocoa plantation are being farmed organically and thus in a way that is both close to nature and sustainable. The woodland style of mixed cultivation makes a considerable contribution to the protection of natural habitat on this practically deforested island state. The vision of "Securing the future by means of organizing small-scale farming and organic agriculture" appears to have taken a further step towards reality.

Unfortunately, CONACADO's future success does not depend solely on the industriousness and willpower of its members. Hurricane George, which devastated part of the cocoa plantation areas in 1998, took its toll on CONACADO. However, it is not just repeated natural disasters, but also other factors that are taxing the organization, e.g. the fact that a major producer can work and economize more efficiently than an army of small-scale producers. This is what the organization mainly notices in its quality assurance programme. Controlling the quality of 9,000 producers is significantly more time-consuming and incurs greater costs than monitoring the quality of the same volume produced by a third of the number of medium-sized producers or a tenth of the number of major producers. When compared to major producers, small farmers organizations are also increasingly worse in terms of adherence to and checking of organic standards. The large number of individual farmers causes additional work and considerably greater costs in this respect. The dream of organic produce can rapidly become a nightmare if the cost of organic production exceeds the extra price paid for the organic product.

What CONACADO and its members therefore need for the future are trading partners who are prepared to perceive and assign value to these major efforts by a farmers' organization. They need customers who are prepared to commit themselves to a longer-term purchasing contract with CONACADO and to pay prices which really cover costs. In return, CONACADO must also supply the quality required.

However, consumers are also needed, in this case chocolate-lovers, who are prepared to pay more for their organic chocolate, for chocolate without a bitter aftertaste.

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2.6 Web information corner

http://www.fibl.ch/
The FiBL website provides:
- Information on FiBL's research programme
- A facility for ordering information and documents
- An overview of courses and training opportunities in organic farming
- Downloadable texts and data on organic agriculture
- Contacts and links to both Swiss and international institutions and organizations involved in organic agriculture.

http://europa.eu.int/eur-lex/de/lif/dat/1991/de_391R2092.html
The EUR-Lex website contains all texts pertaining to EU Regulation No. 2092/91 on organic production in all the languages of the EU.

FiBL provides support during conversion and preparation for initial inspection of organic cocoa farms. (Picture: FiBL)

http://www.ifoam.org/accredit/index.html
This is the accreditation programme of the International Federation of Organic Agriculture Movements.

http://www.blw.admin.ch/
The website of the Swiss Federal Office for Agriculture (Bundesamt für Landwirtschaft) provides detailed information on:
- The Swiss Organic Farming Ordinance
- Forms for attestation of equivalence and individual authorization to import
- Direct payments for organic farms
- Cultivation of organic products.

http://www.blw.admin.ch/nuetzlich/links/d/zertifstellen.htm
A list of European certification bodies can be downloaded from this page maintained by the Swiss Federal Office for Agriculture.

http://www.admin.ch/
Original texts of:
- Swiss legislation
- The Swiss Ordinance on agricultural imports.

http://www.zoll.admin.ch
Customs tariffs of the Swiss Federal Customs Administration.

http://www.bio-suisse.ch
The website of BIO SUISSE (Association of Swiss Organic Agriculture Organizations, Vereinigung Schweizer Biolandbau-Organisationen) provides detailed information on:
- Standards relating to farming and processing
- Approval procedures for the Knospe ('bud') label
- Markets and prices.

http://www.krav.se
The website of KRAV Sweden, one of the internationally known organic certifiers; provides detailed information on:
- Standards relating to farming and processing
- Approval procedures for the KRAV label

http://www.maxhavelaar.ch/
The website of Max Havelaar Switzerland, one of the most important Fair Trade organizations.

http://www.rainforest-alliance.org
The website of the Rainforest Alliance in the USA.

http://www.ecotop-consult.de
Information on principles of successional agroforestry systems, practical examples, training programmes

Further useful websites:

http://www.cirad.fr
http://acri-cocoa.org
http://pestcabweb.org
http://www.cabi.org
www.cocoaresearch.com
www.gtz.de
www.winne.com/ghana/socs/gcocoab.html
www.intracen.org
www.wga-hh.de
www.calcocoa.com

3. Organic tea cultivation

3.1 Introduction

3.1.1 Botany

The tea bush (*Camellia sinensis* (L.), O. Kuntze) belongs to the Thecae family. It originates from the high regions of such countries as South west China, Myanmar and North east India.

3.1.2. Varieties and countries of origin

The tea varieties that are cultivated are all hybrids of the original tea plant *Thea sinensis* and *Thea assamica*. The results gleaned from studies of conventional varieties can at least be used in part (e.g. as regards quality parameters and resistance properties). Until now, though, there have been no studies of varieties for the organic cultivation of tea. For this reason, only generalised recommendations can be offered:

Organic cultivation of tea requires varieties (clones) with broad-scope resistances, and the ability to thrive under shade trees (upright, dark green leaves).

Organically cultivated tea was first produced in 1986 in Sri Lanka. Since then, it has become wide-spread mostly in India and Sri Lanka. Currently, around 5000 ha of tea are being cultivated organically. (Other producing countries include: China, Japan, Seychelles, Tanzania, Kenya, Malawi and Argentina).

3.1.3 Uses

Primarily, tea is drunk as black tea. Other sorts with less importance to the worlds market are green tea (East Asia, Arabian countries) and Oolong-tea (China, Taiwan). Recently, organic green tea is manufactured in increasing quantities. Instant tea has also begun to be manufactured in increasing quantities.

3.2 Aspects of plant cultivation

3.2.1 Site requirements

The ideal growth conditions for tea are average annual temperatures of 18–20 °C, an average daily amount of sunshine of 4 hours per day, as well as a minimum of 1600 mm of rainfall distributed evenly throughout the year. Relative humidity should lie between 70% and 90%. In regions with extensive dry seasons, shading trees play an important role in providing and maintaining sufficient humidity. Additionally, tea plantations in windy regions should also be protected by wind breakers e.g. hedges, to reduce the intensity of evapo-transpiration (whereby, for example, in the dryer regions of East and

Tea Garden of Pathajara. (Picture: Naturland)

Central Africa, these can then also begin to compete with the tea bushes for the available supplies of water).

The soil should be deep, well-drained and aerated. Nutrient-rich and slightly acidic soils are best (optimum pH-value 4.5-5.5). Sufficient drainage and aeration of the soil can be lastingly and economically achieved with the combination of shading trees and deep-rooting green manure plants.

China tea *(C. sinensis var. sinensis)* is especially suited to hilly regions. It is resistant to drought, and can tolerate short periods of frost (yet only has a low tolerance of shade). Contrastingly, Assam tea *(C. sinensis var. assamica)* is a purely tropical crop, and reacts sensitively to drought and the cold (yet only has a high tolerance of shade).

3.2.2 Seeds and seedlings

On organic cultivations, no gen-manipulated varieties are allowed. Tea plants are propagated both generatively or vegetatively. Cultivation takes place under controlled conditions in special beds over the space of 2–3 years. It is recommended to establish own nurseries in the tea garden, in order to ensure a continuous supply of untreated and healthy plants.

In choosing locations for the nursery, the following should be considered:

- A protected site
- Sufficient supply of water
- A site that has not been cultivated, if possible (virgin soil)
- Preparation of the site with legumes (1-2 years, e.g. with *Crotalaria ssp*., *Tephrosia candida*, that are afterwards mulched)
- Natural shade (e.g. *Tephrosia candida*, *Crotalaria ssp*., *Sesbania ssp*.)
- Same altitude and site conditions as the tea garden (in case it is purchased as an addition)

3.2.3 Planting methods

There are different methods applied depending on the site: single plants, double plants or the hedge planting method.

When establishing a new tea plantation, care should be taken to manually uproot problematical grasses, such as e.g. Alang-Alang *(Imperata cylindrica)*. Subsequently, it is recommended to plant fast growing covering plants (e.g. Sarawak bean *Vigna hosei*, Creeping Indigo *Indigofera spicata*, Guatemala grass *Tripsacum laxum*), to suppress the growth of unwanted species of flora. In particular, when the tea is to cultivated on terraces, the soil should be protected against drying out by green manure plants (such as weeping lovegrass *Eragrostis curvula*). New tea plantations, especially those planted on slopes, are at the greatest risk of erosion taking place, which will lead to soil degradation and nutrient losses.

Plantations set on slopes (e.g. Darjeeling) should therefore be planted along the contour lines. Slopes and peaks that are especially at risk from erosion should not be used to cultivate tea. Rather, these areas should be protected by planting permanent forests along them.

Between 10,000 and 20,000 plants per hectare can be planted, depending on the gaps between rows and plants. The crop density should always be adapted to the site conditions (slope, altitude, micro-climate etc.), as well as incorporating those shading trees necessary on organically cultivated tea plantations.

Shading trees have a great importance to the organic cultivation of tea. The following is a list of their positive effects:

- Nutrient supply (e.g. nitrogen, when legume shading trees are used; they retrieve nutrients from lower soil levels; reduction of nutrient losses from washing out)
- Build-up of humus
- Protect the tea bushes from too much sun (yield reductions are possible when the solar radiation is too intense, and there is a lack of shade)
- Reduction of erosion through wind and rain (and damage from hail)
- Influences the quality of the tea
- Positive micro-climatic effects e.g. during drought periods
- Encourage benefical insects to settle
- Create a pleasant atmosphere for the pluckers.

When choosing tree varieties to use as shading plants, it is important to use plenty of local, adapted varieties, enough leguminous trees, and overall, a wide variety of differing species. Care should be taken to choose fast, and not so fast growing varieties of shading trees at the beginning of cultivation. The correct combination of shading tree varieties should always be based on local experience, or, in certain cases, tried out on site.

As regards the number of shading trees or the intensity of shade required, the following rule can be used as a guide: The higher the tea garden is located, the less shade is necessary (and also the other way round).

3.2.4 Diversification strategies

Which types of other crops can be integrated into the tea plantation needs to be decided for each individual production site. Species which should be considered include those which can provide food for worker's families, be sold on the local market or used as additional cash crops. The cultivation of spice plants, such as, e.g. cardamom and ginger (Darjeeling) or nutmeg nuts and pepper (Sri Lanka) are worth mentioning. Vanilla can also be easily integrated into organic tea plantations (the vanilla plants will climb up the shading trees). Furthermore, also the wood of shade trees can be used as fuel or building material.

3.2.5 Supplying nutrients and organic fertilisation management

3.2.5.1 Nutrient requirements

A high amount of nutrients are lost through the continual plucking of tea leaves. Table 31 and 32 provides average nutrient losses on various tea cultivation regions, which are based on studies carried out on conventional tea plantations (therefore, the values can only be approximately used for the situations on organic tea plantations):

Extraction in kg for 1000 kg tea/ha/year (conventional tea gardens) (table 31).

The plant material that accumulates throughout a pruning cycle also contains high levels of nutrients (for a 3-year cycle) (table 32).

Moreover, the perennial tea plant requires a considerable amount of nutrients in order to develop roots, stem and branches.

3.2.5.2 Organic fertilisation management

At the start of the conversion, the tea garden needs to be developed consequently and in stages from a monoculture towards a diversified crop system. Alongside the cash crop tea, plants should be cultivated to improve soil fertility, provide a supply of nutrient (especially nitrogen), increase diversity (habitats for benefical insects), supply wood (fuel and building material) and (if practised) to provide feedstuff for on-farm animal husbandry.

Main objective is to provide a sufficient supply of organic matter for the tea bushes. Spreading the organic matter over the site should be given preference to the more work-intensive practise of composting.

The following sources of nutrient supplies are available:

A. Litter fall and pruning material from shade trees:

Litter is provided without any additional work. Additional working hours need to be calculated for pruning the shade trees (to create an ideal micro-climate, admit light and control the growth of the tea bush).

The following nutrient contents of litters applies to siran *(Albizzia chinensis)*:

Nutrient (kg/ha)	Minimum	Maximum
N	50,2	125,5
P_2O_5	17,6	44,0
K_2O	14,2	35,5
CaO	25,5	63,5
MgO	12,4	12,4

Table 31: Average nutrient losses on various tea cultivation regions

Region	Nitrogen (N)	phosphate (P_2O_5)	Potassium (K_2O)
North India	50	10	20
South India	65	15	35
Sri Lanka	45	8	21
East Africa	42	6 – 8	24

Table 32: Nutrient loss throughout a pruning cycle of 3 years

Loss (kg/ha) over 3 years	Nitrogen (N)	phosphate (P_2O_5)	Potassium (K_2O)
Pruning	785	135	570

The number of shading trees varies according to site and the variety of tree (up to 500 shading trees per hectare). The pruning material should remain as mulch directly on the site, or, if applicable, used as compost material. Yet if the pruning material is to be used as fuel, at least the ashes should be used as a compost supplement (e.g. to replace the potassium).

Three aspects need to be heeded, in order to create the conditions necessary for the soil life to continue decomposition :

- The pruning material needs to be sufficiently chopped (2–5 cm pieces).
- The material must then be evenly spread around the tea bushes (avoid creating heaps of material).
- The carbon-rich material needs to be mixed with additional nitrogen-rich material (e.g. neem-press cakes, castor cake or green manure from crotalaria). In order to achieve a better carbon/ nitrogen ratio for successful decomposition.

B. Green Manure (mulch):
The foliage from green manure plants, as well as that from the other crops, should remain as mulch material on the site. In the cases of tea gardens where integrated animal husbandry is practised, care should be taken to choose green manure plants that can also be used as fodder crops.

C. Returning Pruning material from tea bushes:
As already mentioned, the pruning material from the tea bushes contains a considerable amount of nutrients (especially after deep pruning and/or rejuvenation). These nutrients should not be removed from the tea garden (e.g. as fuel), but should either be re-applied directly as mulch, or via composting (same as shading trees).

D. Composting and animal husbandry:
On many tea gardens, the people living and working there are often supported in their acquiring and maintaining of, e.g., cattle, as they are thereby assisted in an opportunity to supplement their income.

Table 33: Proliferation of different varieties of shade trees in various tea cultivation regions

Northeast India	South India/ Sri Lanka	Indonesia	East Africa
Albizzia chinensis	Erythrina ssp.	Albizzia chinensis	Grevillea robusta
Albizzia odoratissima	Gliricidia ssp.	Albizzia moluccana	Albizzia gummifera
Dalbergica assamica	Grevillea robusta	Albizzia falcata	Albizzia adiantifolia
Derris robusta		Erythrina ssp.	Gliricida maculata
Erythrina indica		Leucaena glauca	

Table 34: The peculiarities of different plant varieties

Plant variety	Peculiarities
Paspalum purpureum (Napier fodder grass)	Fodder grass during early stages, mulch, erosion and wind protection rows
Tripsacum laxum (Guatemala Grass)	Fodder grass, mulch, strengthens soil coherence
Crotalaria anagyroides (rabbit bells)	Hardy and rapid growth, suitable as fodder, legume
Crotalaria ssp.	Annual and perennial, green fertiliser, covering plant, partly suitable for use as fodder
Indigofera spicata (creeping indigo)	Covering plant for new tea plantations, non-climbing, perennial, legume
Vigna hosei (Sawara bean)	Covering plant for new tea plantations, suitable as fodder, legume
Thephrosia candida	Perennial; green manure; legume; use up to 1200 m height; good biomass production even on poor soils;
Leucaena leucocaephala (Horse tamarind)	Drought and salt resistant; legume; limited use as fodder;
Sesbania ssp.	Drought and salt resistant; legume; use as fodder

The basic source of fodder for the animals comes from fodder and green manure plants (e.g. Guatemala grass), vegetation in the tea garden's edges, which are not planted with tea, or from plants neighbouring the tea garden. The space available to grow fodder must be taken into consideration when calculating the number of cattle to acquire. If the tea's nitrogen demand (on average around 60 kg) is to be met entirely from composted cattle manure, around 2 cattle per ha of cultivated tea are required.

E. Ditch composting method:
For this method, small ditches are dug between alternating plant rows every 3–4 years, and filled with pruning material, green manure plants, compost and cattle dung (the organic material must be well cut-up, and should not be buried too deep). Simultaneously, the tea bush roots are also cut to stimulate new growth. The disadvantage of this method is the high workload involved – especially on older plantations with narrow gaps between the rows.

It is therefore vital for the tea plantation's manager to establish a fertilisation programme right at the beginning of the conversion, that places core emphasis on the production and subsequent usage of organic substances, as the most important source of nutrients.

Furthermore, the nutrient content of the soil should be analysed regularly, particularly the supply of potassium, phosphorous and magnesium (also for trace elements). Should deficiencies arise, additional fertilisers, approved for use on organic plantations, are available for sale (e.g. rock phosphate, potassium sulphate, kainit and sylvit). In order to maintain an ideal pH value, liming (e.g. with dolomite meal) may be necessary. In the case of extremely low pH values (risk of Al toxicity), the use of gypsum ($CaSO_4$) is also permitted.

The purchase of additional organic fertilisers may be necessary particularly during the first stages of the conversion period

Tea tasting. (Picture: Naturland)

(during the first 3–6 years, depending on the site). In any case, the purchase of any additional organic fertilisers must first be approved by the certification body. The preparations generally used on tea cultivations include, e.g., neem press cakes, castor cake, coconut press cakes or dung from extensive animal husbandry.

Tea plants in India. (Picture: Naturland)

Tea plantations which are not capable of providing sufficient amounts of compost from organic materials produced on site are permitted to purchase certain organic materials from outside (after approval by the certification body). These include; neem press cakes, castor cake, bone meal, coconut press cakes and cattle dung from extensive animal husbandry.

3.2.6 Biological methods of protecting plants

Experience has shown that the frequency of disease and pest infestations decreases with during the conversion process. Yet this requires all of the necessary requirements to be fulfilled (encouragement of beneficial insects, micro-climate etc.).

The following is a list of counter-measures against infestation by disease or pests that are currently being utilised:

Table 33: Counter-measures used against infestation by diseases or pests

Pest/ disease	Biological counter-measures
Exobasidium vexans (blister blight); Endemic to Southeast Asia, does not occur in East Africa; *Poria hypolateritia* (Red root rot)	Copper preparations permitted in emergencies (max. 3 kg pure copper per ha); Preventive measures (micro-climate, hygiene precautions etc.) important!
Meloidogyne ssp. (Nematodes)	Tearing out and burning of infested tea bushes. Remove infested tea bushes, and remove and replace large amounts of the soil; Prevention e.g. using plant-bags in the seed bed; use shading tree *Indigoferra teismanii* as a trap plant; *Sow Tripsacum laxum* (Guatemala grass) before starting a new plantation.
Helopeltis ssp. (Tea Bugs e.g. Tea mosquito bug)	In emergencies, neem extract ; encourage useful insects such as ladybirds; introduce *Bacillus thuringiensis*; in severe cases – pruning; always begin the harvest in non-infested sectors;
Oligonychus coffeae (Red spider mite)	In emergencies, neem extract, tobacco extract; sufficient shade will suppress development; till weeds early enough before the main harvest begins;
Homona coffearia (Tea roller), an insect that can cause problems in India, Japan, Malaysia and particularly in Sri Lanka.	Plant a diversity of shading tree to attract e.g. parasitical wasps; Another natural antagonist is the *Macrocentrus Hormonae* parasite;.
Andrata bipunctata (Bunch caterpillar) *Biston surpressaria* (Looper caterpillar) *Etrusia magnifica* (Red slug caterpillar)	Counter-act with light traps; collect the caterpillars from the ground, tea bushes and shading trees (in all stages of development); Apply trap bands to the shading trees;
Brevipalpus phoenicis (Scarlet Mite) *Calacarus carinatus* (Purple Mite)	Suppress growth with green fertiliser plants and shading trees; apply lime and Soda washing in emergencies or after pruning.
Taeniothrips setiventris (Common Thrips; mostly in Darjeeling) *Scirtothrips dorsalis* (Assam-Thrips; mostly in Assam and Dooars)	Green manure plants and shading trees; lime and Soda washing; disturbing the soil around the tea bush stem during the cold months will destroy the pupae;
Moss (e.g. in Darjeeling during the winter months)	Wash the tea stems with lime and soda

[4] According to the European Regulation for Organic Agriculture (EEC) 2092/91 the use of copper preparations for plant protection (e.g. Bordeaux Mixture) is allowed for a transitional period which will end at the 31st of March 2002. However, any use of copper preparations until 2002 has to be approved by the certification body. In case copper preparations have to be applied it is recommended to use preparations which contain less copper and therefore to reduce the accumulation of copper in soils (e.g. tribasic copper sulphate, copper hydroxide).

[5] According to the European Regulation for Organic Agriculture (EEC) 2092/91 the application of Neem preparations is restricted and only allowed for the production of seed and seedlings. This regulation is discussed controversial. An up-date information is available from your certification body.

[6] According to the European Regulation for Organic Agriculture (EEC) 2092/91 the use of tobacco extracts is allowed for a transitional period which will end at the 31st of March 2002. However, any use of tobacco extracts until 2002 has to be approved by the certification body. Furthermore, application is restricted only for tropical and subtropical crops and shall be applied at the beginning of the vegetation period.

In principle, the "emergency measures", such as, e.g., neem extract, *Bacillus thuringiensis* cannot be used prophylactically – otherwise, the pests will rapidly become resistant. Measures involving copper preparations must also be used sparingly (and must be approved by the certification body beforehand).

After the tea bushes have been pruned, they need to be protected against infection. Natural waxes are used to protect the cut areas, and alkali solutions to wash off the lower tea branches (alkali solutions can be prepared from 6 kg soda, 2–3 kg lime and 100 Litres of water).

The tea bushes can also be pruned to counter pests and diseases, by cutting away infected branches ("knife cleaning").

The shading trees should be protected against aggressive insects with the use of trap bands (e.g. *Xylotrupes gideon* (Black beetle) and Diacrisia oblique, which are especially attracted to *Indigio teismanii*). On the one hand, shading trees can suppress certain pests, yet on the other, in some cases they can also act as host plants to diseases and pests.

3.2.7 Crop cultivation and maintenance

Pruning the tea bushes

Regular pruning of the tea bushes is one of the most important measures in cultivating tea. A variety of pruning intervals are practised, depending on the site and plucking system. Usually, the bushes are pruned back to a comfortable plucking height every three years, and then radically cut back every 15–20 years (to a plant height of 30–40 cm). Collar pruning, reaching down to the soil, is utilised to rejuvenate the tea plants.

No fundamentally different pruning measures are used to those carried out on conventional tea plantations. Yet it should be noted that the pruning interval will also influence the supply of organic material. Shorter pruning intervals with less pruned off will no doubt facilitate the decomposition of pruning material by the soil life.

Weed Management

Measures to suppress the growth of unwanted flora when beginning a new tea plantation have already been mentioned in chapter 3.2.3. These also apply in principle to tea bushes after a rejuvenation pruning.

Mulching methods can be especially recommended to effectively combat weeds (and erosion-prevention). Hoeing is not recommended on those sites at risk from erosion. Motor scythes can also be used to make the job easier.

Fertilising with compost

Compost should be applied just before the main plucking times on the site. It is important to only work in the compost to a shallow depth, to avoid loss of nutrients. Greater amounts of compost (average 10t / ha) are generally applied after deep pruning.

Shading tree management

The shading trees need to be continually thinned out to create and maintain an optimum amount of shade (the pruning material should be used for composting or mulching if possible). Thinning out will also help prevent infestations of blister blight (Exobasidium vexans), which thrive under too shady (and thereby moist) conditions. The shading trees should be trimmed to prevent blister blight developing directly before the rainy season (monsoon).

3.2.8 Harvesting and post harvest treatment

Harvesting is invariably performed manually, which allows for a degree of quality control.

Independently of which harvesting method is used (orthodox method, CTC etc.), care must be taken to ensure that the produce does not become contaminated by foreign substances. It is important that the tea is not shipped open and unprotected.

The quality of the tea is determined by its colour, smell and taste. (Picture: Naturland)

Possible contamination sources include:

- Substances (e.g. copper, lead from abrasion) emanating from processing machinery that the tea comes into direct contact with,
- Wood protection preparations used to protect wooden crates (e.g. PCP),
- Glues used to make the crates (often containing formaldehyde)
- Glues used in consumer packages often contain contaminants (e.g. PCP)

Supplementary ecological measures

In addition to the erosion protection measures and measures to encourage settling of useful insects already mentioned (erosion from wind and water), emphasis should also be placed on gauging the availability of alternative sources of energy at the site. Generally, a considerable amount of the pruned material is used as fuel, whereby a large amount of nutrients are lost. The use of alternative sources, such as wind, water or solar energy or the manufacture of biogas, can offer some support at certain sites. The objective is to evolve agro forestry systems, as these are capable of producing large quantities of wood for building material and fuel, allowing prunings to remain on the plantation.

3.3 Product specifications

Tea is traded as black tea, green tea, Oolong tea and instant teas. The various processing methods are described in chapter 3.3.2.

- Black tea: Is fully fermented tea.

- Green tea: Through heat treatment (in pans or with steam), polyphenol oxidase (enzymes) in the fresh leaves are inactivated. Only then is the product rolled and dried (often frequently). Fermentation is suppressed by deactivating these enzymes, and the leaves retain their olive green colour.

- Oolong tea: The fermentation process is halted at an earlier stage (partly fermented tea).

- Instant teas: Instant teas are made either from low-quality teas (fermented and dried), or from non-dried tea in a special process directly after fermentation. Instant teas lose much of their aroma during the extraction (only hot water extraction is permitted) and subsequent freeze-drying processes.

3.3.1 Minimum content levels

Table 34: Minimum content level of tea

Dry matter	min.	93 g / 100 g tea
Extract contents	min.	32 g water soluble constituents / 100 g dry matter
	min.	26 g water soluble constituents / 100 g (for tea of Turkish or Russian origin)
Caffeine content	min.	1,5 g / 100 g dry matter
Total ash content	min.	4,0 g / 100 g dry matter
Ash insoluble in	max.	8,0 g / 100 g dry matter
hydrochloric acid	min.	1,0 g / 100 g dry matter
Water soluble ash	min.	45,0 g / 100 g dry matter
Raw fibres	min.	16,5 g / 100 g dry matter

3.3.2 Manufacturing black tea

A. Sorting

Aim:
- To remove contaminants
- To remove old, dry tea leaves
- Fractionation of the flushes according to size

Tea sorting machines work according to the principle of the critical suspension speed.

B. Withering

B.1 Natural withering:
The fresh tea leaves are laid out in thin layers on tats stacked one above eachother, and dried in the fresh air.
Duration: up to 20 h (not terribly efficient)

B.2 Artificial withering:
The leaves are laid out in layers of up to 20 cm thick (ca. 23 kg/m^3) on a mesh. The meshes are placed in a tunnel, through which warm air mixed with fresh air is forced. This considerably reduces the total withering time.

B.3 Drum withering:
The tea leaves are dried in perforated steel drums by warm, 55 °C air that is blown through.

B.4 Tunnel withering:
Conveyance trucks laden with stacks of meshes are continually driven through a withering tunnel (4,5 m in length).
Duration: 2.5 h for 70% withering;
4.0 h for 65% withering

Around a third of the moisture content is extracted during withering (optimum residual moisture 60–62%). And the turgor pressure in the leaves is alleviated, leaving them soft and supple.

C. Breaking up

C.1 Rolling machines

A circular table fitted in the centre with a cone and across the surface with slats called battens. A jacket, or bottomless circular box with a pressure cap, stands atop the table. Table and jacket rotate eccentrically in opposite directions, and the leaf placed in the jacket is twisted and rolled over the cone and battens in a fashion similar to hand rolling.
Output: 455 kg/charge (20-30 minutes)

C.2 Rollbreaker

During the rolling process, the leaves can form relatively solid balls, which can be loosened and broken down in the rollbreaker.

C.3 Lawrence tea processor

The LTP is a combination cutting and hammer mill. The tea leaves are broken down by rapidly rotating knives and hammers. After the process, the tea is run through a bale shredder. LTPs produce 90% small-corn fannings or dust tea.
Output: 450-550 kg/h

C.4 CTC method (crushing, tearing and curling)

This machine consists of two seperated metal rollers, placed close together and revolving at unequal speeds, which cut, tear, and twist the leaf. CTC machines are widely used, for example, in Assam.

C.5 Rotorvane

This breaking-down machine works similarly to a mincer. Rotorvanes can be used to replace rollers, and are often used in combination with a CTC machine.

Output from withered leaves:	455 kg/h
Output from once-rolled leaves:	730 kg/h

C.6 Tobacco or Legg cutter method

The tea leaves do not need to be withered for this method. The leaves are first pressed into a cake form, and then cut up into strips. Afterwards, they are fed into a rollbreaker to be broken up and fermented. Rolling makes the leaf cells burst, until the leaves are coated with juices and oxidation can take place with atmospheric oxygen. The air in the rolling room needs to have a relative humidity of 95% and be 20° C to 24 °C, so that the juices do not dry out.

D. Fermentation

During fermentation, the oxidation process begun during rolling is continued. Fermentation takes place in separate fermentation rooms, which need to be kept extremely clean to avoid bacterial infection of the tea. The tea leaves are placed in 3.5–7.5 cm layers on aluminium trays. The thickness of the layers depends on the room temperature. As soon as the tea has acquired a copper red colour, the correct degree of fermentation has been reached, and the process must be halted by drying.

Temperature:	0-85°C (usually at 20–25 °C)
Duration:	3.5-4 h for normal production processes 1-2 h for CTC and Legg cutting

E. Drying

The drying process generally consists of three to eight conveyor belts placed above each other, whereby the tea enters the dryer on the uppermost, and leaves the process on the lower belt. Hot air up to 90°C is blown against the leaves, which should have reached 80 °C by the time drying has been completed, in order for the polyphenol oxidase enzyme to be properly inactivated. The moisture content should reduced to 3–5%, whereby the aroma becomes established and the leaves take on their typical black colouration.

Temperature:	75-85 °C
Duration:	ca. 20 min

F. Sifting

Afterwards, the tea is fed through mechanical, vibrating sifter meshes in a variety (yet non-standardised) of diameters, and thereby graded into various particle sizes.

3.3.3 Maintaining quality

A. Transport

- Plywood crates lined with aluminium or plastic foils (PE) which are soldered or welded;
- Packaged on the same day,
- Air-tight sealing.

B. Storage

Packaging: Porcelain
Glass
Metal
Bags
(paper-aluminium-paper)

A clear indication on the package that the originates from organic cultivation is needed to avoid any mixture with conventional tea[7].

Protects ag.:	Light	➨ dark
	Heat	➨ 5-20 °C
	Moisture	➨ el. humidity: 60%
Smells		➨ Air-tight sealing
Storage time:		1–2 years

3.3.4 Flavouring of tea

The use of synthetic and/or naturally identical aromas is not permitted on principle in organic foodstuff. This is important to know, because flavouring of tea has a long tradition (e.g. the use of bergamot oil to make Earl Grey tea). However, the use of natural flavourings[8] is permitted. On the other hand, laying out layers of plant blossoms (e.g. jasmine) is permitted (the blossoms must be organically cultivated). In each case, the aroma substances used need to be approved by the certification body.

3.4 Web information corner

Relevant Certifier for Organic Tea Production

No.	Address	Country
1	IMO Institut für Marktökologie Postraße 8 CH-8583 Sulgen Telefon: +41 (0)71 - 644 9880 Fax: +41 (0)71 - 644 9883 E-mail: *international@imo.ch* *http://www.imo.ch*	Switzerland
2	BCS Öko-Garantie GmbH Cimbernstr. 21 D-90402 Nürnberg Tel.: +49 (0) 911 / 4 24 39 -0 Fax: +49 (0) 911 / 49 22 39 *info@bcs-oeko.de* *www.bcs-oeko.de*	Germany
3	Skal Stationsplein 5 P.O. Box 384 8000 AJ Zwolle The Netherlands Tel. +31 (0) 38-4268181 Fax +31 (0) 38-4213063 E-mail: *info@skal.com*	Netherlands
4	Organic Farmers & Growers Shrewsbury Tel. +44 (0) 1743 440512 Fax. +44 (0) 1743 461441 E-mail. *info@organicfarmers.uk.com*	United Kingdom
5	OCIA International International Organic Crop Improvement Association 1001 Y Street, Suite B Lincoln, NE 68508 Tel: +1 (0) 402 477-2323 Fax: +1 (0) 402 477-4325 E-mail: *info@ocia.org*	USA

[7] When products from organic farms are being declared as such, it is necessary to adhere to the requisite government regulations of the importing country. Information concerning this is available from the appropriate certification body. The regulation (EEC) 2092/91is applicable to organic products being imported into Europe.

[8] The European Regulation for Organic Agriculture (EEC) 2092/91 defines that natural flavourings shall fulfil the requirements of the Flavouring Directive 88/388/EEC. Also the IFOAM Basic Standards define additional requirements for natural flavourings (see annex 4 of the IFOAM Basic Standards).

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SIPPO

SIPPO (Swiss Import Promotion Programme) is the new import promotion programme under the patronage of *SECO*, the State Secretariat for the Economy of the Swiss government. It supports private businesses in emerging markets and markets in transition that are endeavouring to access the Swiss market as well as markets in the European Union. SIPPO's services include business branch-related market information, advisory services for products and marketing, promotion in Switzerland as well as assistance at selected European trade fairs.

At the same time, Swiss companies are informed about the requests for contact received from foreign companies and are given support in their search for new sourcing markets, products and cooperation partners.

The aim of this economic and trade promotion is to support emerging markets and markets in transition in their attempts at comprehensive integration into the global economy:

1) an increase in the skills of small and medium-sized companies in the main countries of interest in terms of product quality and marketing in the field of exports
2) a strengthening of skills and the inclusion of trade institutions and business-branch associations in the trade development process
3) an increase and a qualification of small and medium-sized companies' trade contacts with the Swiss/EU import economy
4) an improvement in the status of information in the Swiss/EU import economy regarding new sourcing markets in the partner countries

SIPPO's programme is part of Switzerland's development and foreign trade policies. It is conducted as a complement to other programmes involved in technical cooperation relevant to trade. Apart from participation in costs by participants in the programme, the programmes are largely financed by the State Secretariat for the Economy, SECO.

The target groups are

In emerging countries and countries in transition:

- Small and medium-sized companies and cooperatives
- Business organisations, chambers of commerce, associations

In the importing countries (Switzerland, EU):

- Importers, major distributors and the processing industry
- Business organisations, chambers of commerce, associations

SIPPO focuses its activities on a number of selected sectors, such as:

- Agricultural products, processed food, fish and seafood
- Home furnishings, interior design, furniture
- Textiles, fashion, silk, silk accessories
- Technical components, machines, tools, electronic products, software
- Leather goods, accessories, handicrafts
- Jewellery (gold and silver, ethnic crafts)

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